Appendix A
Roadway Design and Construction Standards – Standard Drawings

Appendix A. Roadway Design and Construction Standards – Standard Drawings

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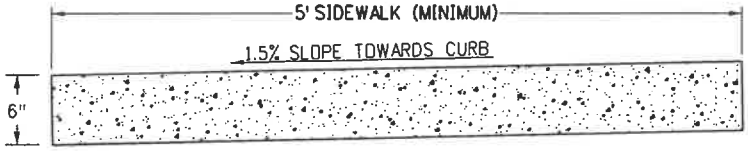
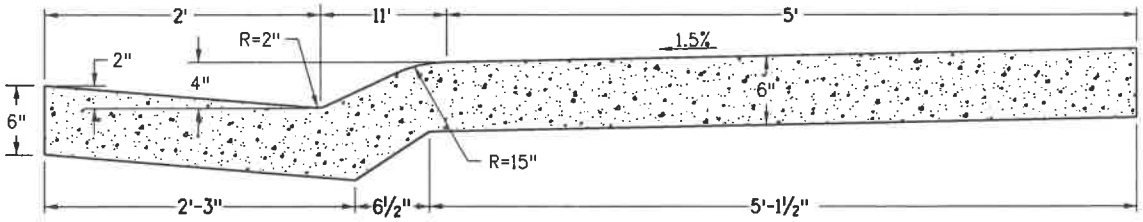
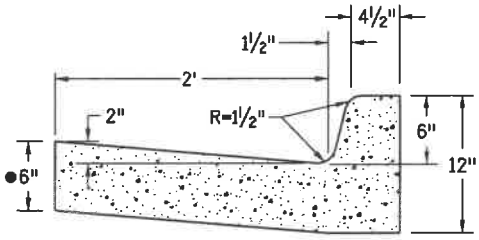


IF USED FOR PEDESTRIAN/BICYCLE COMBINED SIDEWALK, WIDTH SHALL BE 10'.

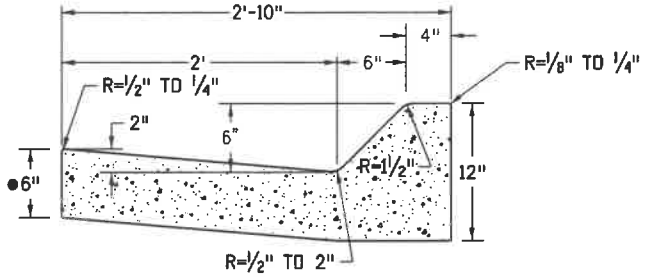
STANDARD ATTACHED OR DETACHED SIDEWALK



COMBINATION CURB, GUTTER & SIDEWALK

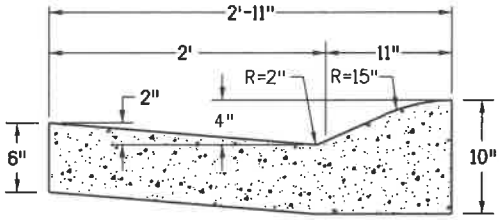


VERTICAL CURB & GUTTER

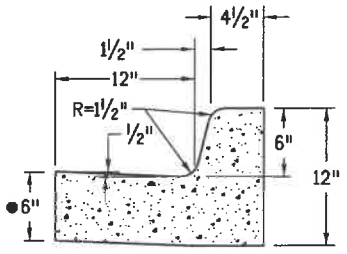


HIGH SPEED MOUNTABLE CURB & GUTTER

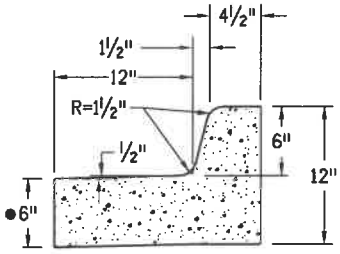
(DESIGN SPEED OF 45 M.P.H. OR HIGHER)



LOCAL MOUNTABLE CURB & GUTTER



MEDIAN CURB & GUTTER (CATCH)



MEDIAN CURB & GUTTER (SPILL)

NOTES:

1. IF A SIDEWALK IS PLACED BEHIND THE CURB BUT IS NOT PLACED MONOLITHICALLY, EXPANSION JOINT MATERIAL AND A SILICONE BASE SEALER MUST BE APPLIED BETWEEN THE SIDEWALK AND THE CURB.
2. SEE DRAWING NUMBER SD.8a and SD.8b FOR TRENCH DRAIN.
3. SEE DRAWING NUMBER SD.16 AND SD.17 FOR CONCRETE JOINTS.

● GUTTER THICKNESS SHALL BE INCREASED TO MATCH CONCRETE PAVEMENT THICKNESS

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CURB & GUTTERS AND SIDEWALKS

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.2

THE FOLLOWING NOTES ARE APPLICABLE TO ALL ROADWAY SECTIONS (LOCALS, COLLECTORS, AND ARTERIALS), UNLESS MODIFICATIONS ARE APPROVED IN WRITING BY THE DIRECTOR OF PUBLIC WORKS.

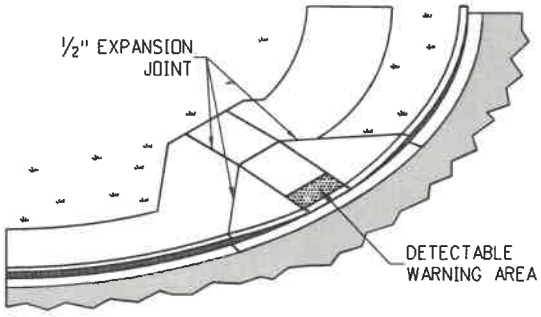
NOTES:

1. GUTTERS SHALL BE AT LEAST 6" THICK.
2. ALL CURBS SHALL USE THE CATCH SECTION UNLESS OTHERWISE NOTES.
3. ALL COMBINATION CURB, GUTTER AND SIDEWALKS TO BE 6" THICK (MIN.) SIDEWALKS WITH VERTICAL CURB AND GUTTER TO BE 6" THICK (MIN.).
4. NON-LANDSCAPED MEDIAN ISLANDS SHALL BE COVERED WITH AN ACCEPTABLE IMPERMEABLE SURFACE.
5. IF ANY SECTION OF A DETACHED SIDEWALK IS TO BE PLACED OUTSIDE OF THE ROAD RIGHT-OF-WAY, THEN A SIDEWALK EASEMENT SHALL BE REQUIRED TO MAINTAIN PUBLIC USE.
6. TOTAL PAVEMENT THICKNESS TO BE DETERMINED BY PAVEMENT DESIGN PROCEDURES IN CHAPTER 10.
7. PLACEMENT, MOISTURE AND DENSITY CONTROL FOR SUBGRADE, SUBBASE, AND SURFACING MATERIALS SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS OF CHAPTER 12.
8. GUTTER THICKNESS SHALL BE INCREASED TO MATCH CONCRETE PAVEMENT THICKNESS.
9. FOR ALL CONCRETE PAVEMENTS, DATE AND COMPANY NAME STAMP MUST BE APPLIED AT 100' INTERVALS ALONG NEW ROADWAYS. FOR REPAIR WORK, DATE AND COMPANY NAME STAMP MUST BE APPLIED AT EACH CONTIGUOUS SECTION.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	ROADWAY NOTES CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. SD.1

CURB RAMP GENERAL NOTES:

1. IN ACCORDANCE WITH CRS43-2-107(2), ADA COMPLIANT CURB RAMPS SHALL BE PROVIDED AT ALL PEDESTRIAN CROSSINGS AND AT PUBLIC TRANSPORTATION STOPS WHERE WALKWAYS INTERSECT A CURB. THESE LOCATIONS USUALLY INCLUDE, BUT ARE NOT LIMITED TO STREET CROSSINGS AT INTERSECTIONS AND AT DESIGNATED MID-BLOCK LOCATIONS.
2. THE FOLLOWING CURB RAMP TYPES ARE GENERAL REPRESENTATIONS. COLORADO DEPARTMENT OF TRANSPIRATION (CDOT). M STANDARD PLANS, LATEST EDITION PROVIDE ADDITIONAL ACCEPTABLE DETAILS. SEE DETAILED RAMP LAYOUTS ON THE PLANS FOR CONSTRUCTION.
3. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE CITY OF CASTLE PINES.
4. SIDEWALK SHALL BE RAMPED WHERE A DRIVEWAY IS EXTENDED ACROSS THE WALK.
5. DETAILS SHOWN IN THE PLAN SHALL APPLY TO ALL CONSTRUCTION OR RECONSTRUCTION OF STREET, CURBS OR SIDEWALKS PER CURB RAMP DETAILS.
6. IN NEW CONSTRUCTION, RAMP AND CURB MAY BE POURED MONOLITHICALLY.
7. RAMP AND WINGS SHALL BE POURED MONOLITHICALLY.
8. MINIMUM WIDTH OF RAMPS SHALL BE 4 FEET AND RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
9. MAINTAIN BACK OF WALK ELEVATION AT 1.5% SLOPE FROM TOP OF CURB.
10. CONCRETE FOR SIDEWALK RAMPS SHALL BE CLASS "D".
11. A ½" EXPANSION JOINT SHALL BE REQUIRED WHERE THE CONCRETE RAMP JOINS ANY RIGID PAVEMENT OF STRUCTURE.
12. DRAINAGE STRUCTURES SHALL NOT BE PLACED IN LINE WITH RAMPS. LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF THE DRAINAGE STRUCTURE.



ISOMETRIC VIEW

DETECTABLE WARNING AREA NOTES

1. DETECTABLE WARNING AREAS SHALL BE INSTALLED WITHIN CURB RAMPS AT ALL SIDEWALK/STREET TRANSITIONS, AS DESCRIBED BY THE AMERICAN'S WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG), LATEST REVISION.
2. DETECTABLE WARNING DEVICES SHALL BE TRUNCATED DOME WARNING DEVICES. COLOR SHALL BE BRICK RED, TILE RED, OR OTHER EQUIVALENT COLOR TO PROVIDE COLOR CONTRAST WITH ADJACENT SURFACES, AS REQUIRED BY ADAAG SECTION 4.29.2. THE CITY MUST APPROVE THE TRUNCATED DOME WARNING AREA COLOR PRIOR TO CONSTRUCTION.
3. CONTRACTION COLOR REQUIREMENT SHALL BE MET BY TRUNCATED DOME SECTIONS AND NOT BY USE OF COLORED CONCRETE.
4. DETECTABLE WARNING SHALL BE ON CDOT'S APPROVED MATERIALS LIST. A SAMPLE OF THE DETECTABLE WARNING (TRUNCATED DOMES) TO BE USED ON THE PROJECT SHALL BE SUBMITTED TO AND ACCEPTED BY THE CITY PRIOR TO CONSTRUCTION.
5. ALL DETECTABLE WARNING AREAS SHALL START A MINIMUM OF 6 INCHES AND A MAXIMUM OF 5 FEET FROM THE FLOW LINE OF THE CURB UNLESS INSTALLED AT CUT-THROUGH REFUGE ISLANDS, IN WHICH CASE THE DETECTABLE WARNING AREA WILL START AT THE EDGE OF THE ISLAND. ALL DETECTABLE WARNING AREAS SHALL BE 24 INCHES IN LENGTH AND COVER THE COMPLETE WIDTH OF THE RAMP AREA ONLY.
6. SURFACE APPLIED TRUNCATED DOME PANELS ARE ONLY ALLOWED ON PRE-EXISTING CURB RAMPS AND ARE NOT ALLOWED IN NEW CONSTRUCTION.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	CURB RAMP & DETECTABLE WARNING AREA NOTES CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. SD.3a

PANEL INSTALLATION NOTES:

1. DETECTABLE WARNING PANELS, 24" X 24" OR 24" X 30" IN SIZE, SHALL BE PREFABRICATED REDDISH WITH TRUNCATED DOMES AND COMPLY WITH ADA REQUIREMENTS. ONLY FULL PANELS SHALL BE USED TO OBTAIN SPECIFIC RAMP THROAT WIDTH. (I.E. TWO 24" PANELS FOR A 4' RAMP, TWO 30" PANELS FOR A 5' RAMP, ETC.)

2. PRIOR TO START OF WORK, CONTRACTOR SHALL SUBMIT, TO THE CITY OF CASTLE PINES FOR APPROVAL, A SAMPLE PANEL AND DOCUMENTATION FROM THE MANUFACTURER. PANEL SURFACE SHALL HAVE A MINIMUM OF 70% LIGHT REFLECTIVITY CONTRAST WITH THE ADJOINING SURFACE. PANELS SHALL ONLY BE SELECTED FROM THE APPROVED PRODUCT LIST BELOW:

PRODUCT NAME	MANUFACTURER	PRODUCER SUPPLIER CODE
CAST-DWD	Pioneer Detectable, LLC	GEN130004
Cast-In-Place Tactile	ADA Solutions, Inc.	GEN100123
DURALAST	EJ USA, Inc.	GEN130020
Detectable Warning Paving Slab	StoneBilt Concepts	GEN100341
TekWay Dome-Tiles	StrongGo LLC	GEN100343
TufTile Cast Iron Tile/Radius-Wedge (CIP)	TufTile, Inc.	GEN150088

3. PANELS SHALL BE PLACED AS SHOWN, WITH DOME PATTERN IN A SQUARE GRID AND ALIGNED IN THE DIRECTION OF TRAVEL. A STEEL TEMPLATE SHALL BE USED TO ENSURE PROPER ALIGNMENT AND UNIFORM GRADE.

4. REMOVE THE PROPER AMOUNT OF CONCRETE WITHIN THE TEMPLATE FOR AN ACCURATE INSTALLATION. ONCE TO THE PROPER DEPTH, FLOAT THE AREA TO RECEIVE THE PANELS UNTIL A SMOOTH PASTE HAS DEVELOPED.

5. WET THE BACK SIDE OF EACH PANEL AND TROWEL SOME CONCRETE PASTE OF APPROVED BONDING AGENT OVER THE WET SURFACE FOR BETTER ADHERENCE.

6. SET THE FIRST PANEL ON THE FRESHLY PREPARED SURFACE. DO NOT PRESS DOWN HARD ON THE PANEL, BUT PREFERABLY TWIST FROM SIDE TO SIDE. SET PANEL WITH RUBBER MALLET TO PROPER DEPTH SO THAT THE BASE OF THE TRUNCATED DOME IS AT THE SAME ELEVATION AS THE ADJOINING RAMP SURFACE.

7. SET SUCCESSIVE PANELS WITH A TIGHT BUTT JOINT AGAINST THE PREVIOUSLY SET PANEL. PROVIDE A 1/8" GAP BETWEEN PANELS.

8. FLOAT FRESH CONCRETE AROUND PANELS. FINISH AND BROOM SURROUNDING CONCRETE AS SPECIFIED. CLEAN ANY CONCRETE OFF PANELS WITH A SPONGE.

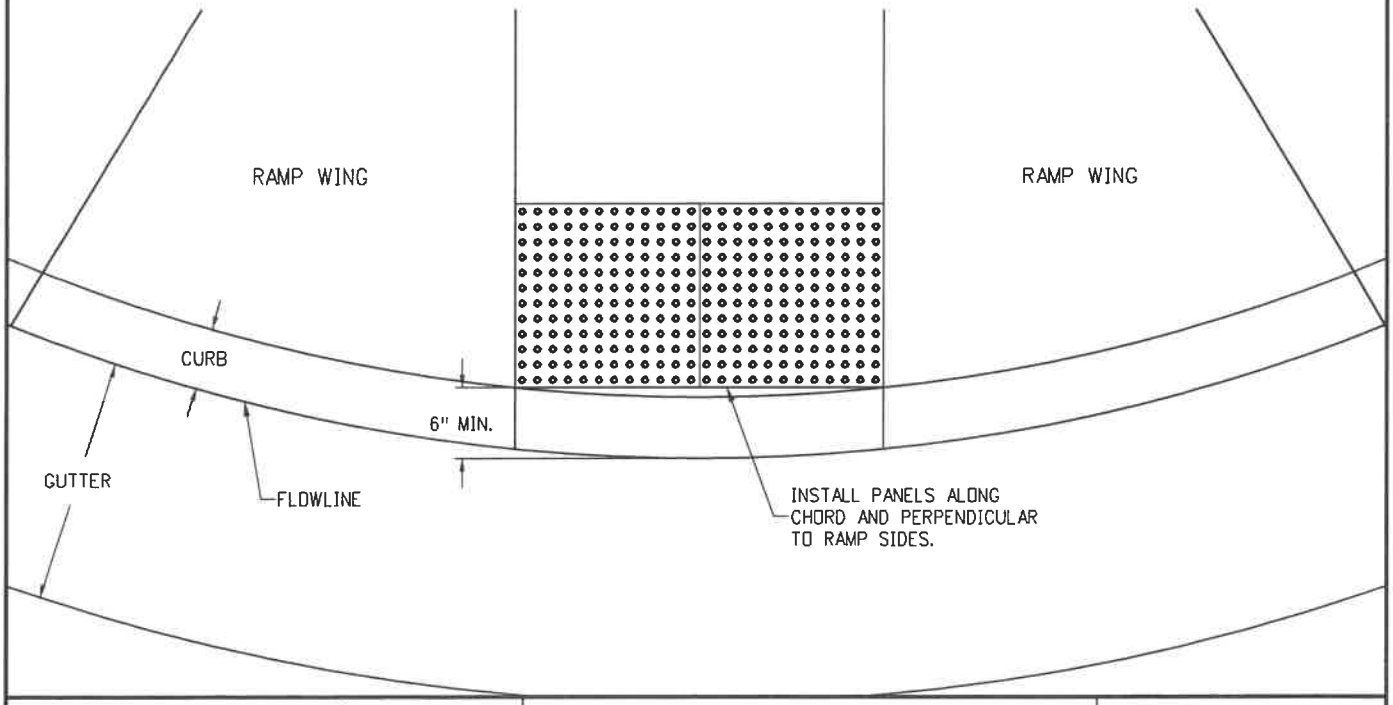
9. PROVIDE 1" DEEP TOOL JOINTS AT CORNERS OF DETECTABLE WARNING AREA, AND TOOL AROUND PANELS WITH 1/8" RADIUS EDGER.

10. WHEN CUT PANELS ARE REQUIRED, CUT SECTIONS SHALL NOT SIGNIFICANTLY IMPACT OVERALL TRUNCATED DOMES PATTERN AND CUT DOMES SHALL BE BEVELED AT A 45-DEGREE ANGLE TO CREATE A SMOOTH TRANSITION.

11. ANY PANELS THAT ARE DAMAGED DURING TRANSPORT OR INSTALLATION WILL BE REJECTED AND SHALL NOT BE INSTALLED.

12. CLEAN OUT 1/8" JOINT(S) BETWEEN PANELS AND SEAL WITH EPOXY.

13. SETTING TRUNCATED DOME PANELS IN SAND BEDDING OR OTHER NON-CEMENTITOUS BEDDING MATERIALS SHALL NOT BE ALLOWED.



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CURB RAMP WITH PANEL DETECTABLE WARNING AREA INSTALLATION

CITY OF CASTLE PINES

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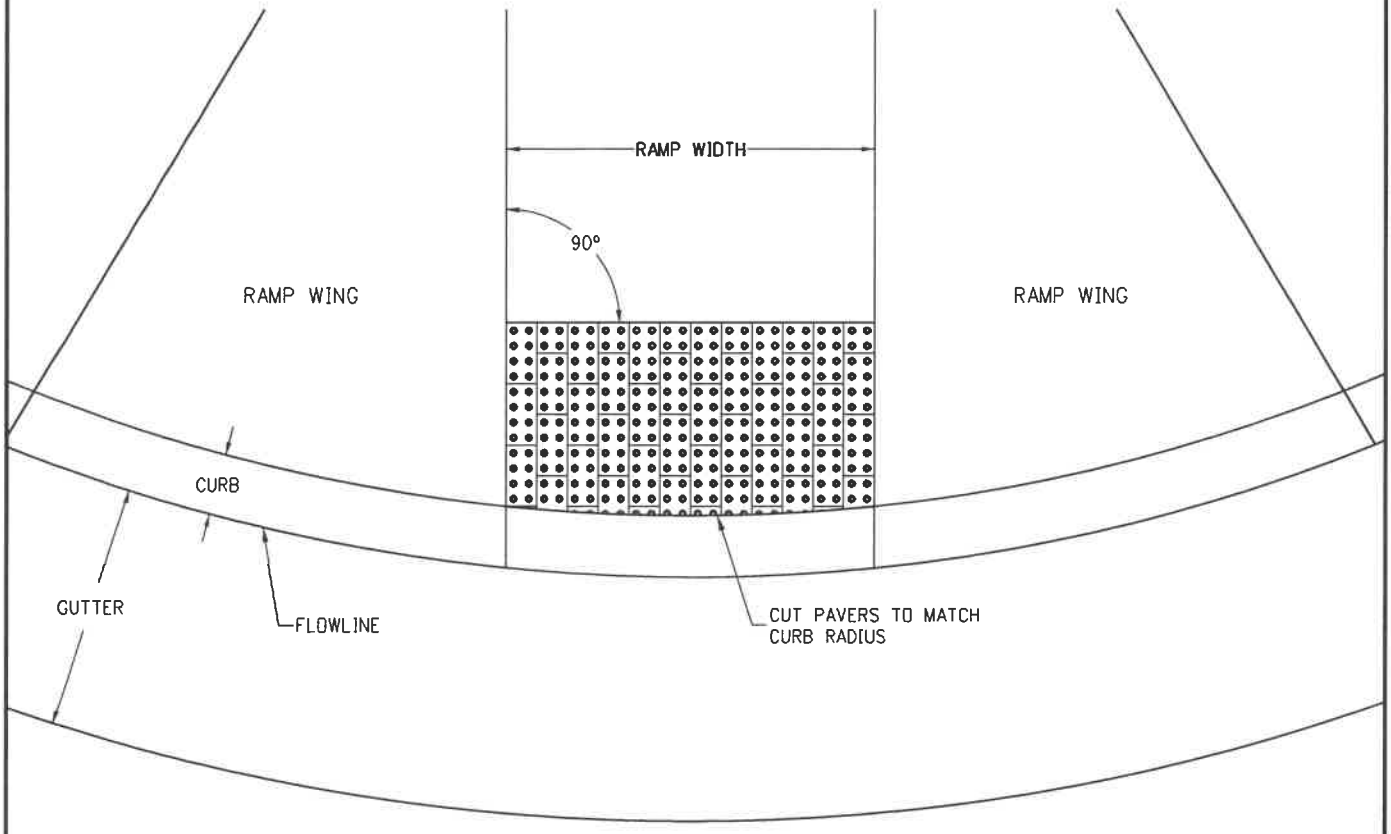
Revised: _____

Standard Drawing No.

SD.3b

PAVER INSTALLATION NOTES:

1. DETECTABLE WARNING PAVERS SHALL BE PREFABRICATED REDDISH INTEGRALLY COLORED TRUNCATED DOMES SURFACED CONCRETE OR MASONRY PAVERS. PAVERS SHALL MEET THE REQUIREMENTS OF ASTM C 902 OR ASTM C 936 AND COMPLY WITH ADA REQUIREMENTS.
2. PRIOR TO START OF WORK, CONTRACTOR SHALL SUBMIT, TO THE CITY OF CASTLE PINES FOR APPROVAL, A SAMPLE PAVER AND DOCUMENTATION FROM THE MANUFACTURER. PAVERS SURFACE SHALL HAVE A MINIMUM OF 70% LIGHT REFLECTIVITY CONTRAST WITH THE ADJOINING SURFACE.
3. WELL FOR PAVERS SHALL BE ACCURATELY BLOCKED OUT TO ENSURE PROPER DEPTH, ALIGNMENT, AND UNIFORM GRADE. ONLY FULL WIDTH PAVERS SHALL BE USED TO OBTAIN SPECIFIED RAMP THROAT WIDTH.
4. PAVERS SHALL BE PLACED IN THE RUNNING PATTERN SHOWN, DOMES PLACED IN A SQUARE GRID AND ALIGNED IN THE DIRECTION OF TRAVEL. PAVERS SHALL BE INSTALLED SO THAT THE BASES OF THE TRUNCATED DOMES ARE AT THE SAME ELEVATION AS THE ADJOINING RAMP SURFACE.
5. SAND FOR BEDDING MATERIAL SHALL CONFORM TO ASTM C 33. SAND TO BE PLACED BETWEEN JOINTS SHALL CONFORM TO ASTM C 144.
6. BEDDING SAND SHALL BE SCREED TO THE APPROPRIATE DEPTH PRIOR TO THE PAVERS INSTALLATION. A PLATE VIBRATOR SHALL BE USED TO EMBED THE PAVERS INTO THE SAND. ANY PAVERS THAT ARE DAMAGED DURING. TRANSPORTATION OR INSTALLATION WILL BE REJECTED AND SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
7. WHEN CUT PAVERS ARE REQUIRED, CUT SECTIONS SHALL NOT SIGNIFICANTLY IMPACT OVERALL TRUNCATED DOMES PATTERN AND CUT DOMES SHALL BE BEVELED AT A 45-DEGREE ANGLE TO CREATE A SMOOTH TRANSITION.
8. JOINT SPACING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, BUT SHALL NOT BE MORE THAN 1/8". JOINTS SHALL BE FILLED COMPLETELY WITH SAND. EXCESS SAND SHALL BE REMOVED BY SWEEPING.
9. DETECTABLE WARNING PAVERS SHALL ONLY BE USED WITH PRIOR APPROVAL BY THE CITY.



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CURB RAMP WITH PAVER DETECTABLE WARNING AREA INSTALLATION

CITY OF
CASTLE PINES

Issued: 6/15/2022

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Standard Drawing No.
SD.3c

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Director of Public Works

DATE 6/14/22

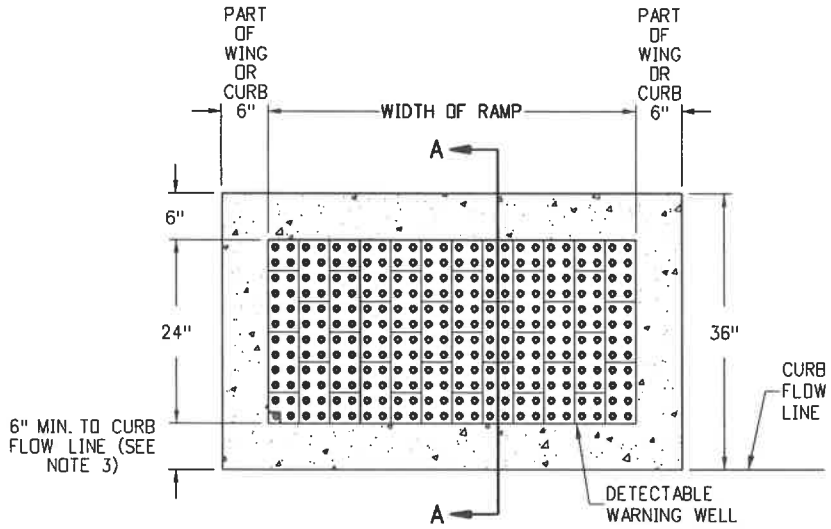
CITY OF CASTLE PINES

CURB RAMP WITH PAVER DETECTABLE WARNING AREA INSTALLATION

Issued: 6/15/2022

Revised:

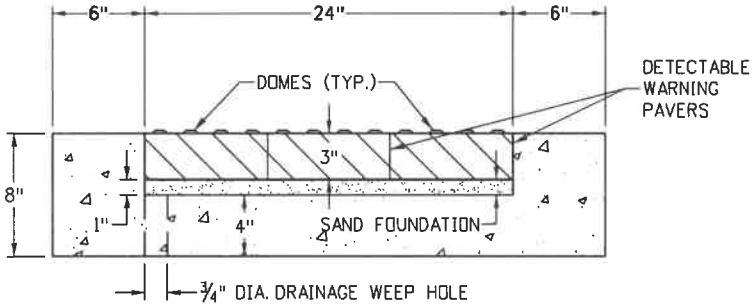
Standard Drawing No. SD.3d



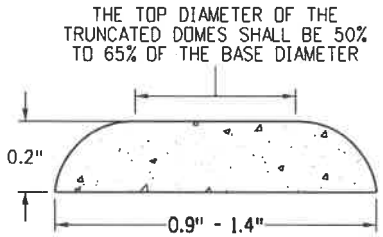
PLAN VIEW OF
DETECTABLE WARNING AND WELL
(PAVERS NOT DRAWN TO SCALE)

GENERAL NOTES

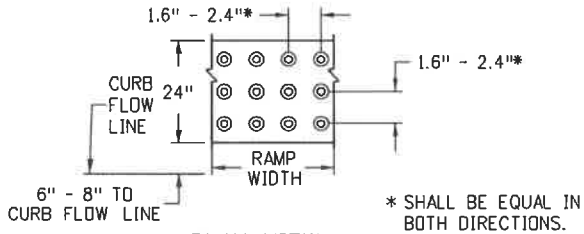
1. THE DETECTABLE WARNINGS SHALL BE INSTALLED AT SIDEWALK/STREET TRANSITIONS. THEY SHALL BE MADE IN PAVER FORM WITH A TRUNCATED DOME SURFACE. THE DOMES SHALL BE PLACED IN A SQUARE GRID.
2. THE TOP OF THE DRAINAGE WEEP HOLE SHALL BE LOCATED AT THE LOWEST POINT OF THE DETECTABLE WARNING WELL.
3. ALL DETECTABLE WARNING AREAS (DWA) SHALL START A MINIMUM OF 6 INCHES FROM THE FLOW LINE OF THE CURB UNLESS INSTALLED AT CUT-THROUGH REFUGE ISLANDS, IN WHICH CASE THE DWA WILL START AT THE EDGES OF THE ISLAND. ALL DETECTABLE WARNING AREAS SHALL BE 24 INCHES IN LENGTH AND COVER THE COMPLETE WIDTH OF THE RAMP AREA ONLY.
4. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
5. DETECTABLE WARNING PAVERS SHALL ONLY BE USED WITH PRIOR APPROVAL BY THE CITY.



SECTION A-A



ELEVATION VIEW



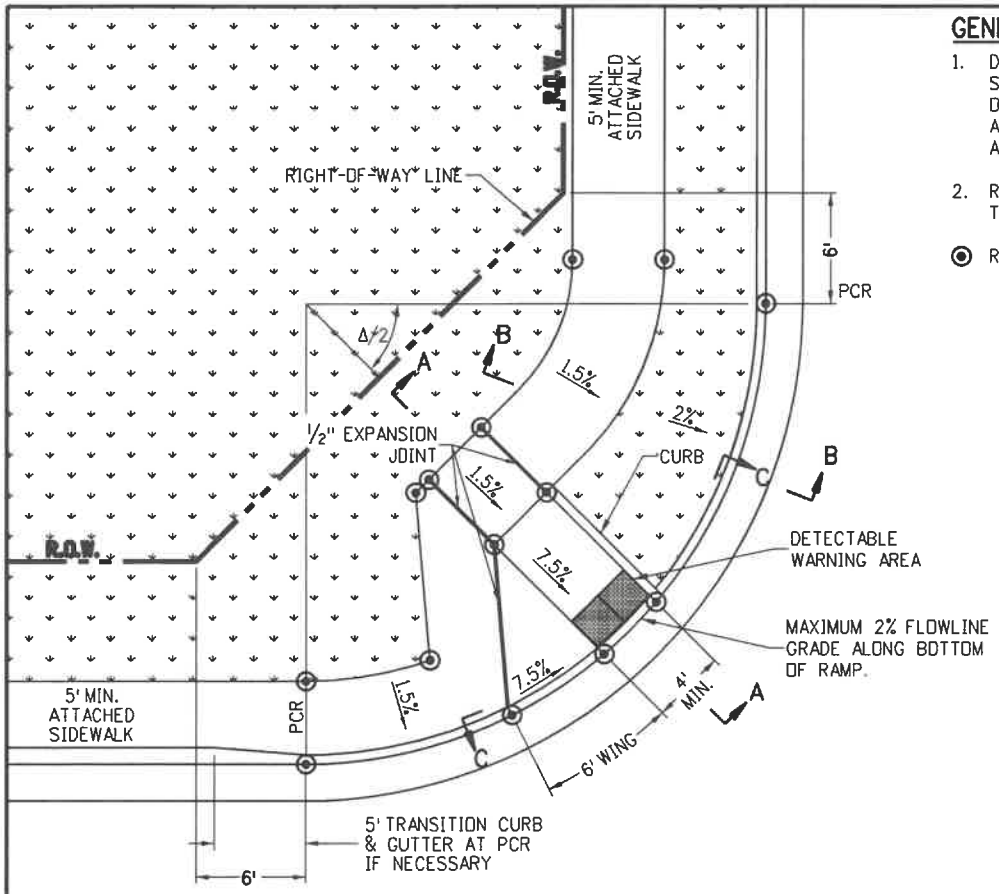
PLAN VIEW

DETECTABLE WARNING AREA AND DOME DETAILS-PAVERS

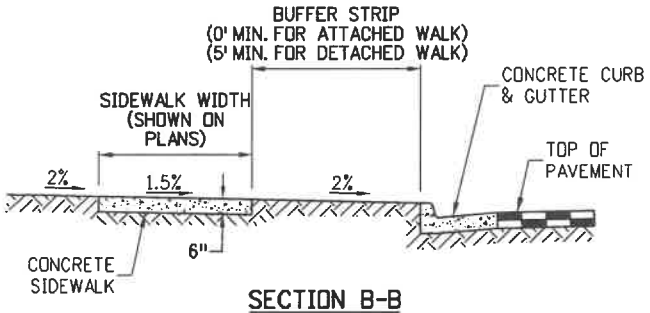
GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR OTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.

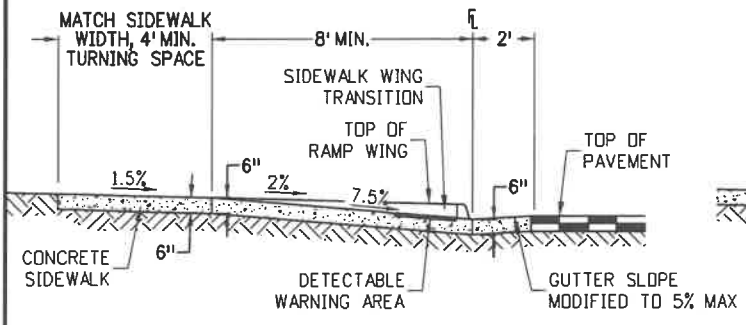
⊙ REQUIRED SPOT ELEVATION



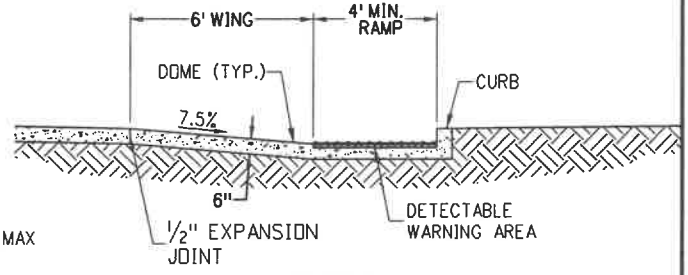
PLAN



SECTION B-B



SECTION A-A



SECTION C-C

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

DIAGONAL CURB RAMP FOR CURB RETURN RADIUS OF 20' TO 30'

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

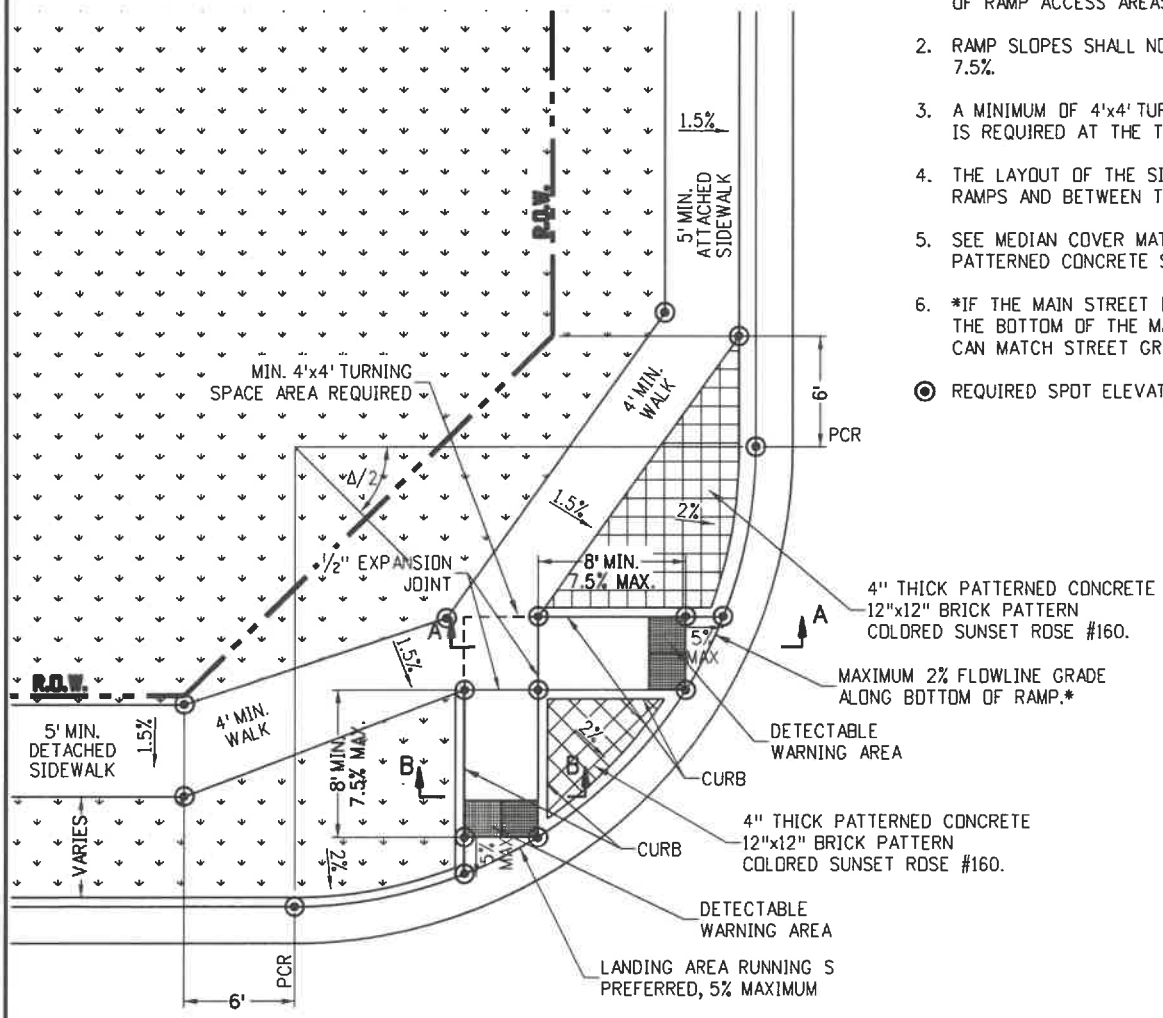
Standard Drawing No.

SD.4a

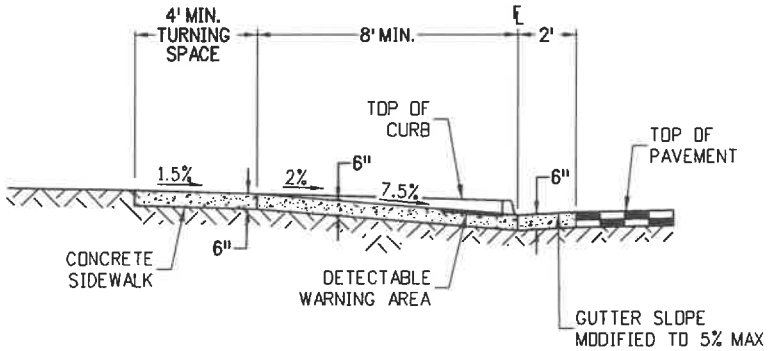
GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR OTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
3. A MINIMUM OF 4'x4' TURNING SPACE AREA IS REQUIRED AT THE TOP OF THE RAMPS.
4. THE LAYOUT OF THE SIDEWALK BEHIND THE RAMPS AND BETWEEN THE PCR'S VARIES.
5. SEE MEDIAN COVER MATERIAL DETAIL FOR PATTERNED CONCRETE SPECIFICATIONS.
6. *IF THE MAIN STREET IS UNCONTROLLED THE BOTTOM OF THE MAIN STREET RAMP CAN MATCH STREET GRADE.

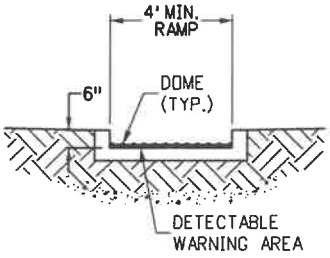
◉ REQUIRED SPOT ELEVATION



PLAN



SECTION A-A



SECTION B-B

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CURB RAMP FOR CURB RETURN RADIUS OF 35' TO 50'

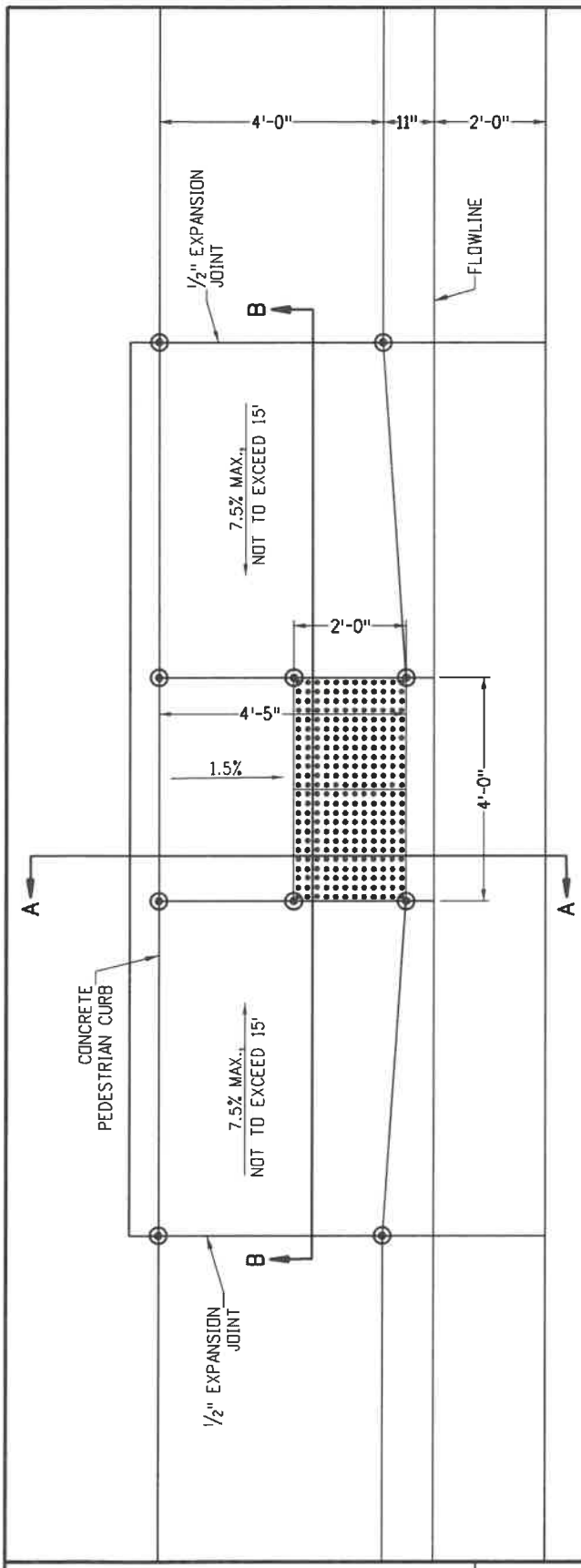
CITY OF CASTLE PINES

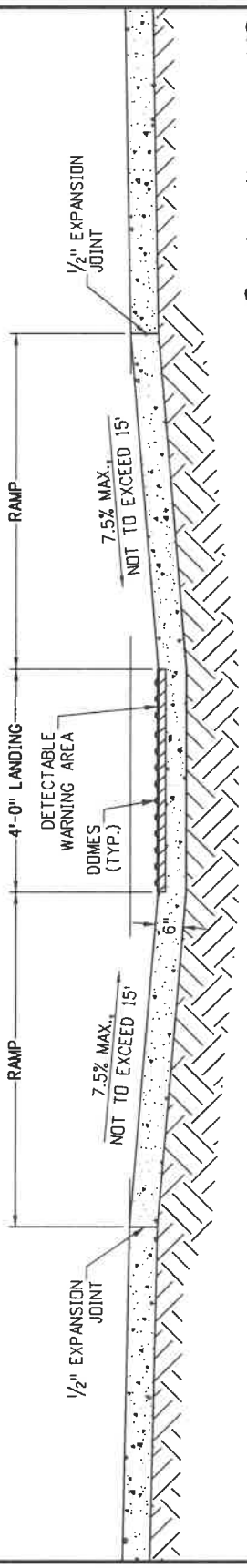
Issued: 6/15/2022

Revised: _____

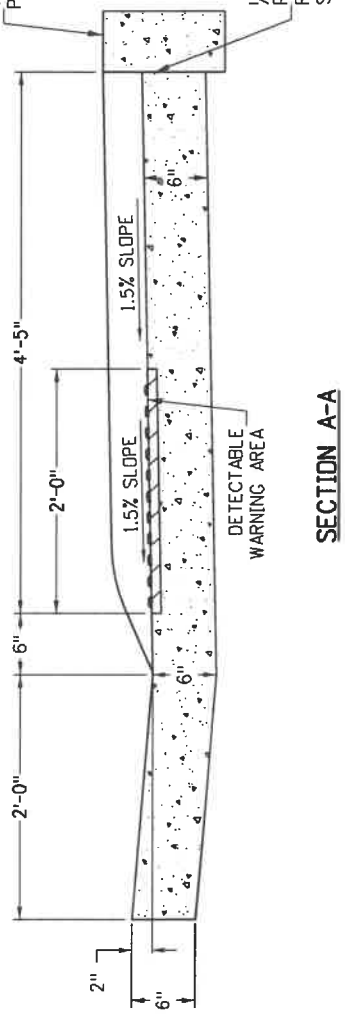
Standard Drawing No.

SD.4b





SECTION B-B



SECTION A-A

GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR DTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
3. *-THE BOTTOM OF RAMP CAN MATCH STREET GRADE.

◉ REQUIRED SPOT ELEVATION

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

MID-BLOCK CURB RAMP

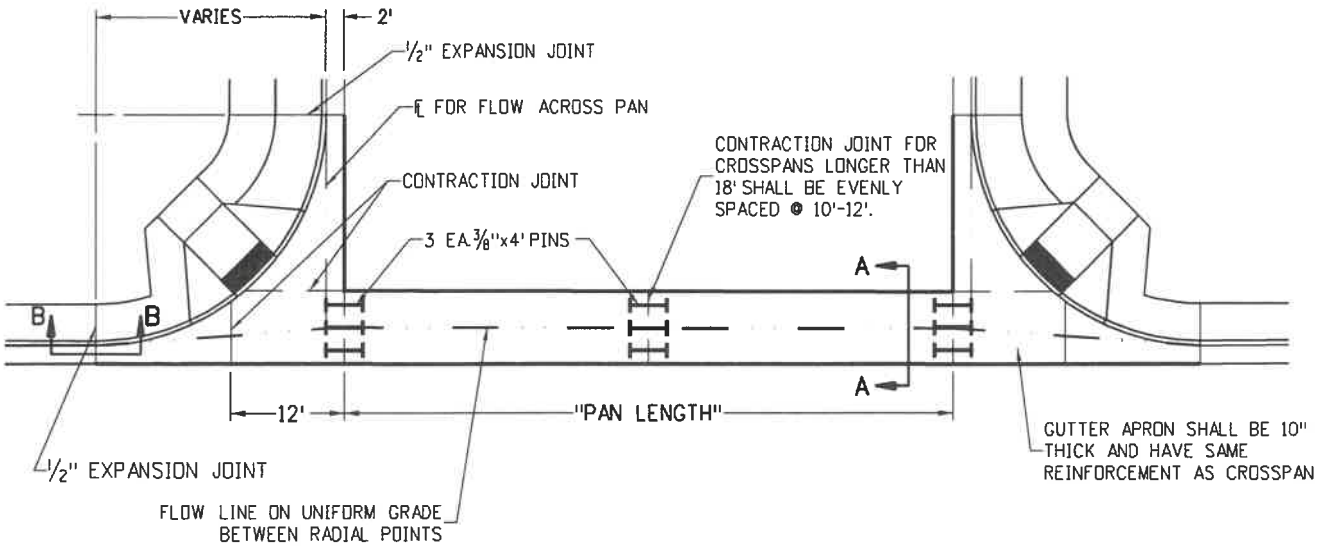
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.5



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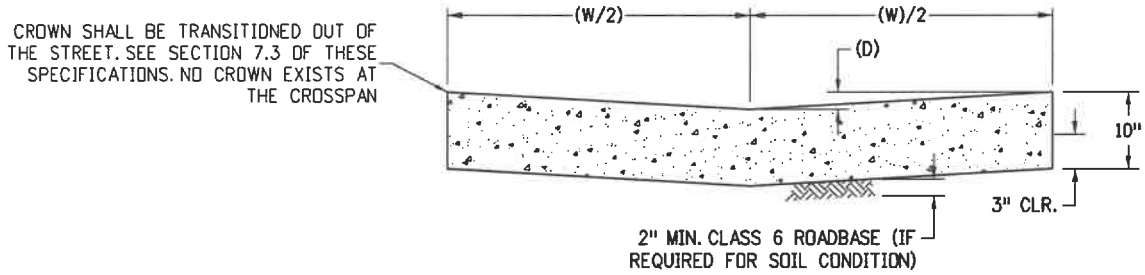
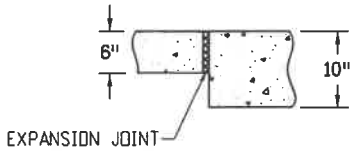


SECTION A-A

FIBERMESH MIXED AI 1½ LBS. / C.Y. CONCRETE



SECTION B-B

WIDTH (W)	DEPTH (D)	THICKNESS (T)
8'	2"	10"
10'	2½"	10"

NOTE: LOCAL STREET INTERSECTIONS REQUIRE AN 8' CROSSPAN. COLLECTOR STREET INTERSECTIONS REQUIRE AN 10' CROSSPAN. CROSSPANS ARE NOT ALLOWED AT ANY ARTERIAL STREET INTERSECTION.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CROSSPAN

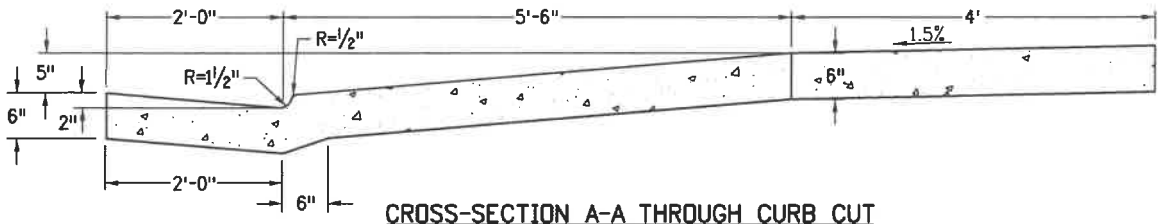
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

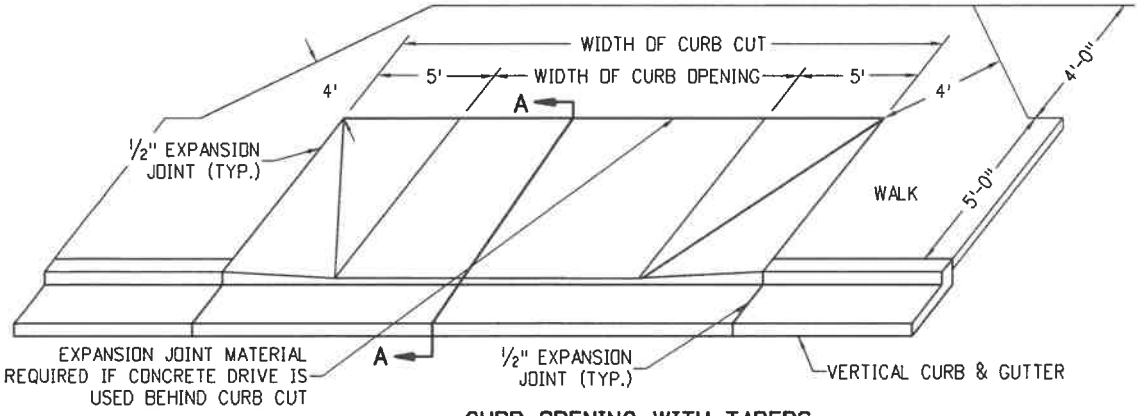
Standard Drawing No.

SD.6

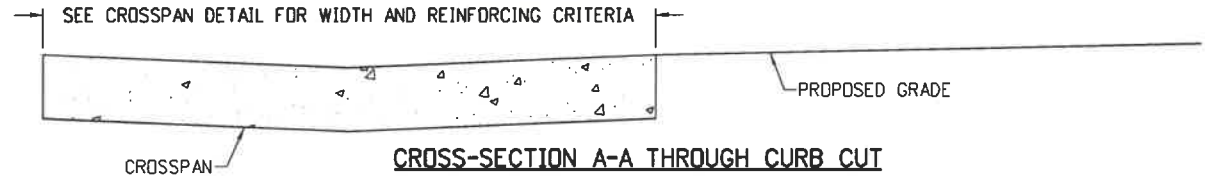


CROSS-SECTION A-A THROUGH CURB CUT

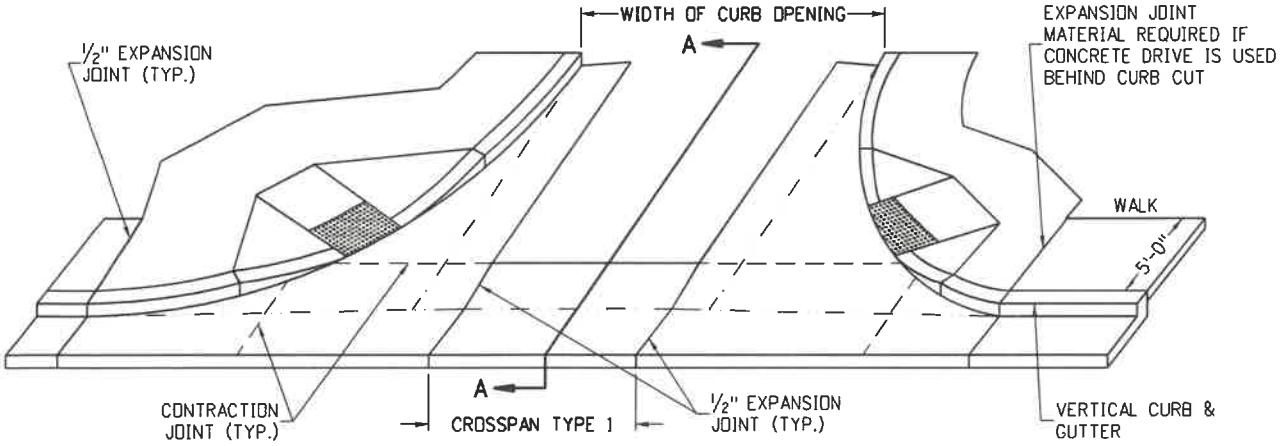
FIBERMESH MIXED AT 1½ LBS. / C.Y. CONCRETE.



CURB OPENING WITH TAPERS



CROSS-SECTION A-A THROUGH CURB CUT



CURB OPENING WITH CROSSPAN

NOTES:

1. BACK OF CURB CUT EXTENDS TO BACK OF WALK OR BACK OF BICYCLE PATH. IF NO WALK IS PRESENT, EXTEND BACK OF CURB CUT TO 5'-6" BEHIND FLOWLINE OR TO R.O.W. LINE, WHICHEVER IS GREATER.
2. CITY SHALL APPROVED LOCATION OF CURB CUT BEFORE CONSTRUCTION.
3. CURB OPENINGS OF 30' OR MORE MUST BE CONSTRUCTED WITH A MINIMUM 20' RADIUS CURB RETURN.
4. DESIGN ENGINEER MUST DEMONSTRATE THAT STREET DRAINAGE STAYS WITHIN THE STREET RIGHT-OF-WAY.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

CURB OPENING

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.7

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

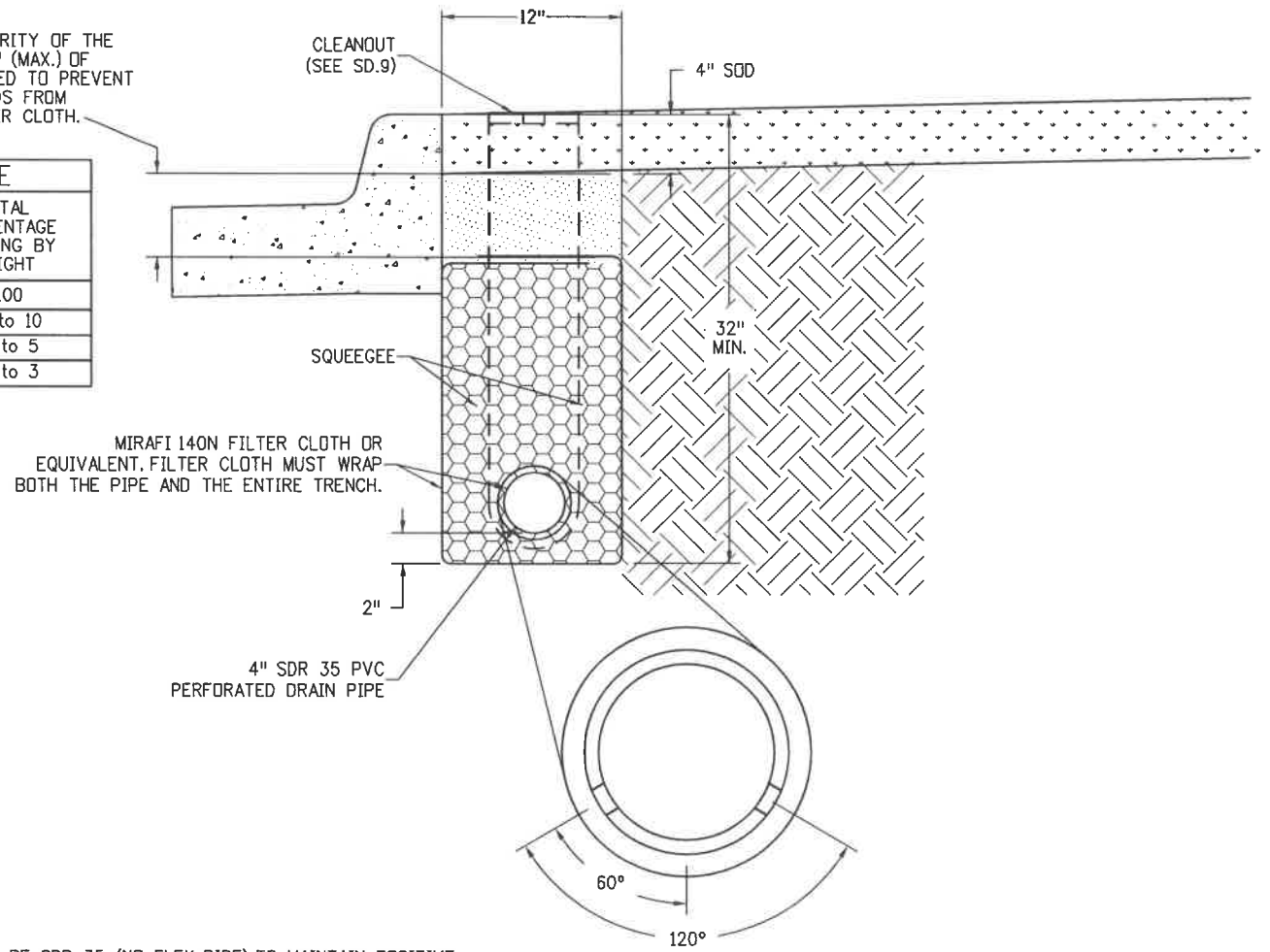
DATE 6/15/2022

CITY OF CASTLE PINES

TRENCH DRAIN

TO MAINTAIN THE INTEGRITY OF THE FILTER CLOTH, UP TO 6" (MAX.) OF "SQUEEGEE" MAY BE USED TO PREVENT POP-UP SPRINKLER-HEADS FROM PENETRATING THE FILTER CLOTH.

SQUEEGEE	
SIEVE SIZE	TOTAL PERCENTAGE PASSING BY WEIGHT
3/8 - INCH	100
NO. 50	0 to 10
NO. 100	0 to 5
NO. 200	0 to 3



NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OF MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 7.6.4 OF THE ROADWAY STANDARDS.
3. IF THE TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

1/2"-5/8" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.8a

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 6/14/22

TRENCH DRAIN WITH TRAFFIC SIGNAL CONDUIT

CITY OF CASTLE PINES

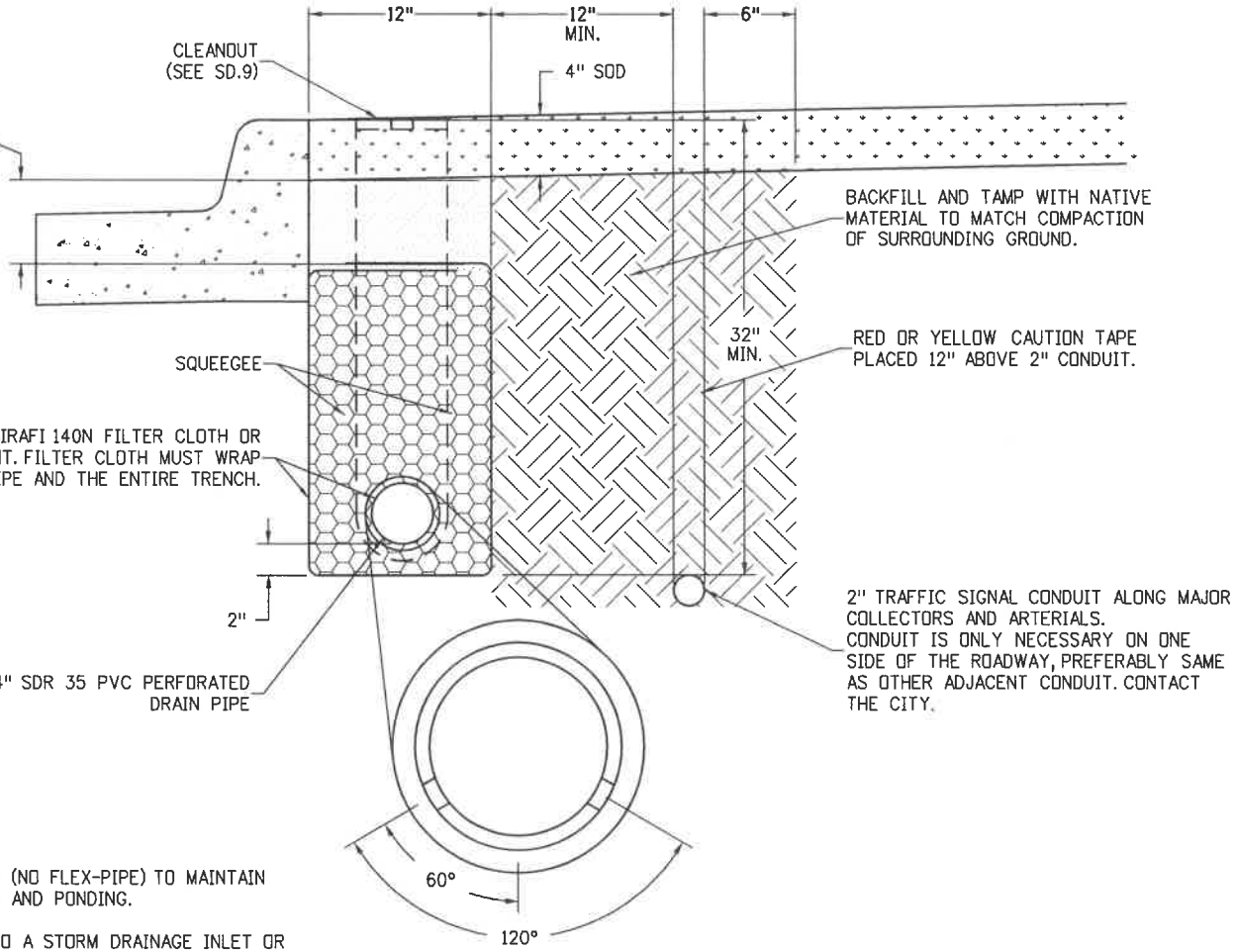
Issued: 6/15/2022

Revised: ____

Standard Drawing No. **SD.8b**

TO MAINTAIN THE INTEGRITY OF THE FILTER CLOTH, UP TO 6" (MAX.) OF "SQUEEGEE" MAY BE USED TO PREVENT POP-UP SPRINKLER-HEADS FROM PENETRATING THE FILTER CLOTH.

SQUEEGEE	
SIEVE SIZE	TOTAL PERCENTAGE PASSING BY WEIGHT
3/8 - INCH	100
NO. 50	0 to 10
NO. 100	0 to 5
NO. 200	0 to 3



NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 7.6.4 OF THE ROADWAY STANDARDS.
3. IF SIDEWALK IS ATTACHED TO THE CURB, THEN TRENCH DRAIN SHALL BE LOCATED BEHIND THE SIDEWALK.
4. TRAFFIC SIGNAL CONDUIT SHALL BE 2" SCHEDULE 80 PVC WITH PULL ROPE AND TRACE WIRE. TYPE I PULLBOX SHALL BE INSTALLED AT 500 FEET MAXIMUM SPACING AND AT BOTH CORNERS OF INTERSECTIONS.
5. TRAFFIC SIGNAL CONDUIT AND PULL BOXES SHALL BE IN CONFORMANCE WITH CHAPTER 9 OF THE ROADWAY STANDARDS.
6. IF TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

$\frac{1}{2}$"-$\frac{5}{8}$" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 6/15/22

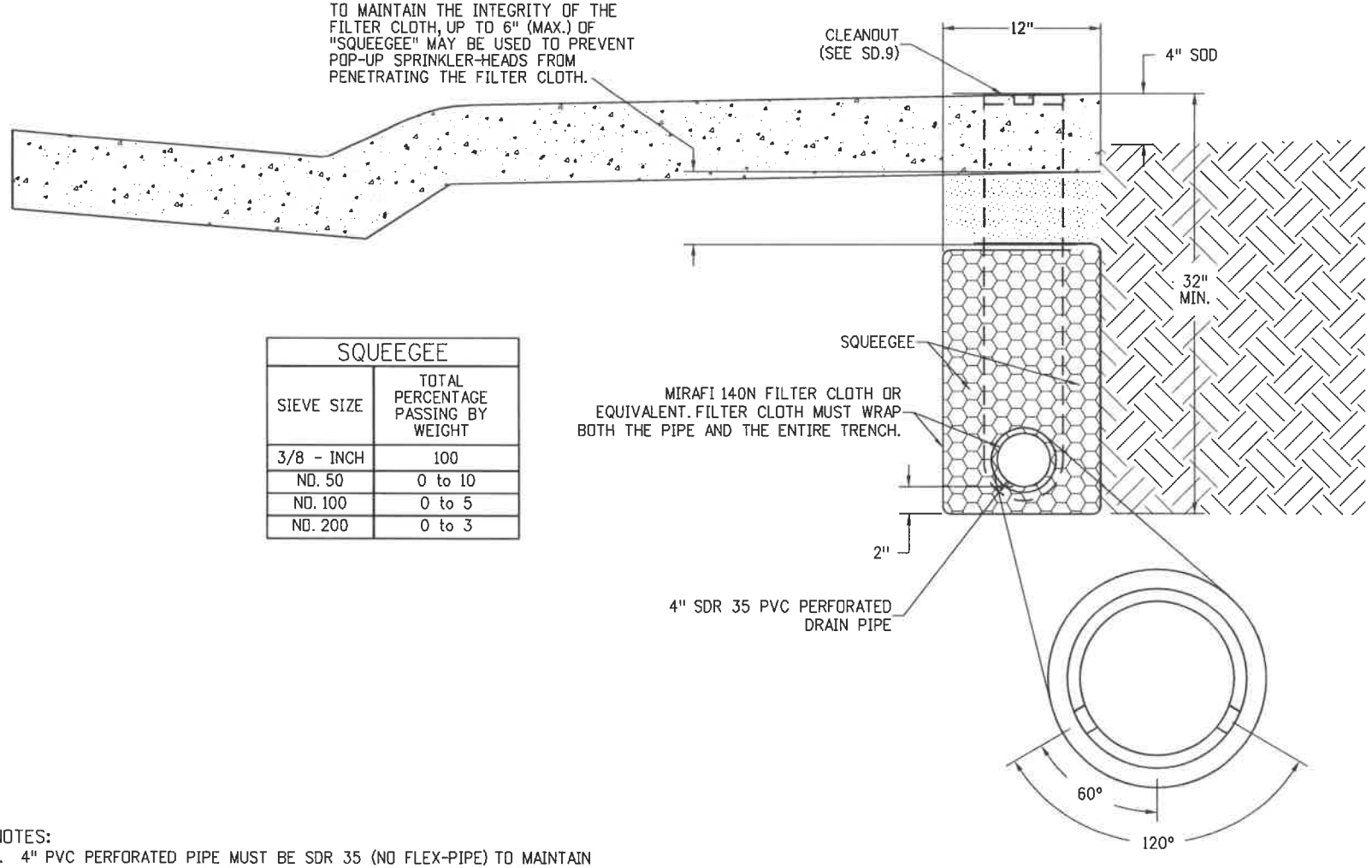
CITY OF CASTLE PINES

TRENCH DRAIN WITH SIDEWALK

Issued: 6/15/2022

Revised: _____

Standard Drawing No. **SD.8c**



SQUEEGEE	
SIEVE SIZE	TOTAL PERCENTAGE PASSING BY WEIGHT
3/8 - INCH	100
NO. 50	0 to 10
NO. 100	0 to 5
NO. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 7.6.4 OF THE ROADWAY STANDARDS.
3. IF THE TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

1/2"-5/8" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 6/15/22

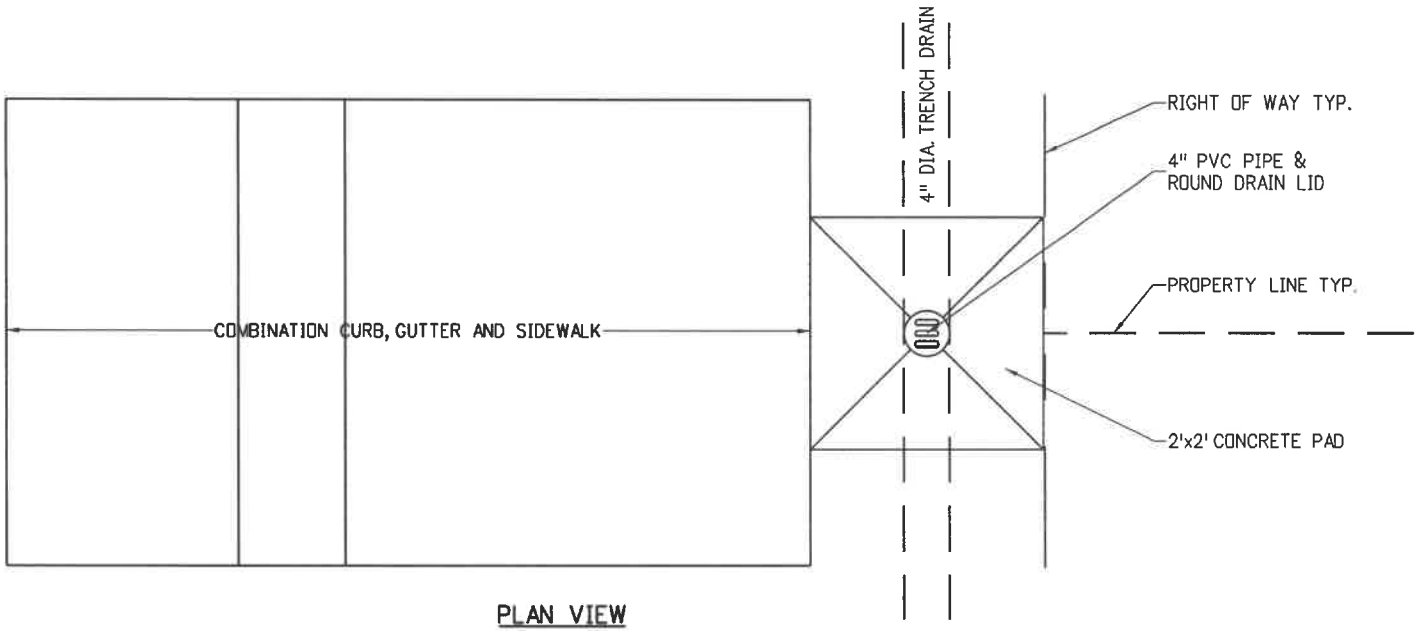
CITY OF CASTLE PINES

TRENCH DRAIN INLET WITH SIDEWALK

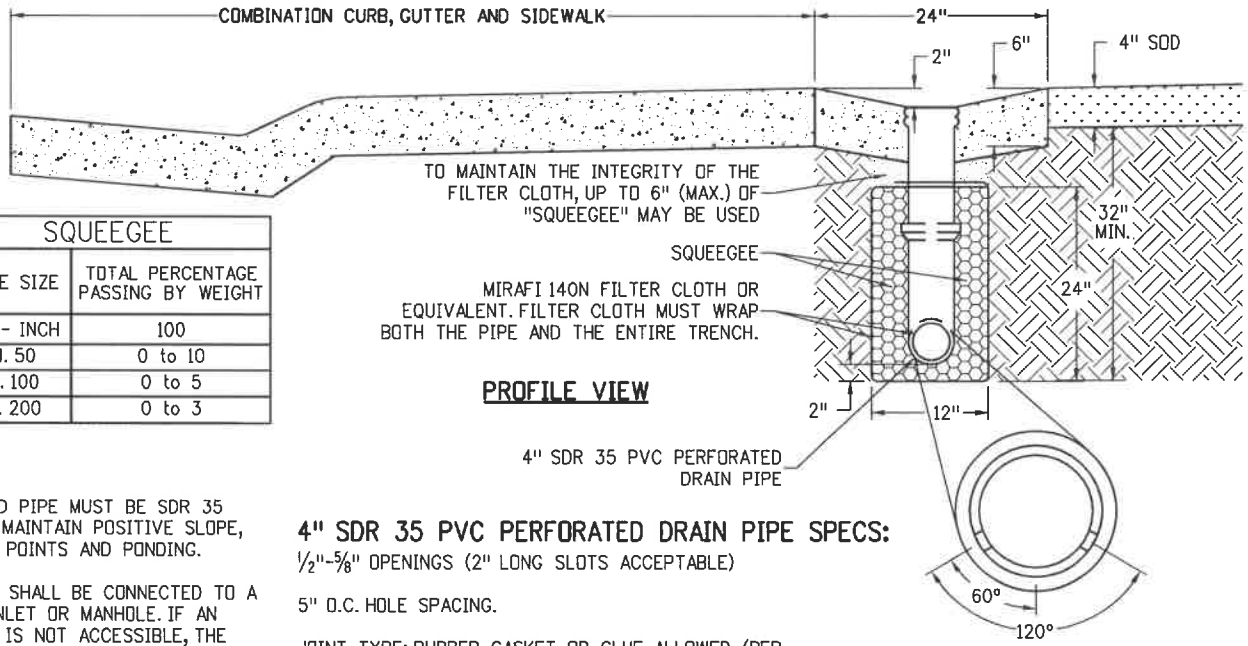
Issued: 6/15/2022

Revised: ____

Standard Drawing No. **SD.8d**



PLAN VIEW



PROFILE VIEW

SQUEEGEE	
SIEVE SIZE	TOTAL PERCENTAGE PASSING BY WEIGHT
3/8 - INCH	100
NO. 50	0 to 10
NO. 100	0 to 5
NO. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 7.6.4 OF THE ROADWAY STANDARDS.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

½"-⅝" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works
DATE 2/14/22

CITY OF CASTLE PINES

TRENCH DRAIN CLEANOUT

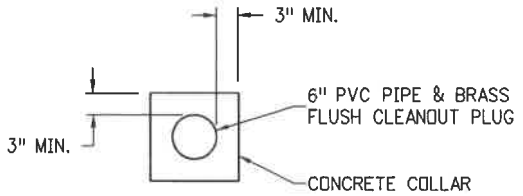
Issued: 6/15/2022

Revised: _____

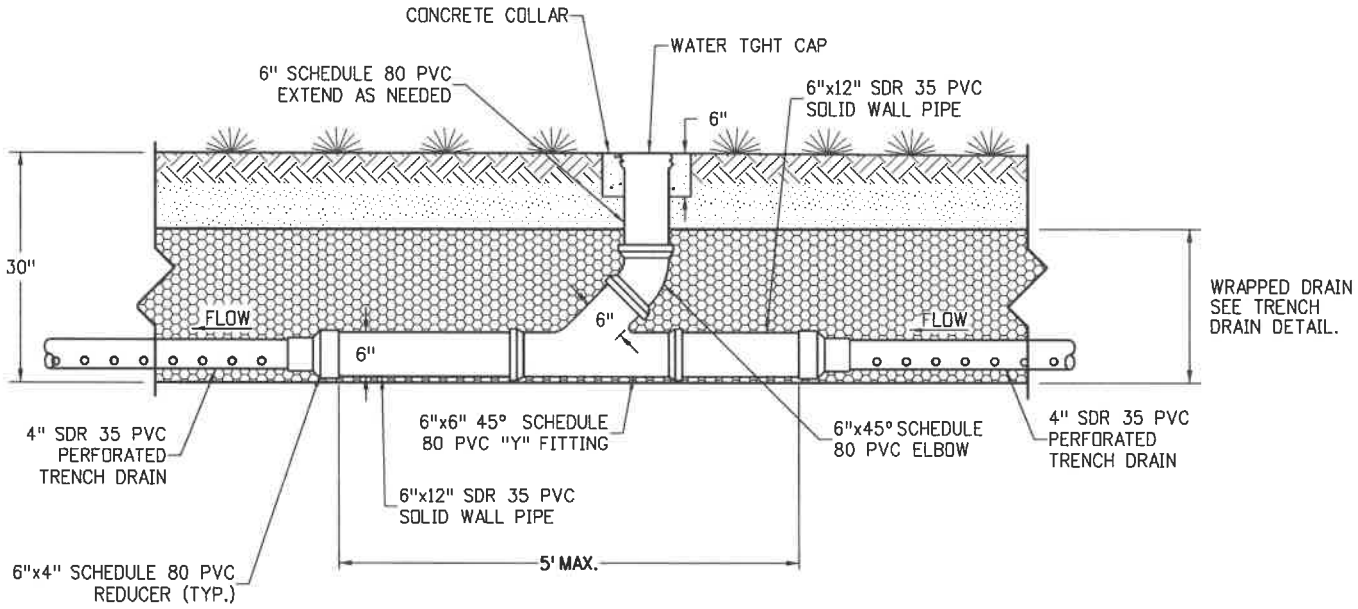
Standard Drawing No. **SD.9**

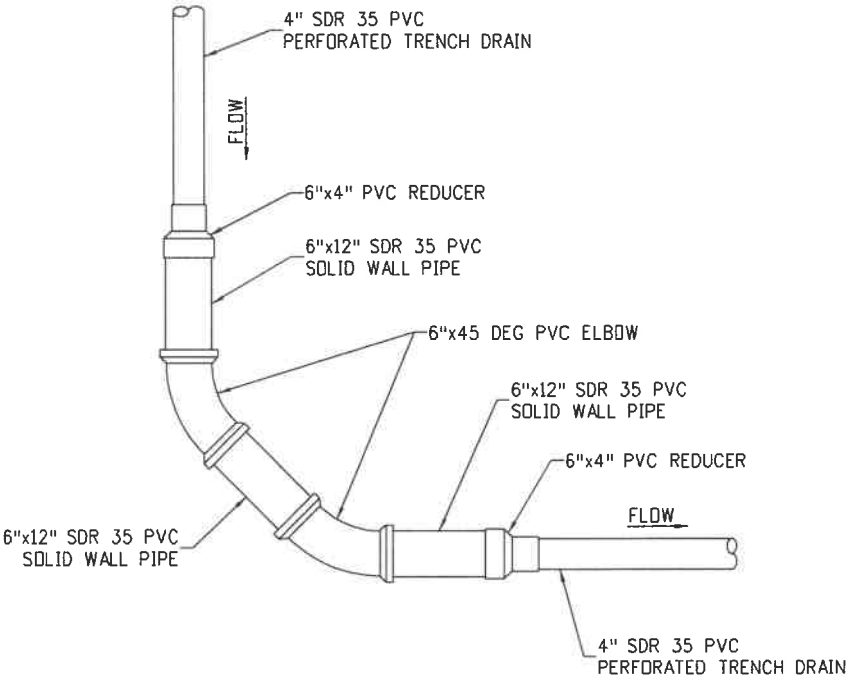
NOTES:

1. OUTSIDE DIAMETER OF CONCRETE COLLAR SHALL BE LARGE ENOUGH TO ACHIEVE 3" THICK MIN. CONCRETE OUTSIDE OF PIPE FITTING. COLLAR SHALL ALLOW PVC CAP TO BE REMOVED AND REPLACED AS INTENDED.
2. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
3. MAX. SPACING 200'.



PLAN VIEW OF COLLAR





APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	TRENCH DRAIN 90° CORNER CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.10**

APPROVED BY THE CITY OF CASTLE PINES

Larry Mimmo
Director of Public Works

DATE 6/15/22

CITY OF CASTLE PINES

BACK TO BACK TRENCH DRAIN CLEANOUTS

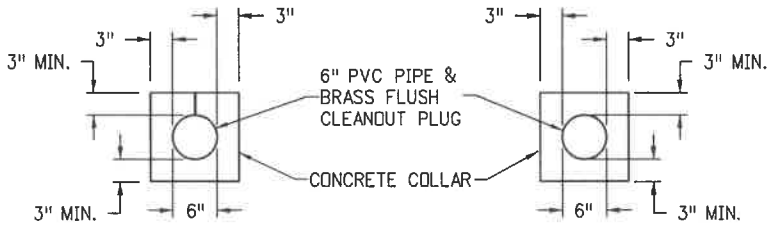
Issued: 6/15/2022

Revised:

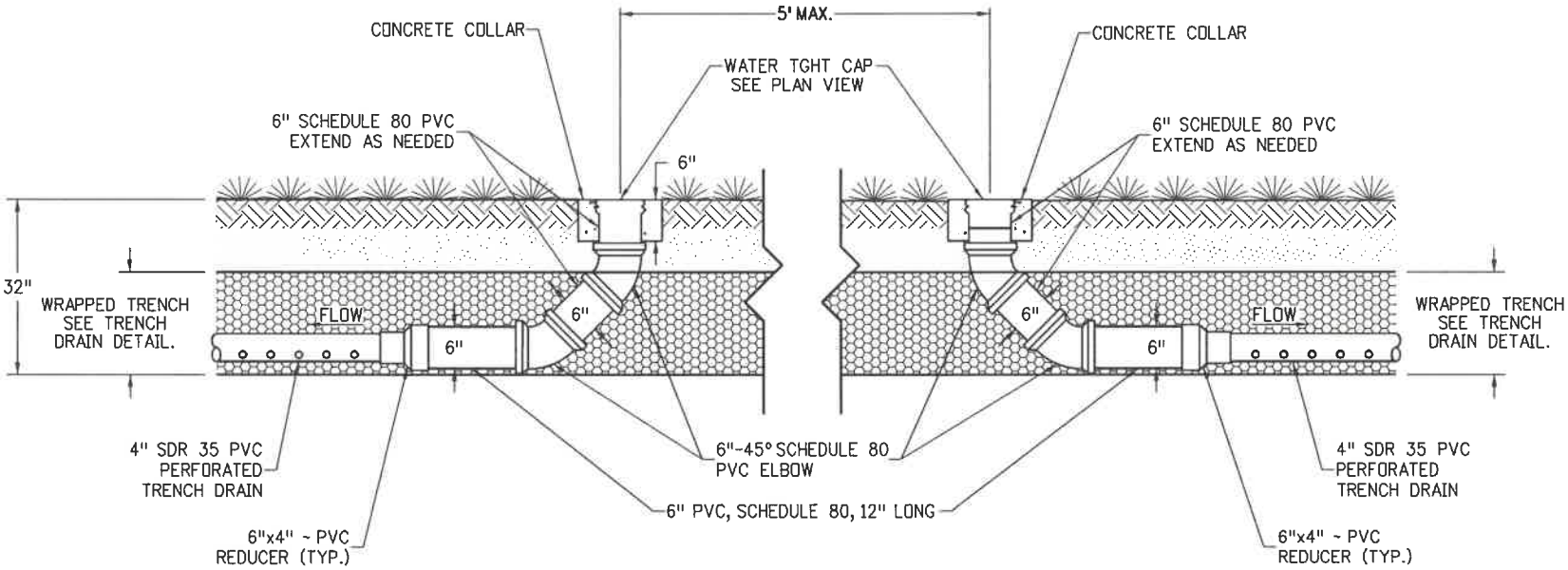
Standard Drawing No. **SD.11**

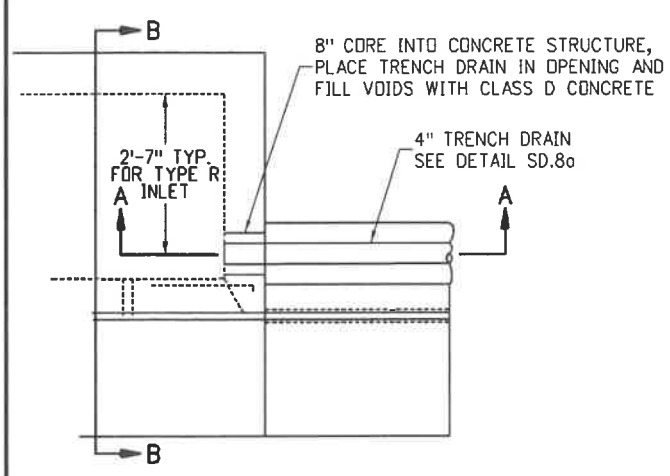
NOTES:

1. OUTSIDE DIAMETER OF CONCRETE COLLAR SHALL BE LARGE ENOUGH TO ACHIEVE 3" THICK MIN. CONCRETE OUTSIDE OF PIPE FITTING. COLLAR SHALL ALLOW PVC CAP TO BE REMOVED AND REPLACED AS INTENDED.
2. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.

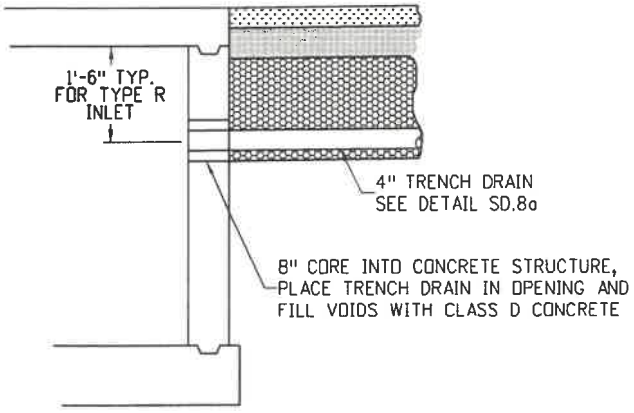


PLAN VIEW

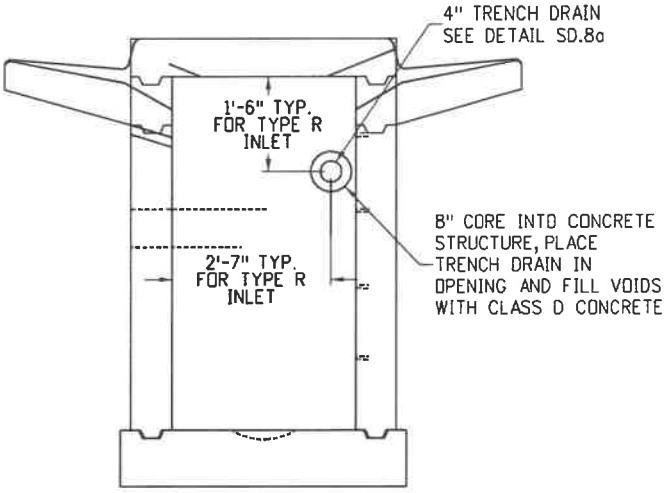




PLAN VIEW



SECTION A-A



SECTION B-B
END VIEW

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

TRENCH DRAIN CONNECTION TO INLET OR MANHOLE

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.12

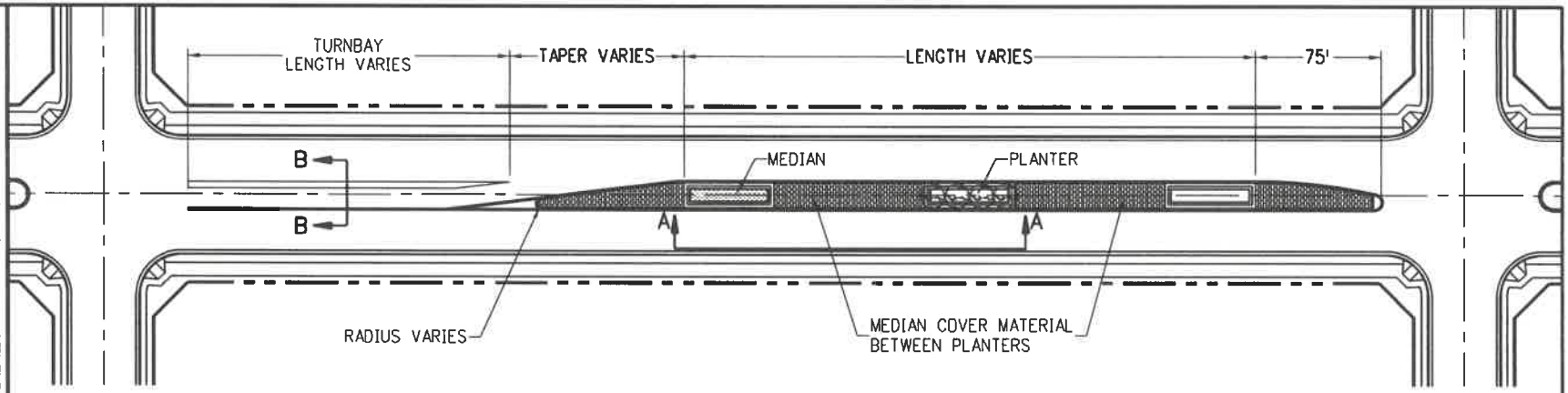
APPROVED BY THE CITY OF CASTLE PINES

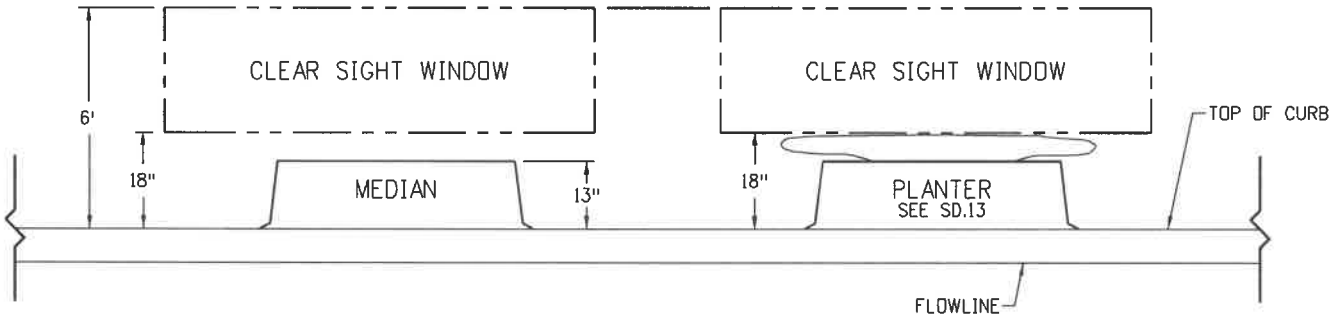
Larry Nimmo
Director of Public Works

DATE 8/19/22

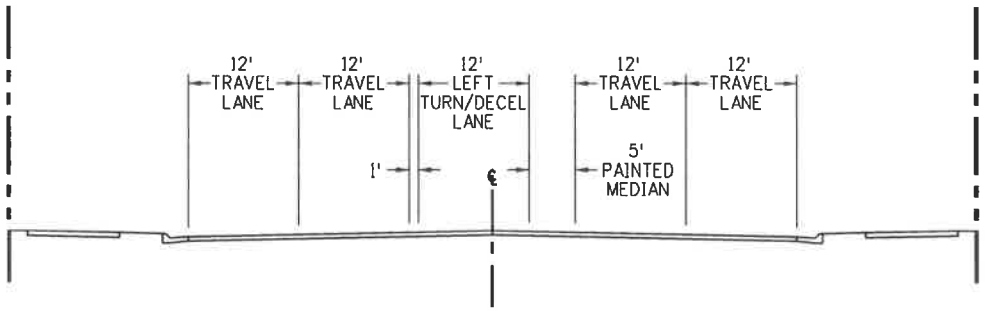
CITY OF CASTLE PINES

MEDIAN PLANTER LAYOUT





SECTION A-A



SECTION B-B

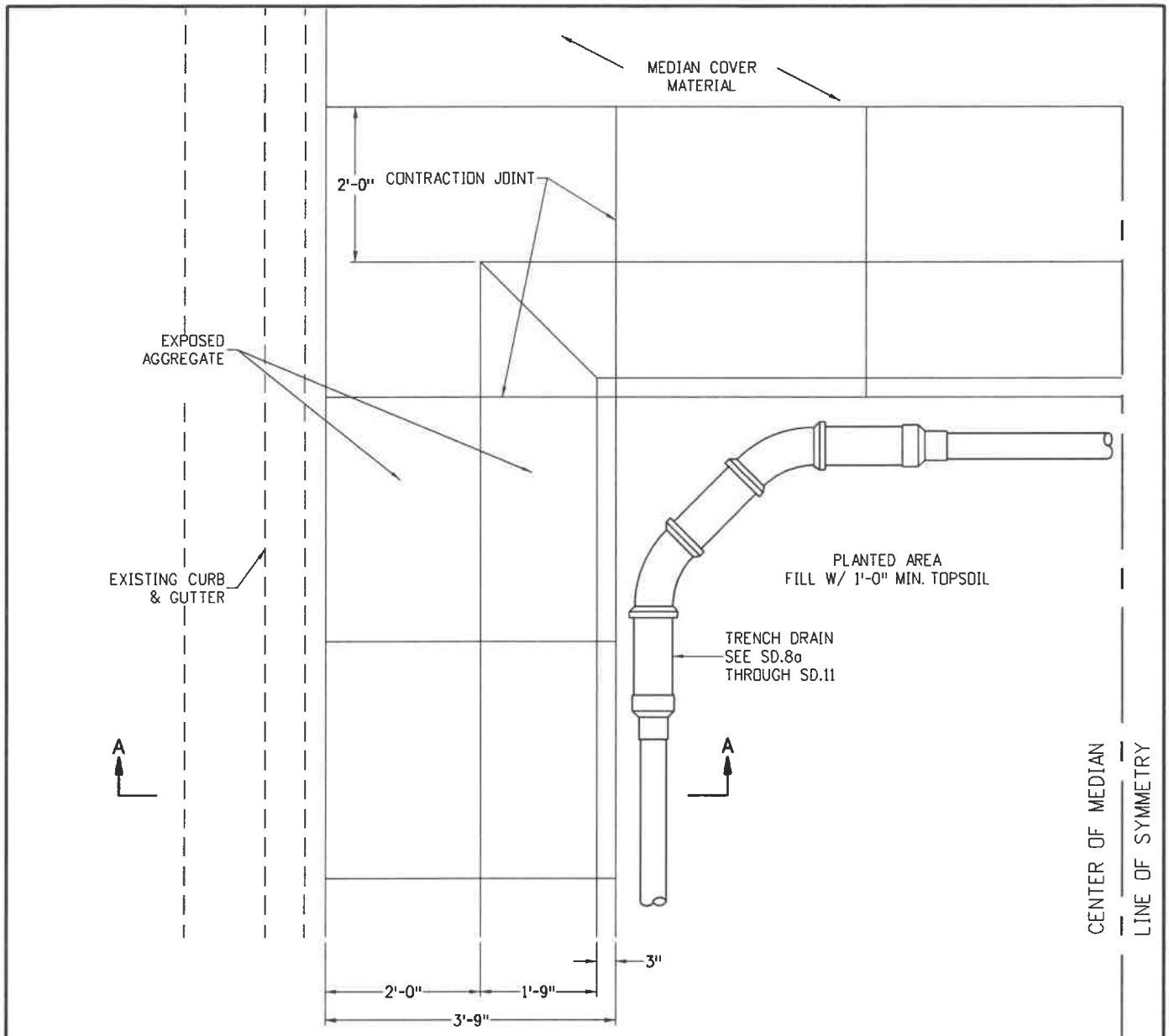
NOTES:
1. RESTRICTED PLANTING - LOW SHRUBS AND GROUND COVER THAT DO NOT EXCEED 1'-6" ABOVE TOP OF ADJACENT CURB.
2. PLANTERS SHALL BE SPACED TO PROVIDE SAFE SIGHT DISTANCE.
3. MATURE VEGETATION GROWTH SHALL NOT EXTEND OVER BACK OF CURB INTO ADJACENT LANES.

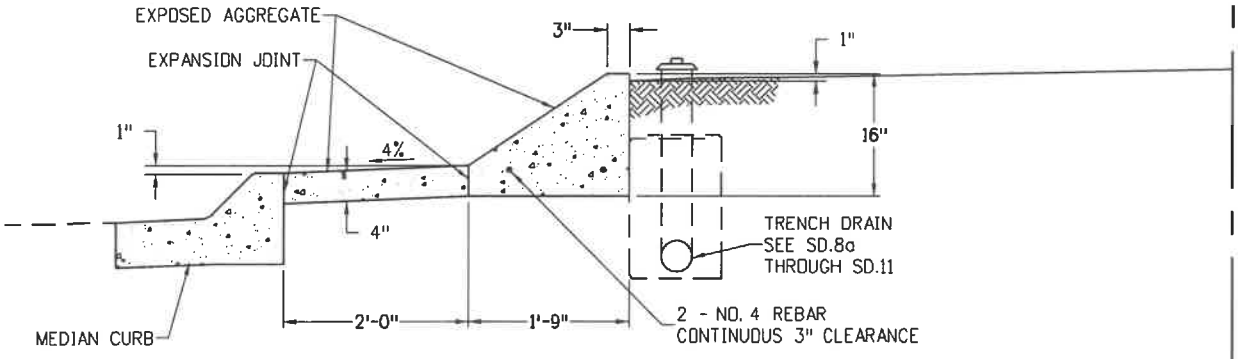
Issued: 6/15/2022

Revised:

Standard Drawing No.

SD.13





SECTION A-A

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

MEDIAN PLANTER DETAIL

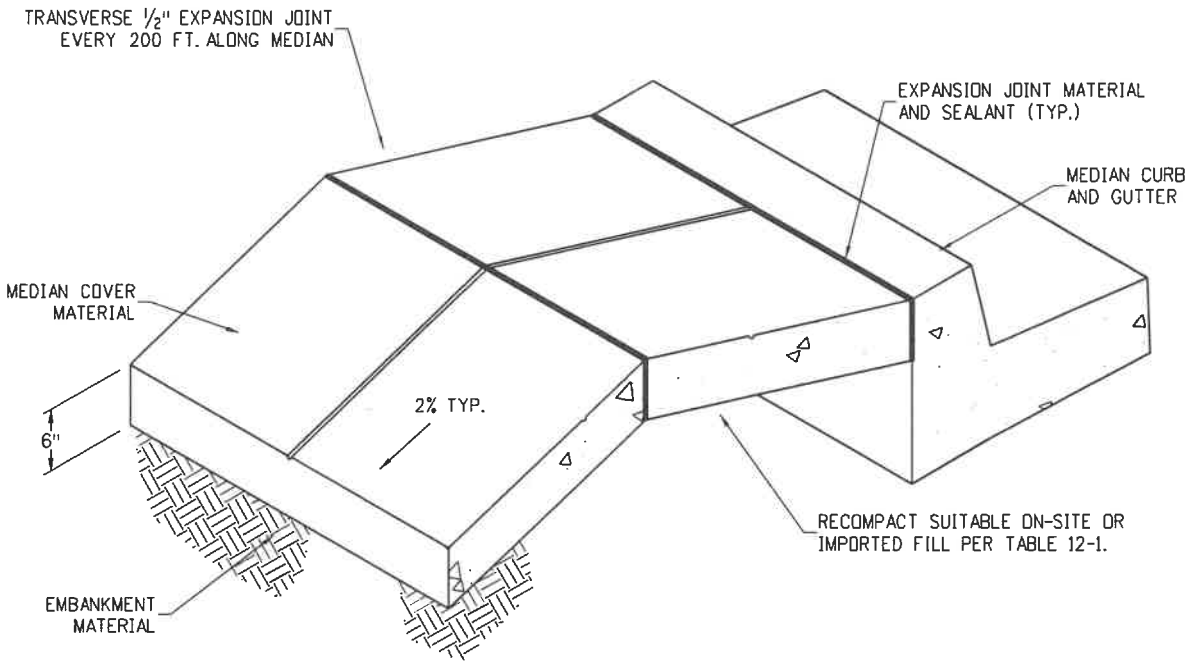
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.14



NOTES:

1. MEDIAN COVER MATERIAL SHALL BE CLASS D OR CLASS P CONCRETE.
2. INSTALL ½"x6" EXPANSION MATERIAL AT MEDIAN NOSES, FIXED OBJECTS, AND AT TRANSVERSE JOINTS AT 200 FT. INTERVALS (MAXIMUM) ALONG THE MEDIAN.
3. CONCRETE IS TO BE COLORED SUNSET ROSE #160 OR APPROVED EQUAL WHEN MEDIAN IS IN A CONCRETE ROADWAY.
4. FOR WEED CONTROL PRIOR TO MEDIAN PAVING, APPLY A PRE-EMERGENT HERBICIDE TO MEDIAN SUBGRADE AREA PER MANUFACTURER'S SPECIFICATIONS FOR PAVING UNDER THE BARRIER 50 LABEL (PBI GORDAN). TRIFLURALIN IS LABELED FOR USE UNDER ASPHALT UNDER THE TREFLAN 4EC LABEL (EIANCO).

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

MEDIAN COVER MATERIAL

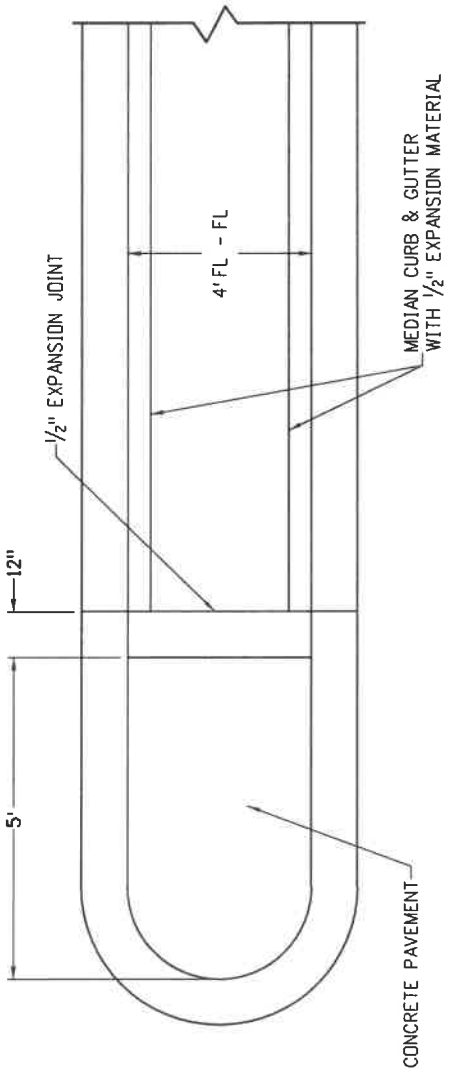
CITY OF CASTLE PINES

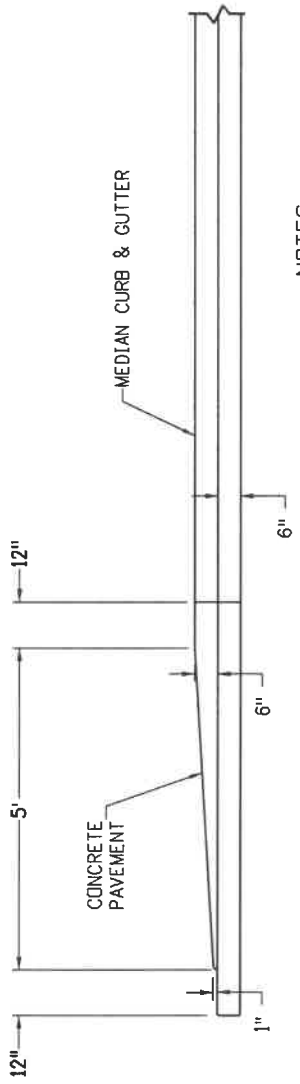
Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.15





NOTES:

1. SEE SS.7 FOR MEDIAN NOSE SIGN AND DELINEATION.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

MEDIAN NOSE DETAIL

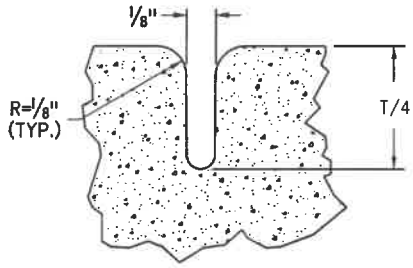
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

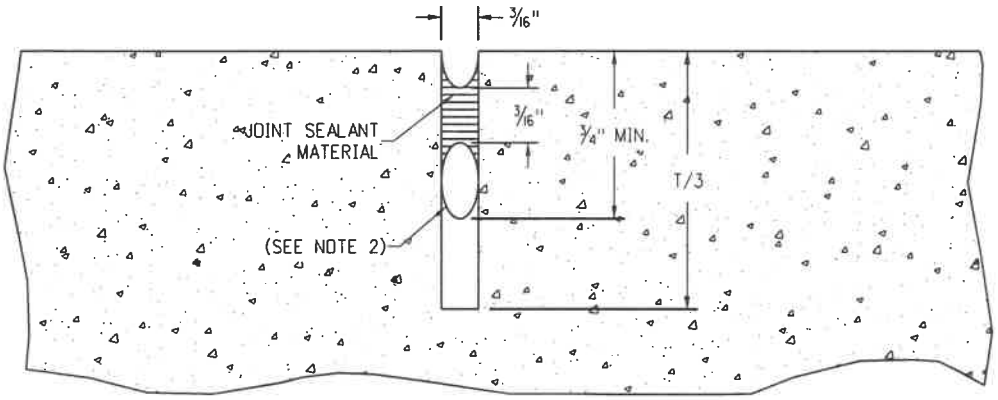
Standard Drawing No.

SD.16



CONTRACTION OR WEAKEN PLANE JOINT

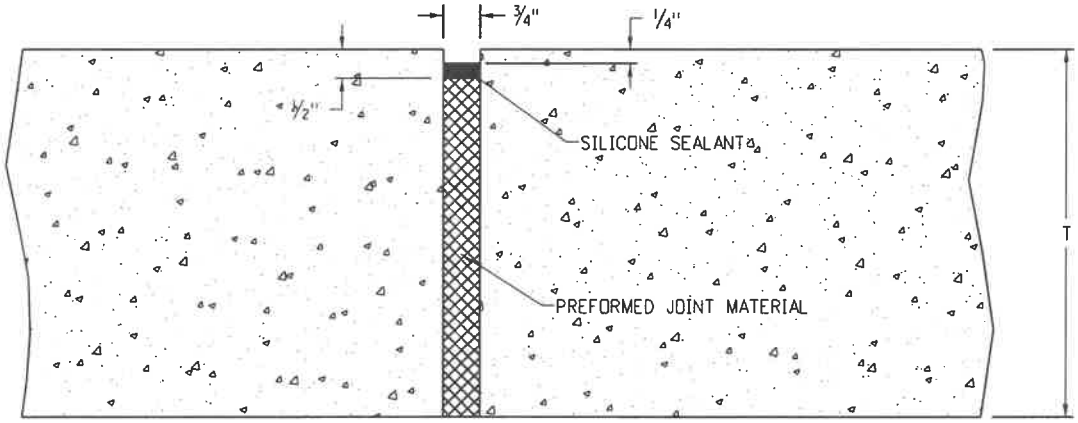
N.T.S.



NOTE: WASH & BLOW OUT WITH FORCED AIR UNTIL DRY BEFORE APPLYING SEALANT MATERIAL.

SAWED JOINT

N.T.S.



EXPANSION JOINT

N.T.S.

NOTES:

1. JOINT SEALANT MATERIAL MUST BE ON CDOT APPROVED PRODUCTS LIST.
2. 3/8" DIA. BACKER ROD.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	CONCRETE JOINTS CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.17**

REFERENCE:

CDOT M & S STANDARDS

M-412-1

CITY OF CASTLE PINES

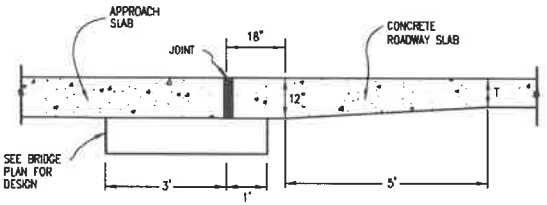
CONCRETE JOINTS

Issued: 6/15/2022

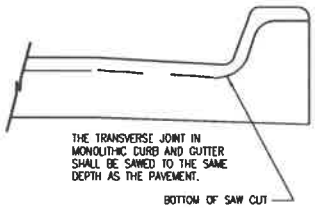
Revised: _____

Standard Drawing No.

SD.18



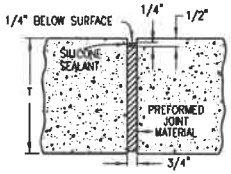
BRIDGE APPROACH



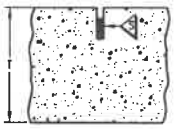
GENERAL NOTES

1. PAVEMENT THICKNESS (T), SHALL BE AS CALLED FOR IN THE PLANS.

PAVEMENT THICKNESS (T)	TIE BAR SIZE	DOWELL BAR DIAMETER
T < 8 IN.	No. 4	1 IN.
8 IN. ≥ T ≤ 10 IN.	No. 5	1.25 IN.
10 IN. > T ≤ 15 IN.	No. 6	1.50 IN.

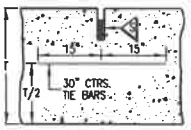


EXPANSION JOINT



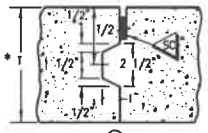
TRANSVERSE CONTRACTION JOINT

(TRANSVERSE WEAKENED PLANE JOINT)



LONGITUDINAL CONTRACTION JOINT

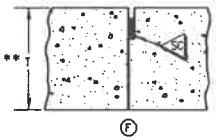
(LONGITUDINAL WEAKENED PLANE JOINT)



LONGITUDINAL CONSTRUCTION JOINT

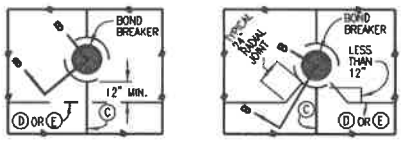
* TO BE USED ONLY IF T ≥ 8 INCHES

ONLY FEMALE KEYWAY TO BE FORMED

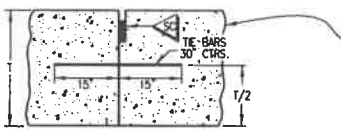


LONGITUDINAL CONSTRUCTION JOINT

** TO BE USED ONLY IF T < 8 INCHES

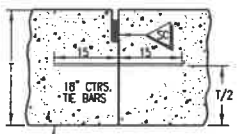


INLET OR MANHOLE CAST IN PAVEMENT

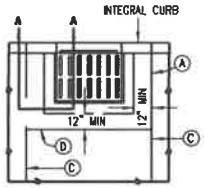


LONGITUDINAL CONSTRUCTION JOINT

A KEYWAY IS ALLOWED TO FACILITATE USE OF BENT, GRADE 40 TIE BARS OR APPROVED TWO PIECE CONNECTORS

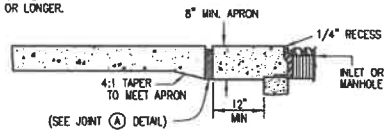


TRANSVERSE CONSTRUCTION JOINT

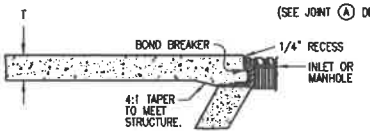


TRANSVERSE JOINT AT BOTH BOXOUT CORNERS IF BOXOUT IS 8' OR LONGER.

CURB INLET BOXOUT

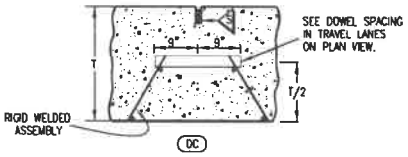


SECTION A-A

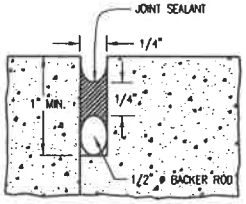


SECTION B-B

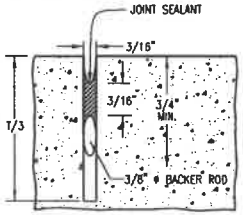
BOND BREAKER SHALL BE COMPOSED OF PLASTIC SHEET, BUILDING PAPER OR OTHER APPROVED MATERIAL TO PREVENT BONDING.



DOWELED TRANSVERSE CONTRACTION JOINT



SEAL AT CONSTRUCTION JOINT



▲ SHALL BE 0.4T FOR LONGITUDINAL JOINTS ALONG SLABS 14 FEET OR GREATER IN WIDTH.

SAWED JOINT

REFERENCE:

CDOT M & S STANDARDS

M-412-1

CITY OF CASTLE PINES

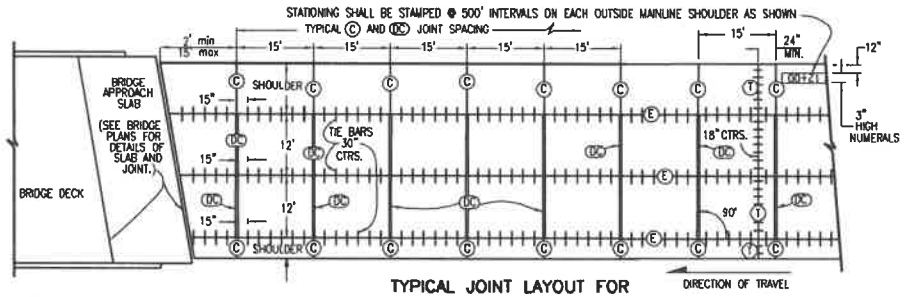
TYPICAL CONCRETE JOINT LAYOUT

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.19a



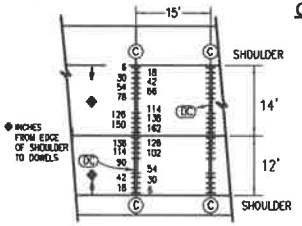
TYPICAL JOINT LAYOUT FOR CONCRETE ROADWAY WITH CONCRETE SHOULDERS

GENERAL NOTES

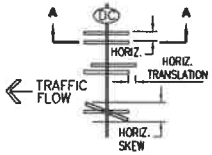
1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. LOCATE (T) JOINT AT A (C) JOINT OR A MINIMUM OF 2 FEET FROM A (C) JOINT.
3. THIS JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER. 14 FOOT SLABS SHALL BE CONSTRUCTED ONLY WHERE DESIGNATED ON THE PLANS.
4. WHEN A CONTINUOUS WIDTH OF PAVEMENT IS POURED WIDER THAN 40 FEET, THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.
5. ON 4 LANE DIVIDED HIGHWAYS, THE 2 LANE DIRECTIONAL PAVEMENT AND BOTH SHOULDERS SHALL BE PLACED WITH (E) LONGITUDINAL SAWED CONTRACTION JOINTS.
6. ON VARIABLE WIDTH SLABS, THE 2 FOOT OR 4 FOOT END OF SLAB WIDTH DIMENSION MAY VARY ±6 INCHES.
7. (L) TO BE USED WHEN TRAFFIC LANE IS ADDED SEPARATELY OR FOR TAPERS OR SPEED CHANGE LANES. ALTERNATIVE LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANE MAY BE USED IF APPROVED.

JOINT LEGEND

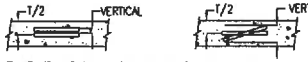
- (C) TRANSVERSE CONTRACTION
- (D) LONGITUDINAL CONSTRUCTION
- (DC) DOWELED TRANSVERSE CONTRACTION
- (L) (E) LONGITUDINAL CONSTRUCTION OR LONGITUDINAL CONTRACTION
- (T) TRAVERSE CONSTRUCTION



DOWEL BAR DETAIL FOR (DC) JOINT WITH 14 ft. AND 12 ft. LANES



PLAN VIEW
SHOWING HORIZ. TRANSLATION, AND HORIZ. SKEW TOLERANCES

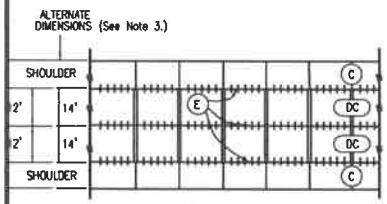


T IS PAVEMENT THICKNESS FROM PLANS

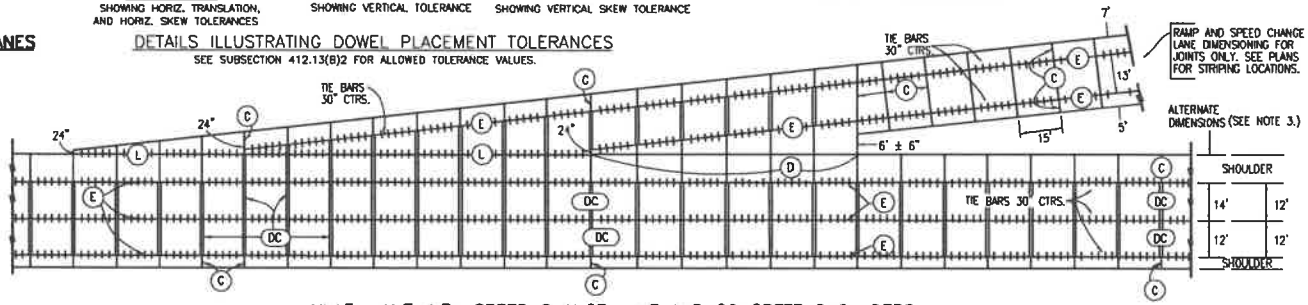
SECTION A–A
SHOWING VERTICAL TOLERANCE

SECTION A–A
SHOWING VERTICAL SKEW TOLERANCE

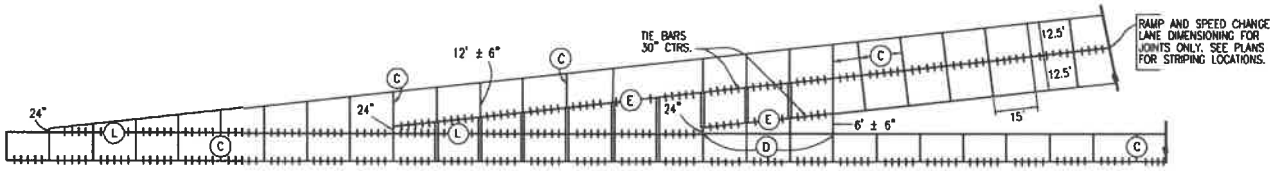
DETAILS ILLUSTRATING DOWEL PLACEMENT TOLERANCES
SEE SUBSECTION 412.13(B)2 FOR ALLOWED TOLERANCE VALUES.



RURAL TWO-LANE



MULTI-LANE WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE SPEED CHANGE LANE

REFERENCE:

CDOT M & S STANDARDS

M-412-1

CITY OF CASTLE PINES

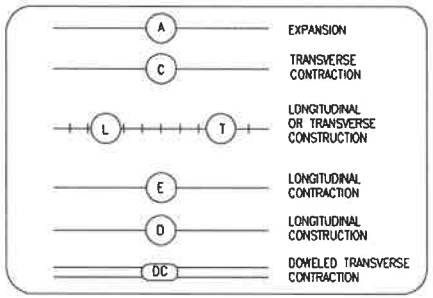
TYPICAL CONCRETE JOINT LAYOUT

Issued: 6/15/2022

Revised: _____

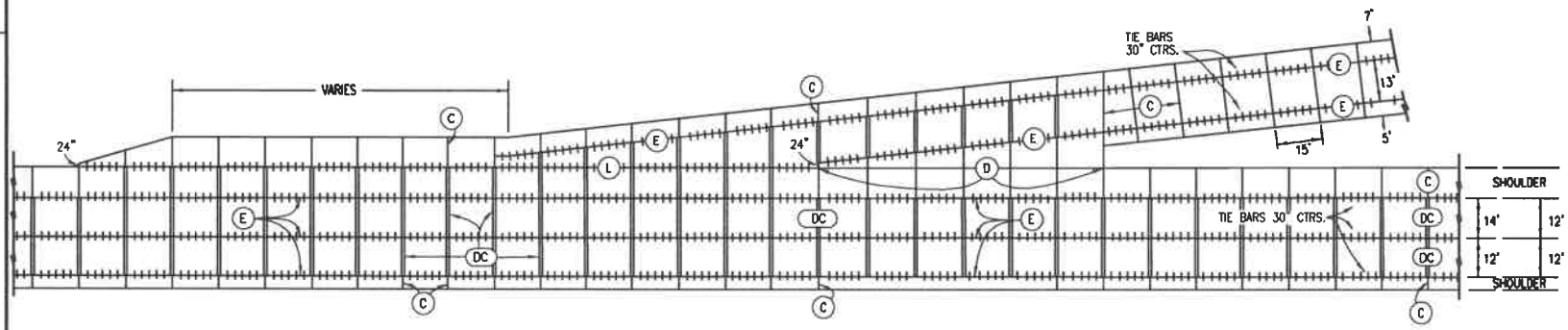
Standard Drawing No. **SD.19b**

JOINT LEGEND

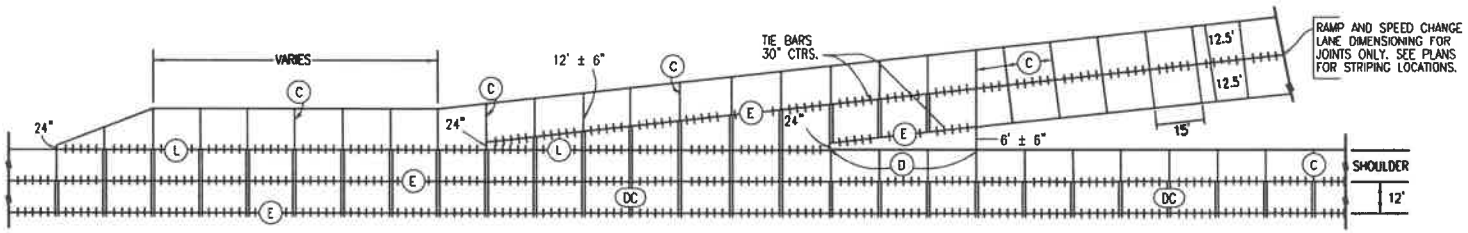


GENERAL NOTES

1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. LOCATE (T) JOINT AT A (C) JOINT OR A MINIMUM OF 2 FEET FROM A (C) JOINT.
3. THIS JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER. 14 FOOT SLABS SHALL BE CONSTRUCTED ONLY WHERE DESIGNATED ON THE PLANS.
4. WHEN A CONTINUOUS WIDTH OF PAVEMENT IS POURED WIDER THAN 40 FEET, THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.
5. ON 4 LANE DIVIDED HIGHWAYS, THE 2 LANE DIRECTIONAL PAVEMENT AND BOTH SHOULDERS SHALL BE PLACED WITH (E) LONGITUDINAL SAWED CONTRACTION JOINTS.
6. ON VARIABLE WIDTH SLABS, THE 2 FOOT OR 4 FOOT END OF SLAB WIDTH DIMENSION MAY VARY ±6 INCHES.
7. (L) TO BE USED WHEN TRAFFIC LANE IS ADDED SEPARATELY OR FOR TAPERS OR SPEED CHANGE LANES. ALTERNATIVE LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANE MAY BE USED IF APPROVED.



MULTI-LANE WITH ACCELERATION AND DECELERATION LANES AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE ACCELERATION AND DECELERATION LANE

REFERENCE:

CDOT M & S STANDARDS

M-412-1

CITY OF CASTLE PINES

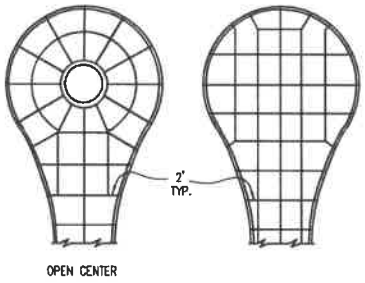
TYPICAL CONCRETE JOINT LAYOUT

Issued: 6/15/2022

Revised: _____

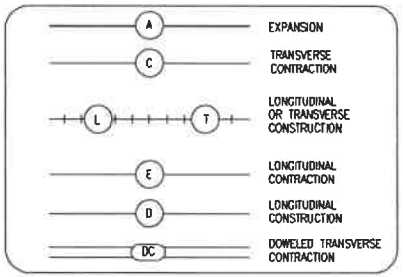
Standard Drawing No.

SD.19c



CUL-DE-SAC

JOINT LEGEND

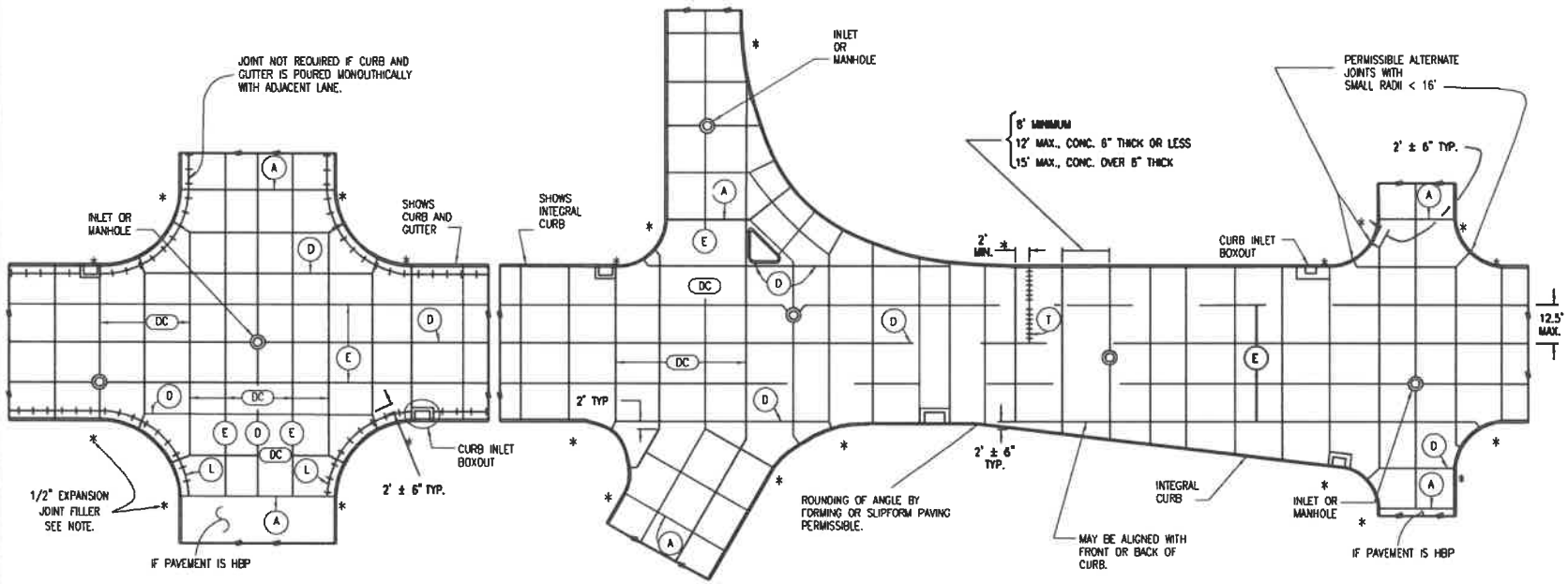


GENERAL NOTES

1. THIS STANDARD DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. THIS TYPICAL JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.
3. LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS WHEN POSSIBLE, AND HAVE MAXIMUM SPACING OF 12.5 FT. (15 FT. PERMITTED WITH MONOLITHIC CURB AND GUTTER).
4. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.

* 5. PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.

6. THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.
7. TRANSVERSE JOINTS SHALL BE LOCATED AT THE CENTER OF CIRCULAR MANHOLES AND INLETS. NO TRANSVERSE JOINT SHALL PASS WITHIN 4 FT. OF A MANHOLE.
8. WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
9. LOCATE (T) JOINT AT (C) JOINT OR 2 FT. MIN FROM (C)
10. WHEN A CONTINUOUS WIDTH AT PAVEMENT IS POURED WIDER THAN 40 FT., THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.



TYPICAL CURBED PAVEMENT JOINT LAYOUT

GENERAL NOTES

1. THIS STANDARD DOES NOT APPLY TO CONCRETE OVERLAYS LESS THAN 6 FT. THICK (WHITETOPPING).
2. THIS TYPICAL JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.
3. LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS WHEN POSSIBLE, AND HAVE MAXIMUM SPACING OF 12.5 FT. (15 FT. PERMITTED WITH MONOLITHIC CURB AND GUTTER).
4. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
5. PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.
6. THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.
7. TRANSVERSE JOINTS SHALL BE LOCATED AT THE CENTER OF CIRCULAR MANHOLES AND INLETS. NO TRANSVERSE JOINT SHALL PASS WITHIN 4 FT. OF A MANHOLE.
8. WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
9. LOCATE (T) JOINT AT (C) JOINT OR 2 FT. MIN FROM (C).
10. WHEN A CONTINUOUS WIDTH AT PAVEMENT IS POURED WIDER THAN 40 FT., THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.

JOINT LEGEND

- (A) EXPANSION
- (C) TRANSVERSE CONTRACTION
- (L)(T) TIED LONGITUDINAL OR TRANSVERSE CONSTRUCTION
- (E) LONGITUDINAL CONTRACTION
- (D) LONGITUDINAL CONSTRUCTION
- (DC) DOWELED TRANSVERSE CONTRACTION

MULTI-LANE INTERSECTION WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS

REFERENCE:

CDOT M & S STANDARDS
M-412-1

TYPICAL CONCRETE JOINT LAYOUT

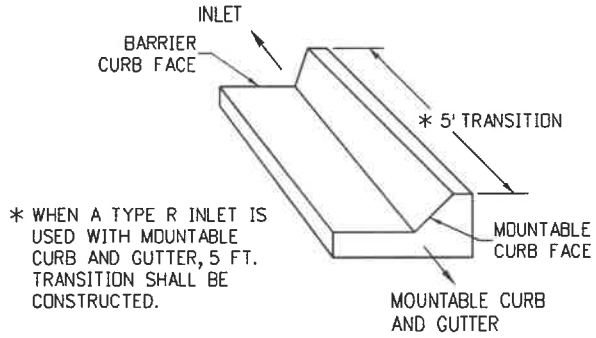
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.19d



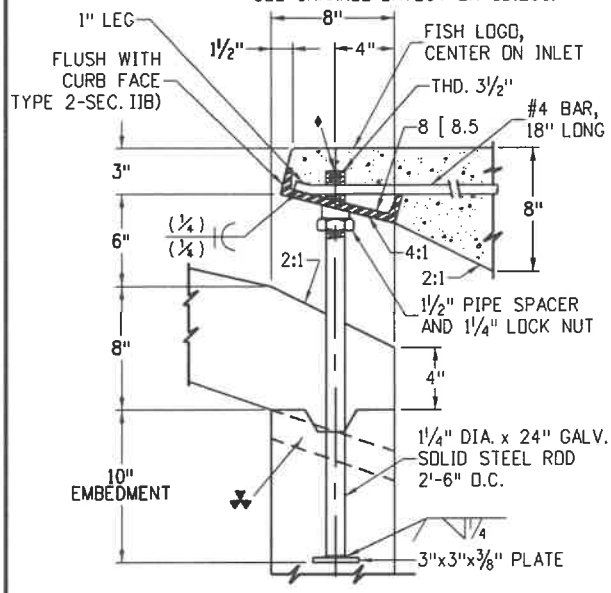
* WHEN A TYPE R INLET IS USED WITH MOUNTABLE CURB AND GUTTER, 5 FT. TRANSITION SHALL BE CONSTRUCTED.

TRANSITION CURB

GENERAL NOTES:

SEE SHEET SD.20d

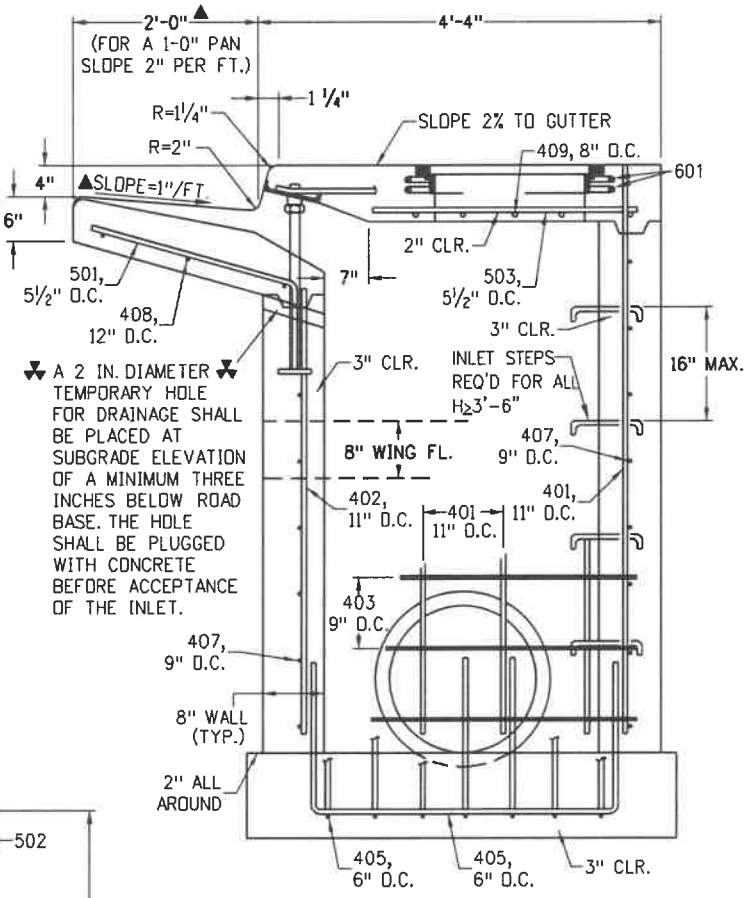
SEE CHANNEL LAYOUT ON SD.20d.



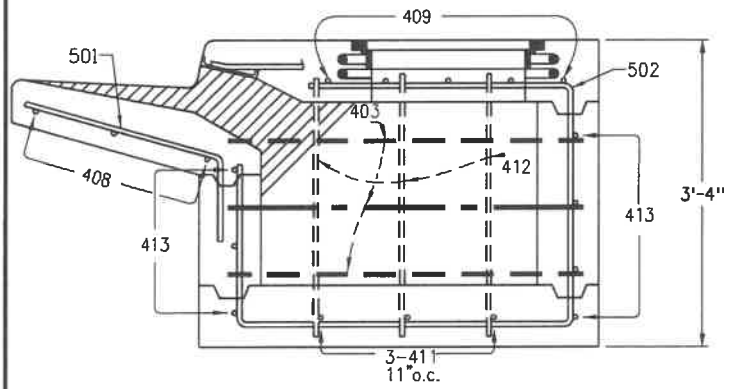
♦ PLACE ENTIRE ASSEMBLY BEFORE POURING CONCRETE.

CURB FACE ASSEMBLY

▲ - FOR A 1'-0" PAN SLOPE 2" PER FT.



♣ A 2 IN. DIAMETER TEMPORARY HOLE FOR DRAINAGE SHALL BE PLACED AT SUBGRADE ELEVATION OF A MINIMUM THREE INCHES BELOW ROAD BASE. THE HOLE SHALL BE PLUGGED WITH CONCRETE BEFORE ACCEPTANCE OF THE INLET.



SECTION C-C & D-D

(DOTTED BARS ARE IN SECTION D-D)

SECTION B-B END VIEW

NOTE: MANHOLE RING & COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET.

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

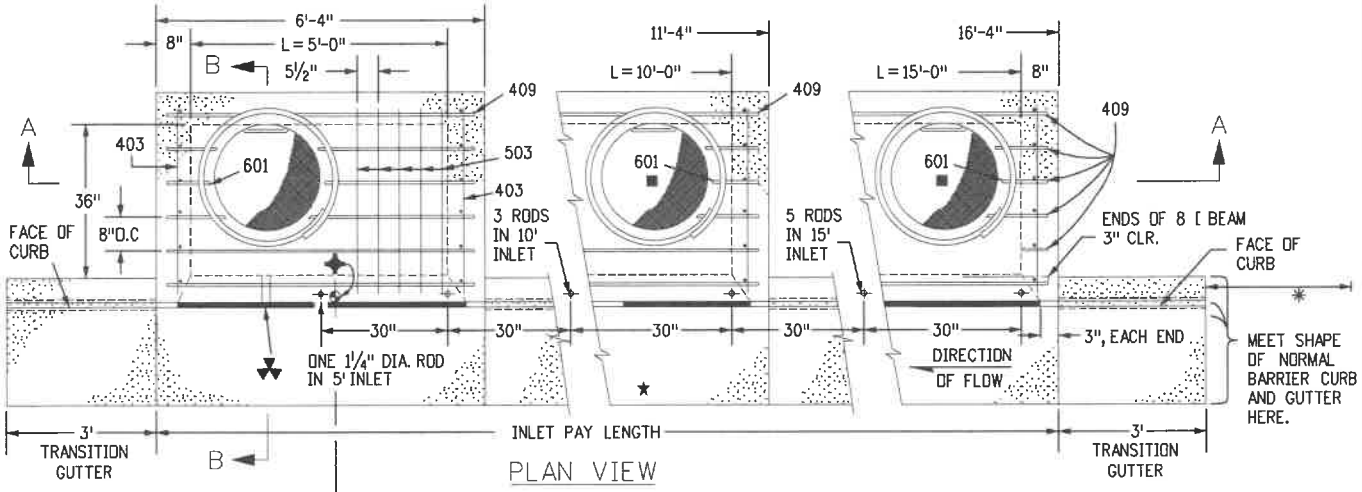
Standard Drawing No.

SD.20a

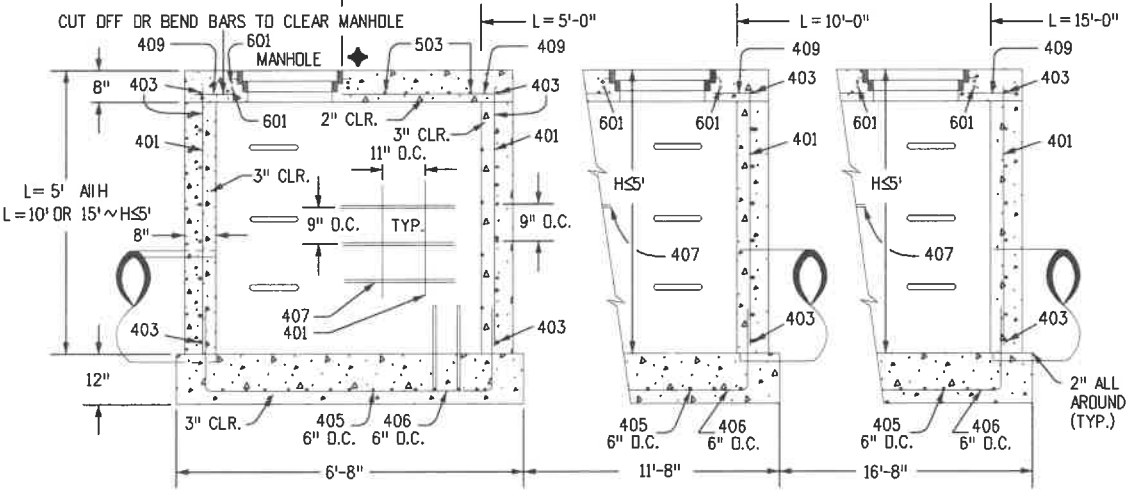
* WHEN A TYPE R INLET IS USED WITH MOUNTABLE CURB AND GUTTER, 5 FT. TRANSITION SHALL BE CONSTRUCTED. TRANSITION SHALL BE PAID FOR AS CURB AND GUTTER.

★ FOR LENGTH (L) 10 FT. OR MORE, PROVIDE MAINTENANCE ACCESS AT BOTH ENDS WITH AN ADDITIONAL MANHOLE RING AND COVER. CUT REINFORCEMENT BAR ACCORDINGLY.

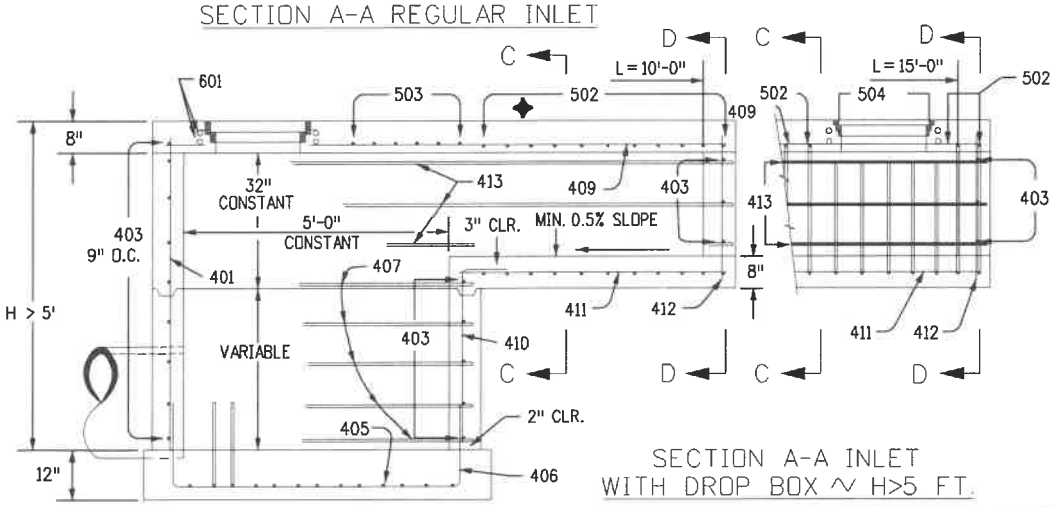
✦ STATION POINT AT MIDPOINT OF INLET ALONG FLOWLINE



PLAN VIEW



SECTION A-A REGULAR INLET



SECTION A-A INLET WITH DROP BOX ~ H>5 FT.

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised:

Standard Drawing No.

SD.20b

MARK	BAR # OR SIZE	O.C. SPACING	TYPE	ALL INLETS L = 5 FT.		INLETS: H ≤ 5 FT. L = 10 FT.		INLETS: H ≤ 5 FT. L = 15 FT.		INLETS: H > 5 FT. L = 10 FT.		INLETS: H > 5 FT. L = 15 FT.	
				NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
401	4	11"	II	15	*	21	*	26	*	11	*	11	*
402	4	11"	II	7	*	13	*	18	*	7	*	7	*
403	4	9"	II	*	4'-0"	*	4'-0"	*	4'-0"	*	4'-0"	*	4'-0"
405	4	6"	VI	11	6'-10"	21	6'-10"	31	6'-10"	11	6'-10"	11	6'-10
406	4	6"	VIII	7	8'-10"	7	13'-10"	7	18'-10"	7	8'-10"	7	8'-10"
407	4	9"	II	*	5'-10"	*	10'-10"	*	15'-10"	*	5'-10"	*	5'-10"
408	4	12"	II	3	6'-10"	3	11'-10"	3	16'-0"	3	11'-10"	3	16'-0"
409	4	8"	II	6	5'-10"	6	10'-10"	6	15'-10"	6	10'-10"	6	15'-10"
410	4	11"	VII							3	*	3	*
411	4	11"	II							3	5'-2"	3	10'-2"
412	4	11"	II							3	2'-9"	3	2'-9"
413	4	9"	II							7	10'-10"	7	15'-10"
501	5	5 1/2"	IV	11	3'-4"	22	3'-4"	33	3'-4"	22	3'-4"	33	3'-4"
502	5	5 1/2"	III							11	11'-5"	17	11'-5"
503	5	5 1/2"	II	5	3'-6"	16	3'-6"	27	3'-6"	6	3'-6"	6	3'-6"
504	5	5 1/2"	IX									5	8'-4"
601	6	2 1/2"	V	2	8'-10"	2	8'-10"	2	8'-10"	2	8'-10"	4	8'-10"
■8[8.5				1	5'-10"	1	10'-10"	1	15'-10"	1	10'-10"	1	15'-10"
				2 BARS, 1 ROD	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——

* VARIABLE, REFER TO TABLE TWO.

■ INCLUDE #4, 18 IN. BARS (SEE CHANNEL LAYOUT).

REGULAR INLETS

DROP BOX INLETS

TABLE ONE ~ BAR LIST FOR CURB INLETS, TYPE "R"

'H'	LENGTH 401	LENGTH 402	LENGTH 410	NO. REQ'D. REGULAR 403	NO. REQ'D. REGULAR 407	NO. REQ'D. DROP BOX 403	NO. REQ'D. DROP BOX 407	L=5' CONC. CU. YDS.	L=5' STEEL LBS.	L=10' CONC. CU. YDS.	L=10' STEEL LBS.	L=15' CONC. CU. YDS.	L=15' STEEL LBS.
3'-0"	2'-8"	1'-8"		10	7			3.2	285	5.3	497	7.4	706
3'-6"	3'-2"	2'-2"		10	7			3.4	305	5.7	528	7.9	747
4'-0"	3'-8"	2'-8"		12	9			3.7	326	6.0	559	8.4	786
4'-6"	4'-2"	3'-2"		12	9			3.9	334	6.4	571	8.8	803
5'-0"	4'-8"	3'-8"		14	11			4.1	354	6.7	602	9.3	844
5'-6"	5'-2"	4'-2"	3'-5"	16	13	15	6	4.4	375	6.0	607	7.4	850
6'-0"	5'-8"	4'-8"	3'-11"	16	13	16	6	4.6	382	6.2	616	7.6	860
6'-6"	6'-2"	5'-2"	4'-5"	18	15	18	8	4.8	402	6.4	637	7.8	880
7'-0"	6'-8"	5'-8"	4'-11"	20	17	19	10	5.0	423	6.6	654	8.0	897
7'-6"	7'-2"	6'-2"	5'-5"	20	17	20	10	5.3	430	6.9	664	8.3	907
8'-0"	7'-8"	6'-8"	5'-11"	22	19	22	12	5.5	451	7.1	684	8.5	927
8'-6"	8'-2"	7'-2"	6'-5"	24	21	23	14	5.7	471	7.3	702	8.7	944
9'-0"	8'-8"	7'-8"	6'-11"	24	21	24	14	6.0	479	7.6	711	9.0	954
9'-6"	9'-2"	8'-2"	7'-5"	26	23	26	16	6.2	499	7.8	732	9.2	974
10'-0"	9'-8"	8'-8"	7'-11"	28	25	27	18	6.4	520	8.0	749	9.4	992
10'-6"	10'-2"	9'-2"	8'-5"	28	25	28	18	6.7	527	8.3	759	9.7	1001
11'-0"	10'-8"	9'-8"	8'-11"	30	27	30	20	6.9	547	8.5	779	9.9	1022

NOTES: FOR L=5 FT., L=10 FT., AND L=15 FT.
REGULAR INLETS: TOTAL QUANTITIES NEEDED ARE OUTSIDE THE HEAVY BLACK LINE.
DROP BOX INLETS: TOTAL QUANTITIES NEEDED ARE INSIDE THE HEAVY BLACK LINE.

STEEL WEIGHTS DO NOT INCLUDE STRUCTURAL STEEL CHANNEL.

TABLE TWO ~ BARS AND QUANTITIES VARIABLE WITH "H"

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R
(5', 10' OR 15' IN LENGTH)

CITY OF
CASTLE PINES

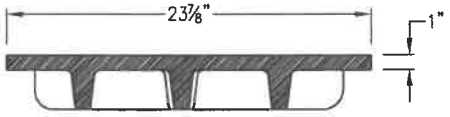
Issued: 6/15/2022

Revised: _____

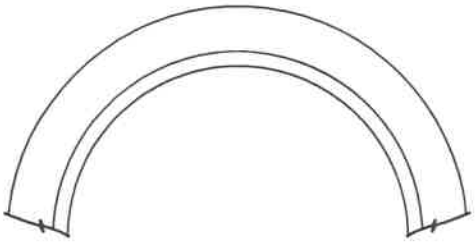
Standard Drawing No.
SD.20c

GENERAL NOTES

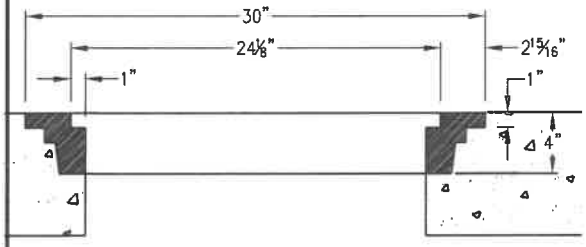
1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
2. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8 INCHES THICK.
3. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 199.
4. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING.
5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ OF A INCH. CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.
6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2 INCH MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE GRADE 60 AND EPOXY COATED.
7. DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06.
9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH CDOT SUBSECTION 712.06.
11. ALL MANHOLE COVERS SHALL BE CAST WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE AND A FISH SYMBOL. THE SURFACE OF THE MANHOLE COVER SHALL HAVE A NON-SLIP PATTERN.



ELEVATION VIEW
MANHOLE COVER (TYP.)

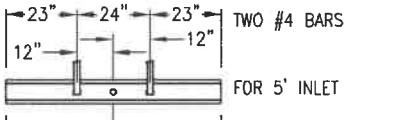


PLAN VIEW

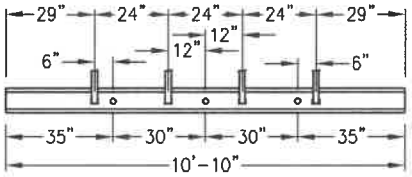


WEIGHTS: COVER = 125 LBS.
+ RING = 135 LBS.
TOTAL = 260 LBS.

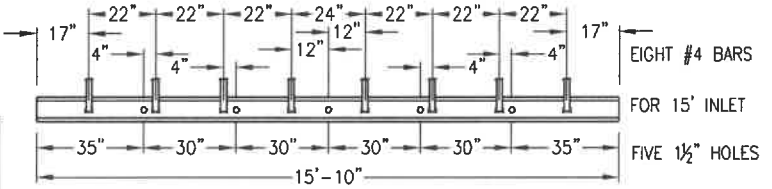
ELEVATION VIEW
MANHOLE RING (TYP.)



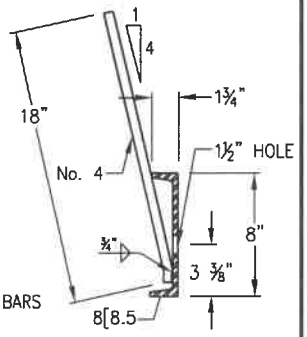
TWO #4 BARS
FOR 5' INLET
ONE 1½" HOLES



FOUR #4 BARS
FOR 10' INLET
THREE 1½" HOLES

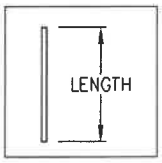


EIGHT #4 BARS
FOR 15' INLET
FIVE 1½" HOLES



SECTION AT
HOLE (TYP.)

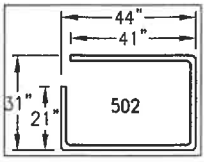
TYPE II



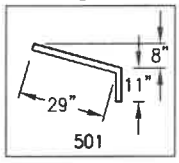
CHANNEL LAYOUT DETAILS

SEE CURB FACE ASSEMBLY ON SD.20a.

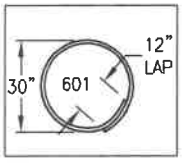
TYPE III



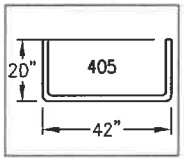
TYPE IV



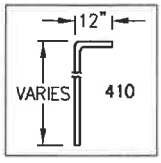
TYPE V



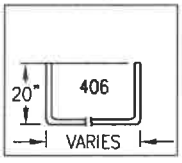
TYPE VI



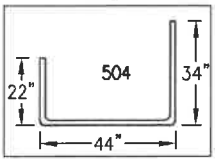
TYPE VII



TYPE VIII



TYPE X



BAR BENDING DIAGRAMS ~ (Dimensions are Out-to-Out of bar)

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R
(5', 10' OR 15' IN LENGTH)

CITY OF
CASTLE PINES

Issued: 6/15/2022

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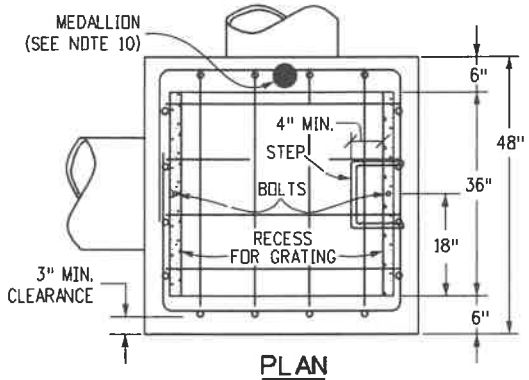
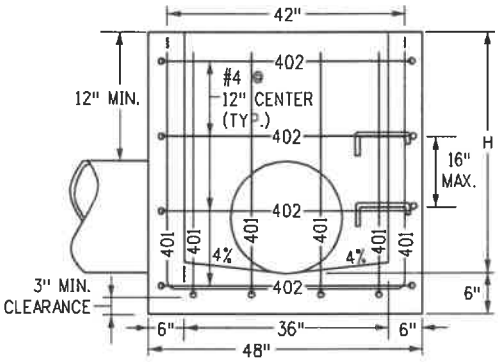
Standard Drawing No.
SD.20d



PLAN



ELEVATION
CONCRETE INLET

GENERAL NOTES

1. INLET TYPE C IS NOT HS-20 RATED AND SHALL NOT BE PLACED IN PAVED ROADWAYS. THIS INLET SHALL BE USED ONLY OUTSIDE PAVED ROADWAYS.
2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
3. REINFORCING BARS SHALL BE GRADE 60, EPOXY COATED, AND DEFORMED #4, AND SHALL HAVE A MIN. 2 INCH CLEARANCE. CUT OR BEND AROUND PIPES AS REQUIRED.
4. CONCRETE SLOPE AND DITCH PAVING SHALL BE IN ACCORDANCE WITH SECTION 507. REINFORCEMENT FOR CONCRETE SLOPE PAVING SHALL BE 6 X 6 - W1.4 X W1.4 OR 6 X 6 - W2.1 X W2.1.
5. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED, AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
6. THE STANDARD INLET GRATES SHALL BE USED ON ALL TYPE C INLETS UNLESS CLOSE MESH INLET GRATES ARE ACCEPTED BY THE CITY OF CASTLE PINES THROUGH WRITTEN VARIANCE.
7. CLOSE MESH GRATES ARE RECOMMENDED WHERE FOOT TRAFFIC OR BICYCLE ROUTES ARE IN CLOSE PROXIMITY TO GRATE. THIS GRATE IS NOT ADA COMPLIANT OR BICYCLE FRIENDLY AND SHALL NOT BE PLACED DIRECTLY IN SIDEWALKS, CROSSWALKS OR BIKE PATHS.
8. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FEET - 6 INCHES AND SHALL CONFORM TO AASHTO M 199.
9. SEE STANDARD DETAIL SD.22a, SD.22b, AND SD.22c, FOR REINFORCEMENT AROUND THE PIPE OPENING.
10. ALL INLETS SHALL HAVE A 4 INCH DIA. METAL MEDALLION WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE ON IT. THE MEDALLION SHALL HAVE A FISH SYMBOL WITH A BLUE BACKGROUND. IT SHALL BE FIRMLY ATTACHED TO THE TOP OF THE INLET WITH A PERMANENT FASTENER.

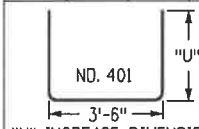
QUANTITIES FOR ONE INLET

H	CONCRETE (CU. YDS.)	STEEL (LBS.)	NO. STEPS REQ'D.
2'-6"	1.0	76	0
3'-0"	1.1	81	0
3'-6"	1.2	97	0
4'-0"	1.3	102	1
4'-6"	1.5	117	2
5'-0"	1.6	123	2
5'-6"	1.7	138	2
6'-0"	1.9	143	3
6'-6"	2.0	159	3
7'-0"	2.1	164	3
7'-6"	2.2	180	4
8'-0"	2.4	185	4
8'-6"	2.5	200	4
9'-0"	2.6	206	5
9'-6"	2.8	221	5
10'-0"	2.9	236	6
11'-6"	3.3	252	6

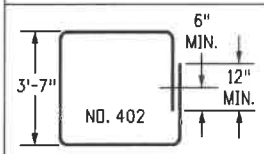
▼ PIPE INSIDE DIAMETER SHALL BE 30 IN. OR LESS. CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

BAR LIST FOR H = 2 FT.-6 IN. AND BENDING DIAGRAM

MARK	NO. REQ'D.	HEIGHT	LENGTH
401	2	2'-2½"	8'-0"
401	6	2'-7"	8'-8"
402	4	"U"	15'-4"



"U" INCREASE DIMENSION 6 IN. FOR EACH 6 IN. INCREASE OF "H" ABOVE 2 FT.-6 IN.



ADD ONE BAR FOR EACH FT. INCREASE OF "H" ABOVE 2 FT. - 6 IN.

402 BARS SHALL BE EQUALLY SPACED FROM EACH OTHER.

REFERENCE:

CDOT M & S STANDARDS
M-604-10

INLET - TYPE C

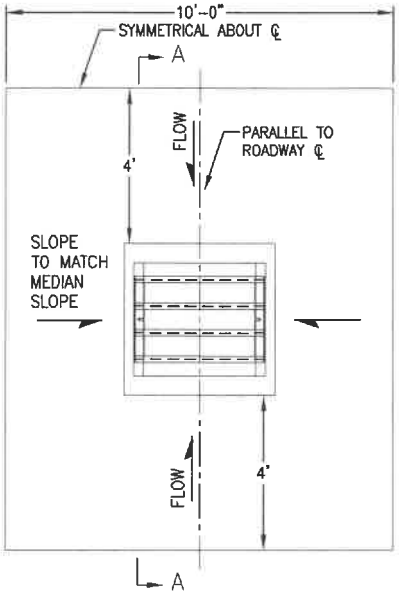
CITY OF
CASTLE PINES

Issued: 6/15/2022

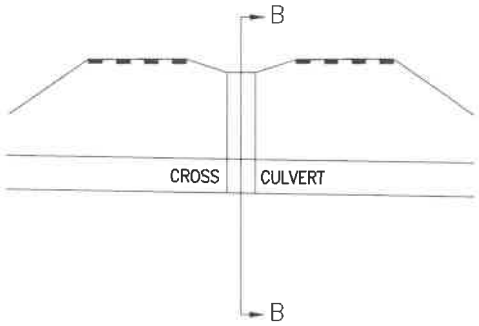
Revised: _____

Standard Drawing No.

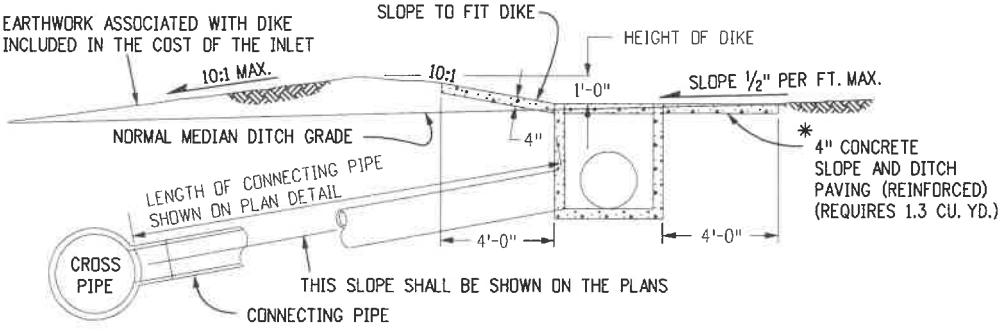
SD.21a



INLET WITH DITCH PAVING



SECTION VIEW

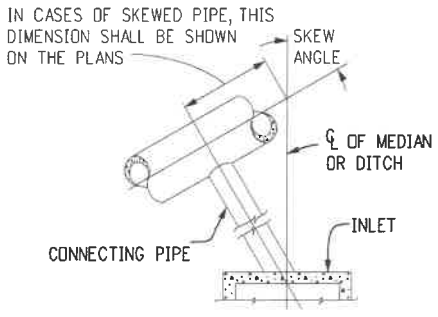


SECTION B-B

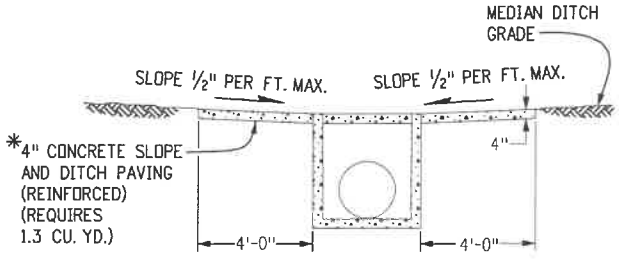
INLET CONNECTED TO A CROSS PIPE

SECTION A-A

INLET ON GRADE (FLOW FROM ONE DIRECTION)



INLET CONNECTED TO A SKEWED CROSS PIPE



SECTION A-A

*CONCRETE SLOPE AND DITCH PAVING WILL BE REQUIRED WHEN SHOWN ON THE PLANS.

INLET AT BOTTOM OF VERTICAL CURVE (FLOW FROM TWO DIRECTIONS)

REFERENCE:

CDOT M & S STANDARDS
M-604-10

INLET - TYPE C

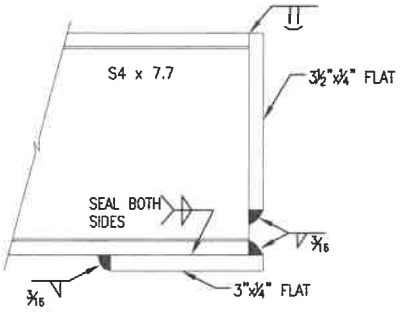
CITY OF CASTLE PINES

Issued: 6/15/2022

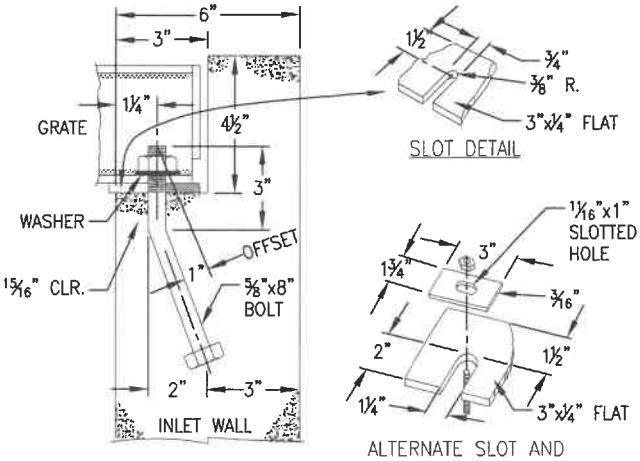
Revised:

Standard Drawing No.

SD.21b

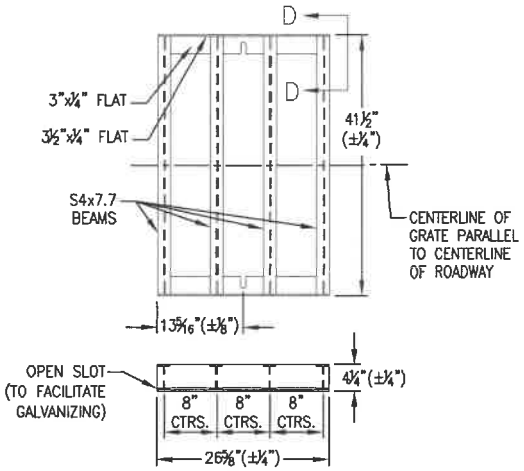


SECTION D–D

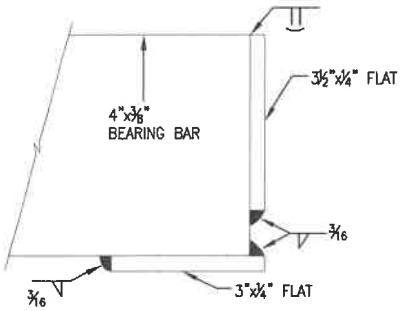


GRATE INSTALLATION DETAIL

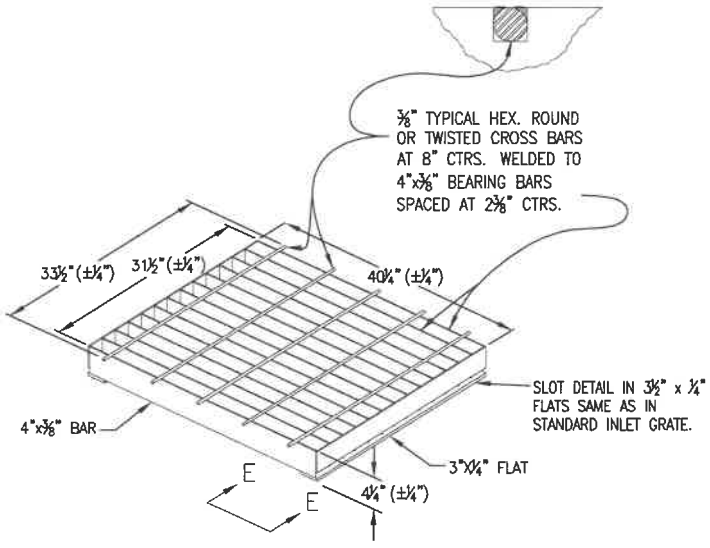
ALTERNATE SLOT AND HOLD DOWN PLATE DETAIL



STANDARD INLET GRATE



SECTION E–E



CLOSE MESH GRATE

USE FOR PEDESTRIAN AND BICYCLE AREAS ONLY.

REFERENCE:

CDOT M & S STANDARDS
M-604-10

INLET - TYPE C

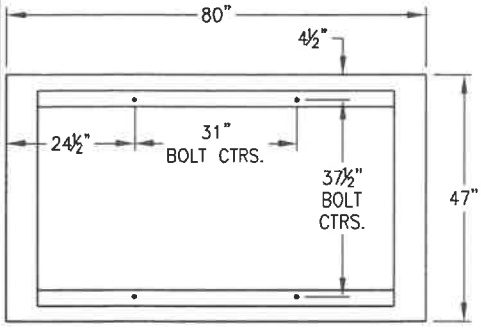
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised:

Standard Drawing No.

SD.21c

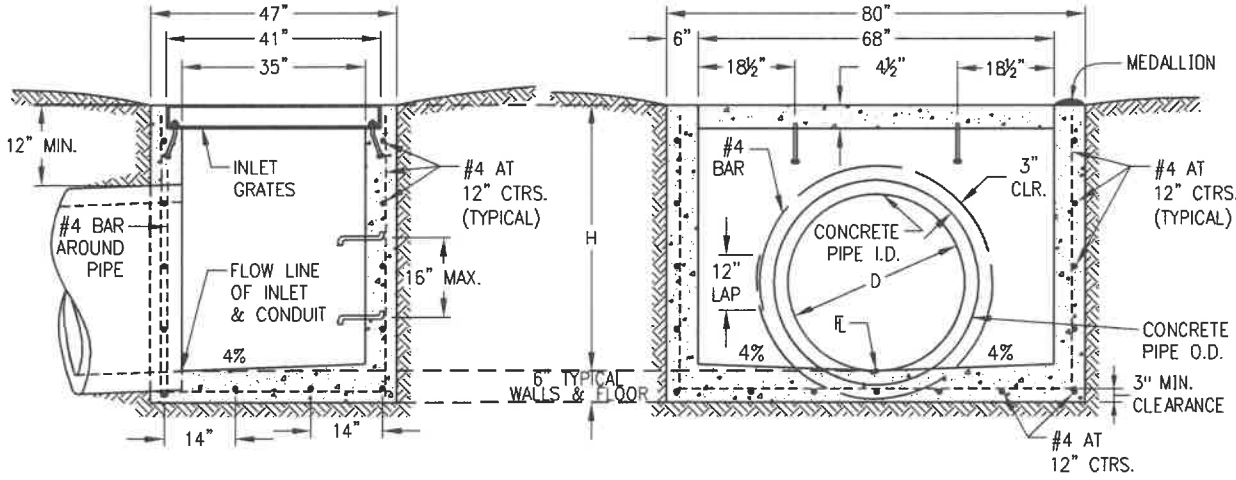


PLAN VIEW
(SHOWING ANCHOR BOLT LAYOUT)

OUTLET PIPE INSIDE DIA. IN. – "D"	MIN. "H" FT.
18	3.0
24	3.5
30	4.0
36	4.5
42	5.0

GENERAL NOTES

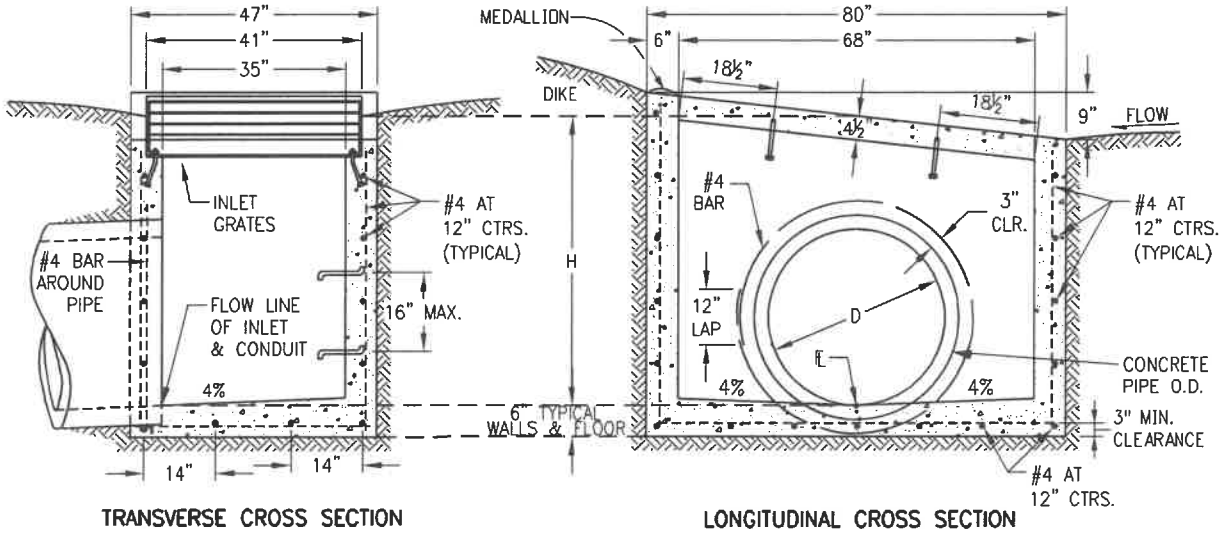
1. INLET TYPE D IS NOT HS-20 RATED AND SHALL NOT BE PLACED IN PAVED ROADWAYS. THIS INLET SHALL BE USED ONLY OUTSIDE PAVED ROADWAYS.
2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
3. SEE PLANS FOR SIZE AND LOCATION OF PIPE.
4. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
5. STANDARD INLET GRATES SHALL BE USED ON ALL TYPE D INLETS UNLESS CLOSE MESH GRATES ARE ACCEPTED BY THE CITY OF CASTLE PINES.
6. CLOSE MESH GRATES ARE RECOMMENDED WHERE FOOT TRAFFIC OR BICYCLE ROUTES ARE IN CLOSE PROXIMITY TO GRATE. THIS GRATE IS NOT ADA COMPLIANT OR BICYCLE FRIENDLY AND SHALL NOT BE PLACED DIRECTLY IN SIDEWALKS, CROSSWALKS OR BIKE PATHS.
7. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO CLEARANCE OR GREATER THAN 3 FEET-6 INCHES AND SHALL CONFORM WITH AASHTO M 199.
8. REINFORCING BARS SHALL BE GRADE 60, EPOXY COATED, AND DEFORMED #4, AND INLET WALL ALTERNATE SLOT AND HOLD DOWN PLATE DETAIL 12" CTRS. SHALL HAVE A 2 INCH MIN. CLEARANCE. CUT OR BEND BARS AROUND PIPE AS REQUIRED.
9. ALL INLETS SHALL HAVE A 4 INCH DIA. METAL MEDALLION WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE ON IT. THE MEDALLION SHALL HAVE A FISH SYMBOL WITH A BLUE BACKGROUND. IT SHALL BE FIRMLY ATTACHED TO THE INLET'S SURFACE WITH A PERMANENT FASTENER.



TRANSVERSE CROSS SECTION

LONGITUDINAL CROSS SECTION

LEVEL GRATE INSTALLATION



TRANSVERSE CROSS SECTION

LONGITUDINAL CROSS SECTION

SLOPING GRATE INSTALLATION

REFERENCE:

CDOT M & S STANDARDS
M-604-11

INLET - TYPE D

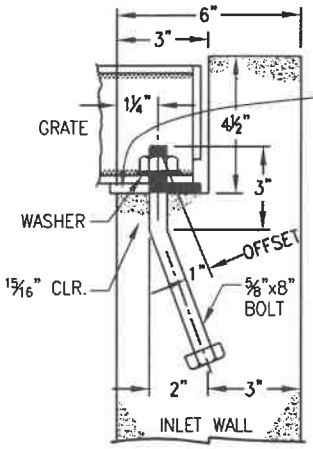
CITY OF
CASTLE PINES

Issued: 6/15/2022

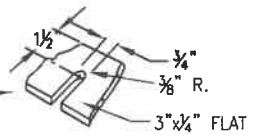
Revised: _____

Standard Drawing No.

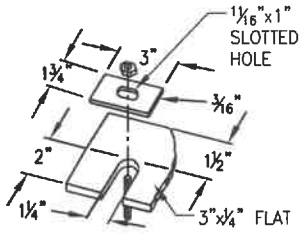
SD.22a



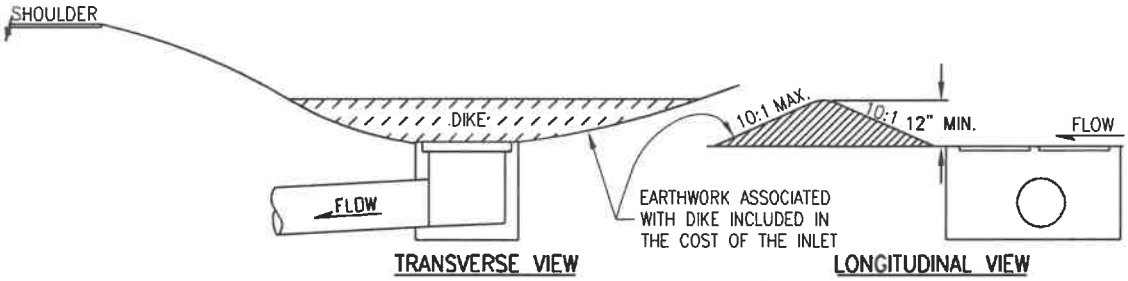
GRATE INSTALLATION DETAIL



SLOT DETAIL



ALTERNATE SLOT AND HOLD DOWN PLATE DETAIL



DIKE

QUANTITIES FOR ONE INLET

H FT.	CONCRETE CU. YD. ▽	STEEL LB. ▽	CIRCULAR PIPE RANGE INSIDE DIA., IN. – "D"
3.0	1.5	127	18
3.5	1.7	149	18–24
4.0	1.9	157	18–30
4.5	2.0	179	18–36
5.0	2.2	187	18–42
5.5	2.4	208	18–42
6.0	2.6	215	18–42
6.5	2.8	236	18–42
7.0	2.9	243	18–42
7.5	3.1	264	18–42
8.0	3.3	271	18–42
8.5	3.5	292	18–42
9.0	3.6	299	18–42
9.5	3.8	320	18–42
10.0	4.0	327	18–42

▽ CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

REFERENCE:

CDOT M & S STANDARDS
M-604-11

INLET - TYPE D

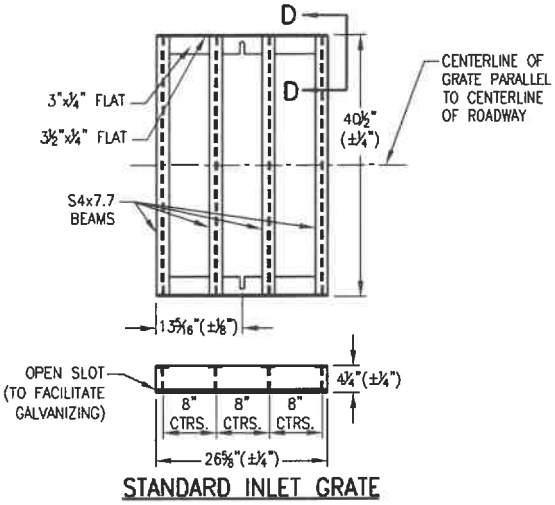
CITY OF CASTLE PINES

Issued: 6/15/2022

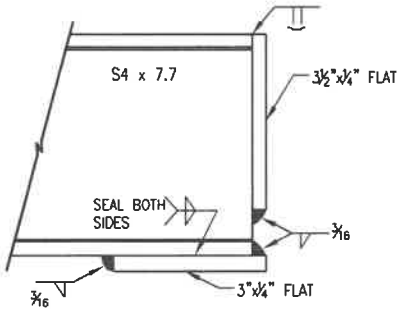
Revised: _____

Standard Drawing No.

SD.22b



STANDARD INLET GRATE

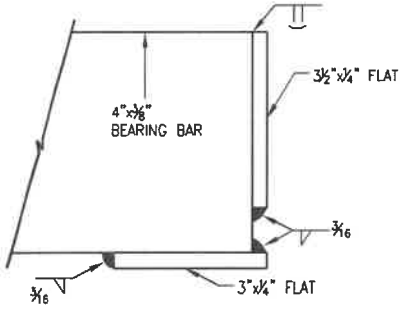


SECTION D–D

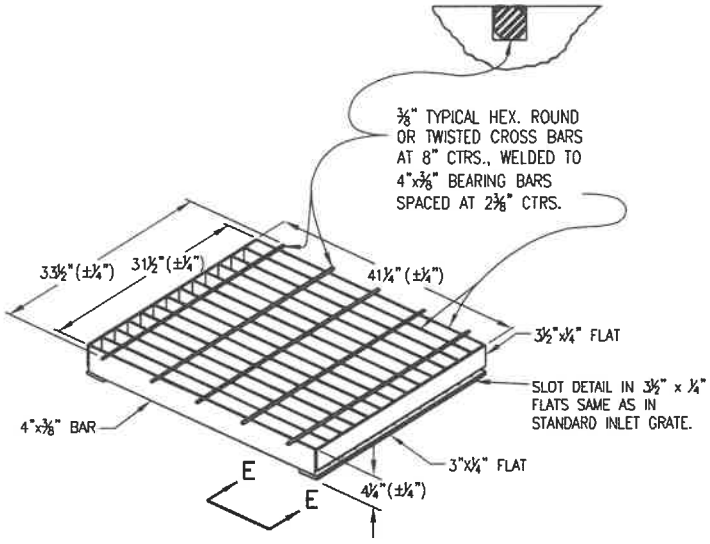
QUANTITIES: 2 STEEL GRATES PER INLET

NO. PIECES	DESCRIPTION	LENGTH	LB. PER FT.	WEIGHT (LBS.)
8	S4x7.7 BEAM	40"	7.70	206
4	3½"x¼" FLAT	26⅝"	2.98	26
4	3"x¼" FLAT	26⅝"	2.55	24

TOTAL 256 LBS.



SECTION E–E



CLOSE MESH GRATE

USE FOR PEDESTRIAN AND BICYCLE AREAS ONLY.

REFERENCE:

CDOT M & S STANDARDS
M-604-11

INLET - TYPE D

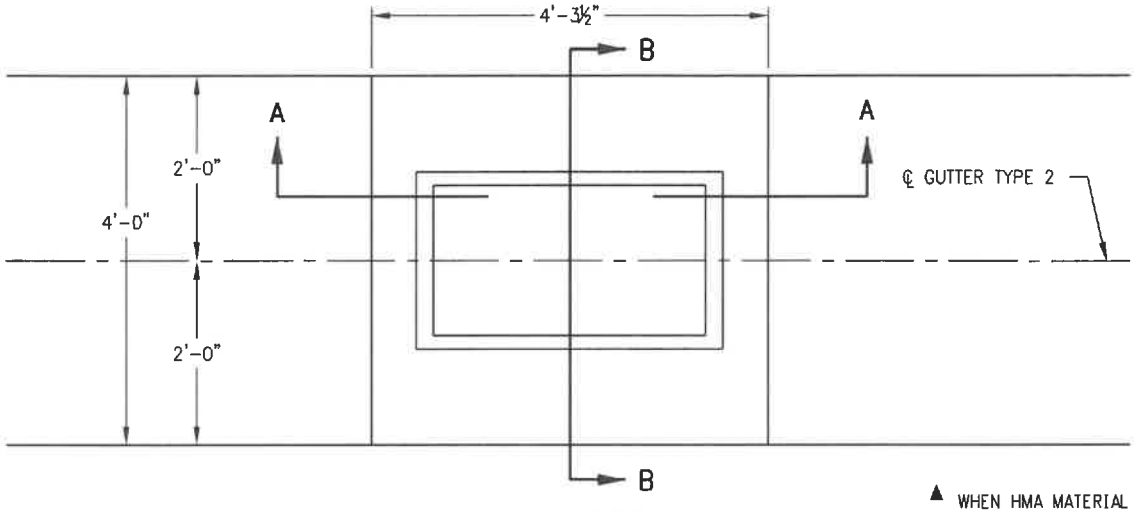
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

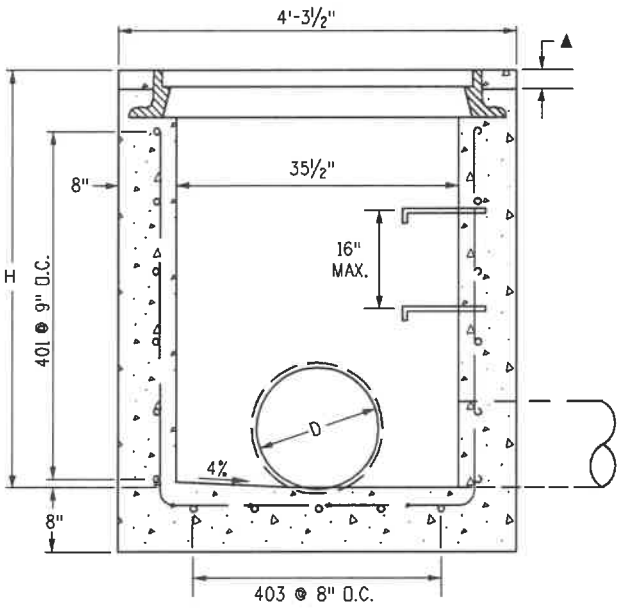
Standard Drawing No.

SD.22c

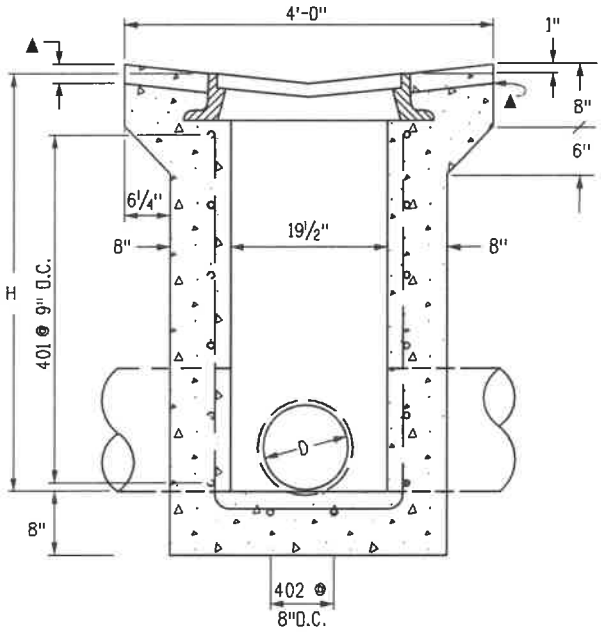


PLAN VIEW
TYPE 13 INLET FOR GUTTER TYPE 2

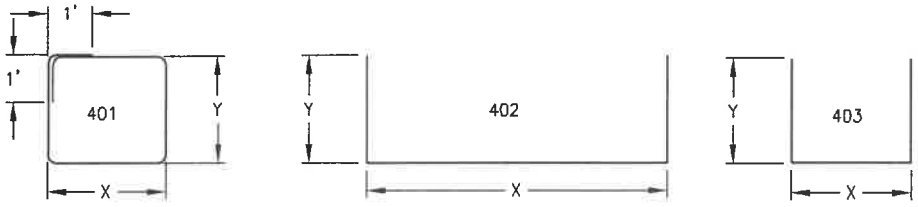
▲ WHEN HMA MATERIAL IS TO EXTEND TO THE EDGE OF THE GRATING FRAME, CONCRETE MAY BE DEPRESSED.



SECTION A–A
D MAX = 30" FOR H > 4 FT.



SECTION B–B
D MAX = 18" FOR ALL H

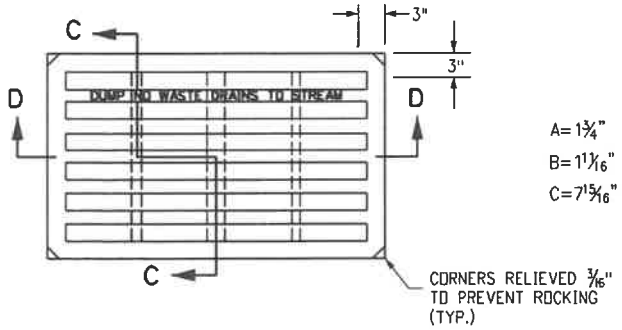


BENDING DIAGRAM
ALL DIMENSIONS ARE OUT-TO-OUT OF BAR.

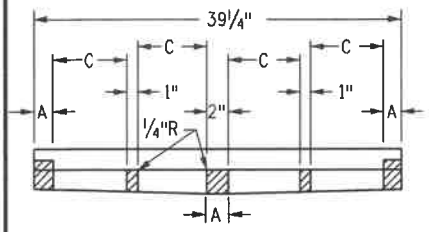
REFERENCE:	GRATED INLET TYPE 13	Issued: 6/15/2022
CDOT M & S STANDARDS M-604-13	CITY OF CASTLE PINES	Revised:
		Standard Drawing No. SD.23a

GENERAL NOTES

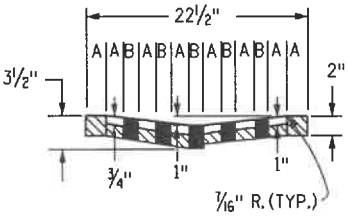
1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ OF A INCH.
4. REINFORCING BARS SHALL BE DEFORMED #4 AND SHALL HAVE A 2 INCH MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE GRADE 60 AND EPOXY COATED.
5. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FEET-6 INCHES AND SHALL CONFORM TO AASHTO AASHTO M 199.
6. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
7. STATION POINT IS AT THE CENTER OF THE INLET.
8. GRATE SHALL HAVE "DUMP NO WASTE DRAINS TO STREAM" MESSAGE CAST ON SURFACE.



NO. 13 GRATE



SECTION D-D



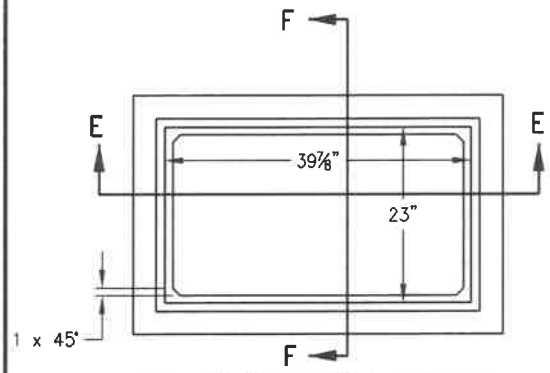
SECTION C-C

QUANTITIES

H	CONCRETE	REINFORCING STEEL	NO. OF 401 BARS REQ'D.	MAXIMUM PIPE I.D.	
				SEC. A-A	SEC. B-B
	CU. YD.	θ LB.		IN.	IN.
3'-0"	1.3	72	4	18	18
3'-6"	1.5	76	4	24	18
4'-0"	1.6	90	5	30	18
4'-6"	1.8	104	6	30	18
5'-0"	1.9	109	6	30	18
5'-6"	2.1	122	7	30	18
6'-0"	2.2	136	8	30	18
6'-6"	2.4	141	8	30	18
7'-0"	2.5	154	9	30	18
7'-6"	2.7	168	10	30	18
8'-0"	2.8	173	10	30	18
8'-6"	3.0	187	11	30	18
9'-0"	3.1	200	12	30	18
9'-6"	3.3	205	12	30	18
10'-0"	3.4	219	13	30	18

θ INCLUDES 1% FOR OVERRUN.

NOTE: CONCRETE QUANTITIES INCLUDE VOLUME OCCUPIED BY PIPE.

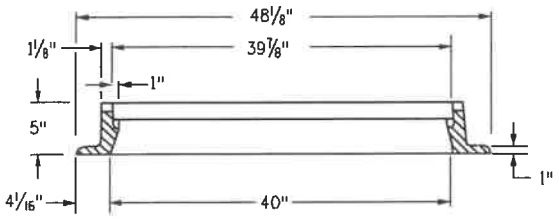


NO. 13 GRATING & FRAMES

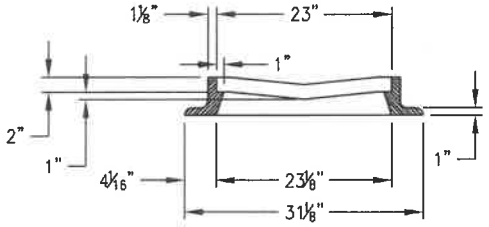
BAR LIST FOR H=3'-0"

MARK	NO. REQ'D.	DIMENSIONS		LENGTH
		X	Y	
401	4	3'-6"	2'-2"	13'-4"
402	2	3'-4½"	*2'-6½"	8'-5½"
403	5	2'-½"	*2'-7"	7'-2½"

*ADD 6 IN. TO THIS DIMENSION FOR EACH 6 IN. INCREASE OF "H" OVER 3 FT.-0 IN.



SECTION E-E
APPROX. WEIGHT 590 LBS.



SECTION F-F

REFERENCE:

CDOT M & S STANDARDS
M-604-13

GRATED INLET TYPE 13

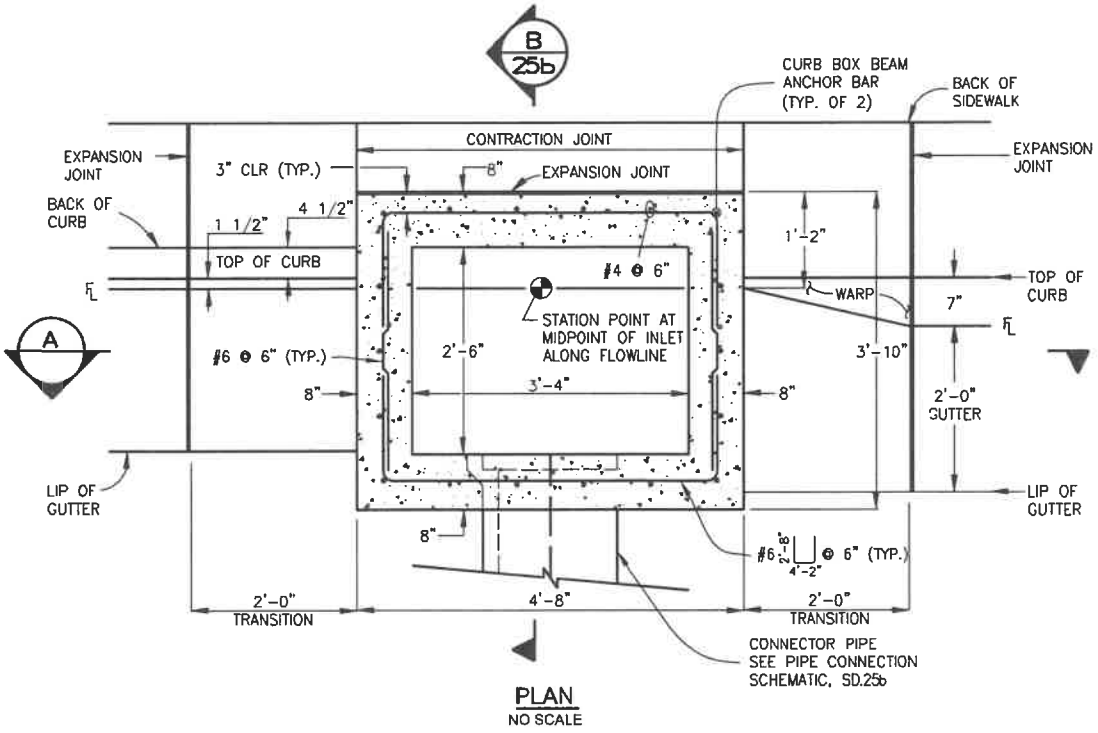
CITY OF CASTLE PINES

Issued: 6/15/2022

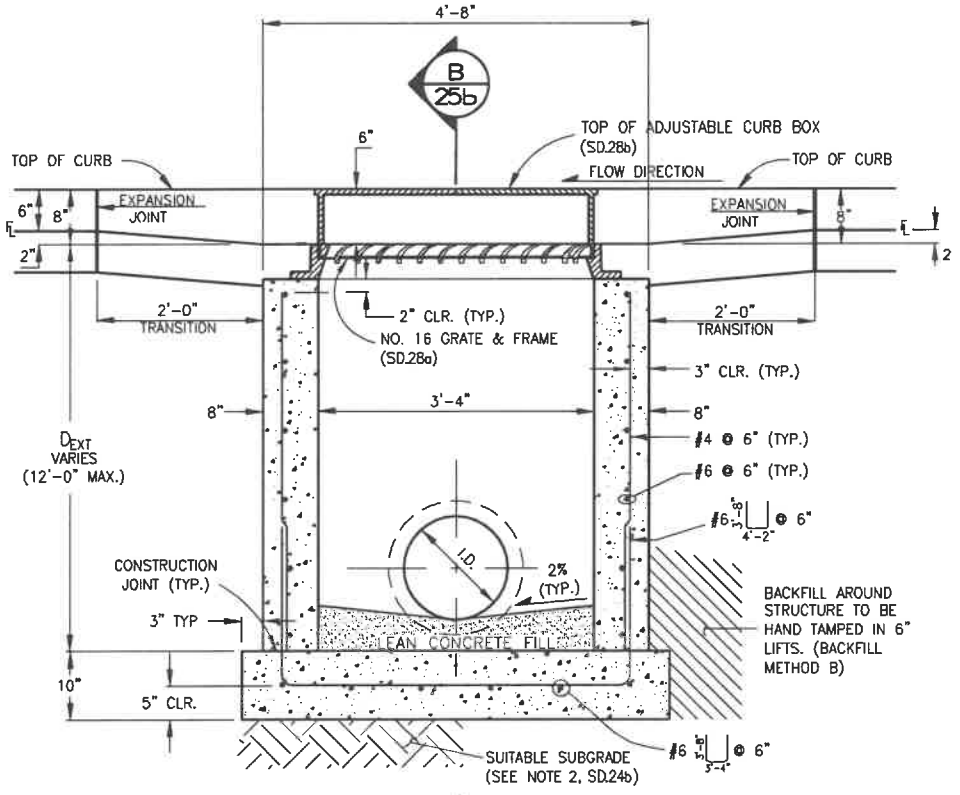
Revised: _____

Standard Drawing No.

SD.23b



PLAN
NO SCALE



A SECTION
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.1

DENVER TYPE 16 SINGLE NO. 16 INLET

CITY OF
CASTLE PINES

Issued: 6/15/2022

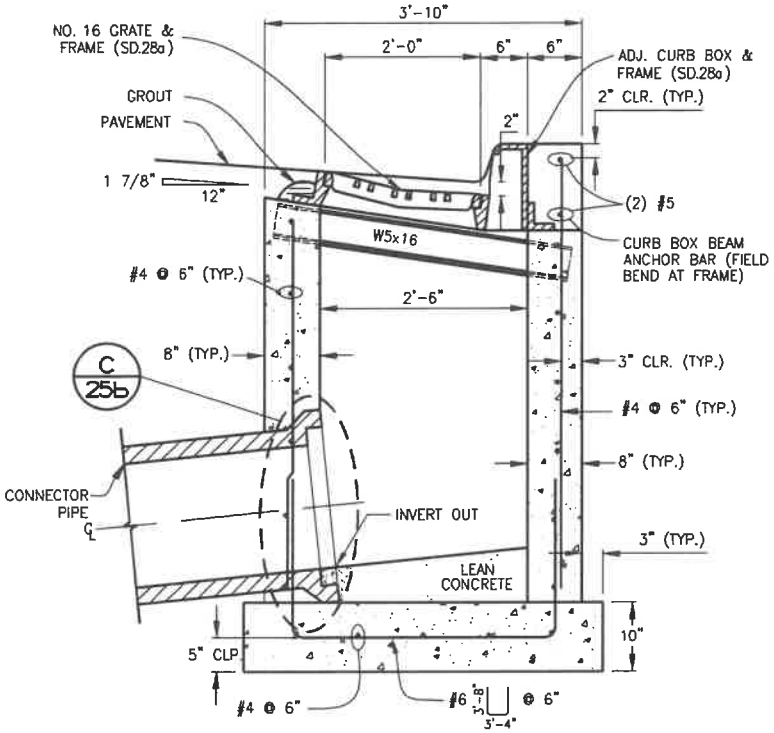
Revised: _____

Standard Drawing No.

SD.24a

SINGLE NUMBER 16 INLET NOTES

1. FOR PAYMENT PURPOSES, INLET STRUCTURES SHALL ALSO INCLUDE 2'-0" CURB & GUTTER TRANSITION SECTION AT EACH END OF INLET PLUS SIDEWALK SECTIONS WHERE REQUIRED BEHIND INLET STRUCTURE AND TRANSITION SECTIONS.
2. SUB-GRADE SHALL BE 6-12" OF CLASS B BEDDING COMPACTED PER THE CITY AND COUNTY OF DENVER DOTI STANDARD CONSTRUCTION SPECIFICATIONS, ON SUITABLE, UNDISTURBED MATERIAL. IF SUBGRADE IS UNSUITABLE, THE SUBGRADE SHALL BE OVEREXCAVATED AND STABILIZED WITH CLASS B BEDDING PER THE CITY AND COUNTY OF DENVER DOTI STANDARD CONSTRUCTION SPECIFICATIONS.
3. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
4. Sc = SLOPE OF CONNECTOR = 2% MIN.
5. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL NO. 16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE CAST IRON CURB BOX (STANDARD DETAIL SD.28a AND SD.28b).
6. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 12'-0" (MAX.). FOR INLETS MORE THAN 12'-0" FEET IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
7. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER.
8. ALL SHALL CONFORM TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION, 2017.
9. NO FORMWORK SHALL WORK REMAIN INSIDE STRUCTURE WHEN COMPLETE.
10. CONCRETE MIX FOR GUTTER AND ANY ADDED STREET PANELS SHALL MEET CLASS 2 REQUIREMENTS FOR SULFATE RESISTANCE IN ACCORDANCE WITH CDOT STANDARD 601.04 ON STREETS WHERE MAGNESIUM CHLORIDE CHEMICAL DEICERS ARE APPLIED. REFER TO DOTI STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11 FOR REQUIREMENTS FOR SULFATE RESISTANCE IN CONCRETE EXPOSED TO EARTH.
11. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
12. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
13. LEAN CONCRETE FILL TO BE F'C = 2000 PSI. INLET STRUCTURE, LID, STREET CURB AND GUTTER, AND PAVEMENT TO BE F'C = 4,500 PSI, MAX W/CM = 0.45 AND AIR ENTRAINED 5% TO 8%. F'C = 28 DAY COMPRESSIVE STRENGTH REQUIREMENT FOR MIX DESIGN, FIELD ACCEPTANCE.
14. FOR THROUGH STRUCTURES, BENCHES MUST COME TO TOP OF PIPE.
15. NO CORNER PENETRATIONS ON STRUCTURE.
16. SEE DOTI STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11.04 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAIL WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.
17. SEE (STANDARD DETAIL SD.25a AND SD.25b) FOR REBAR PLACEMENT AT WALL PENETRATION DETAIL.
18. REFER TO "CITY OF CASTLE PINES ROADWAY AND CONSTRUCTION STANDARDS" FOR ADJACENT ROADWAY AND SIDEWALK DESIGN CRITERIA.



B SECTION (TYPICAL, ALL SIZES)
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.1

DENVER TYPE 16 SINGLE NO. 16 INLET

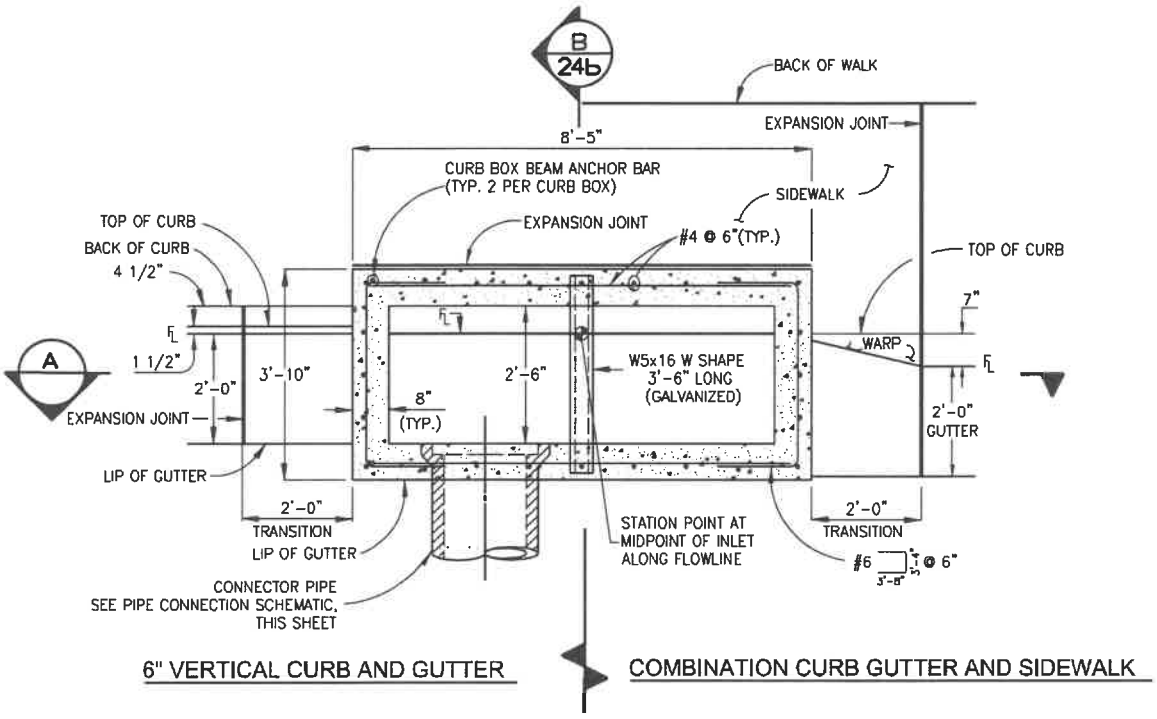
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

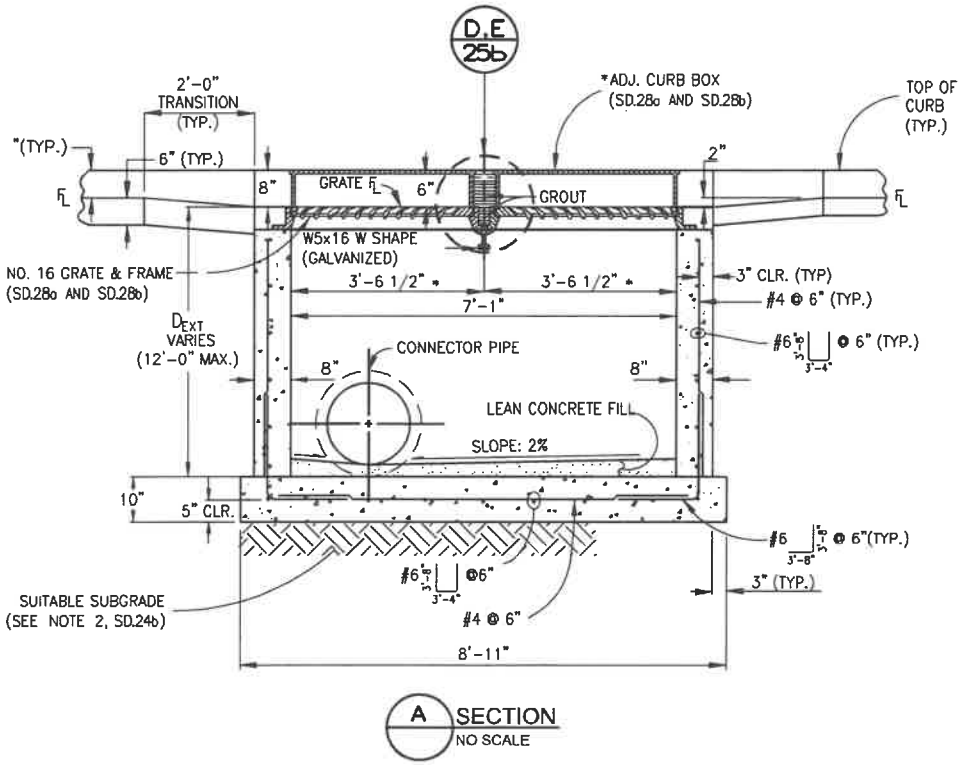
SD.24b



6" VERTICAL CURB AND GUTTER

COMBINATION CURB GUTTER AND SIDEWALK

PLAN
NO SCALE



A SECTION
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.2

DENVER TYPE 16
DOUBLE NO. 16 INLET

CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

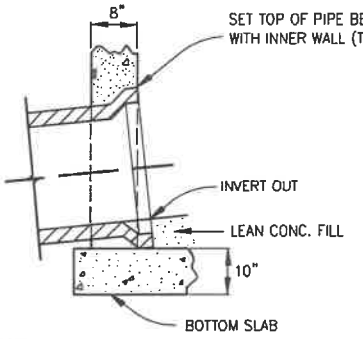
Standard Drawing No.

SD.25a

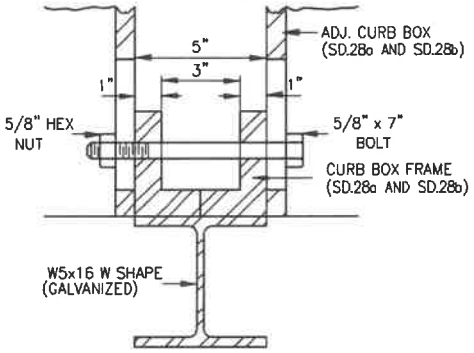
DOUBLE NUMBER 16 INLET NOTES

1. SEE DETAIL SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAIL WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.
2. SEE GENERAL NOTES ON STANDARD DETAIL SD.24a AND SD.24b.
3. EXPANSION JOINT MATERIAL SHALL BE PLACED FULL DEPTH OF THE CURB AND GUTTER, SIDEWALK, CONCRETE PAVEMENT, AS APPLICABLE. THE TOP PORTION OF THE JOINT SHALL BE SEALED WITH SILICONE SEALANT.
4. SEE STANDARD DETAIL SD.24a AND SD.24b FOR REBAR PLACEMENT AT WALL PENETRATION DETAIL.

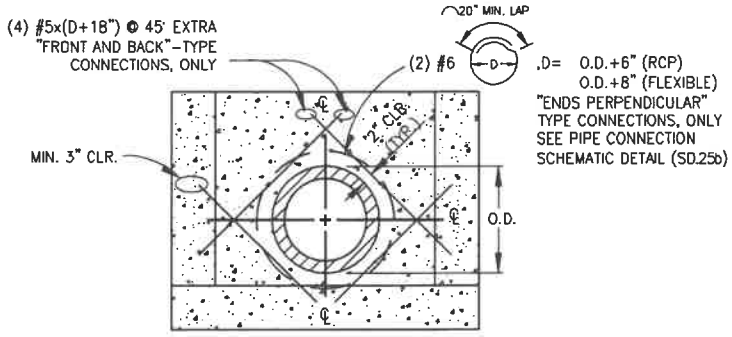
* STANDARD DETAIL SD.28a AND SD.28b APPLIES TO ALL OF THE GRATE & FRAME GEOMETRIC DIMENSIONS FOR THE DOUBLE NUMBER 16 INLET EXCEPT FOR THE FRAME LENGTH. FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT ON THIS SHEET.



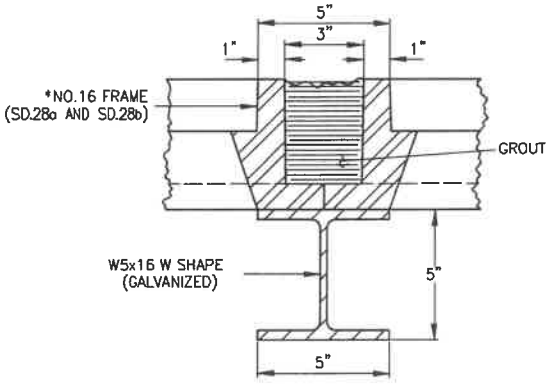
C DETAIL - CONNECTOR OUTLET
NO SCALE



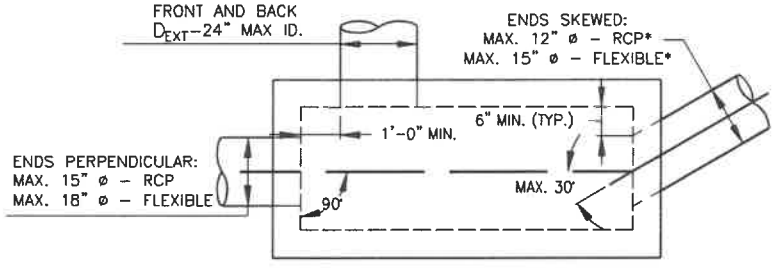
D DETAIL - PLACEMENT OF ADJ. CURB BOX ON SUPPORT RAIL (TYP.)
NO SCALE



DETAIL - REBAR PLACEMENT AROUND CONNECTOR PIPE
NO SCALE



E DETAIL - FRAME PLACEMENT ON SUPPORT RAIL (TYP.)
NO SCALE



*ANGLED CONNECTIONS REQUIRE CITY APPROVAL.

PIPE CONNECTION SCHEMATIC (NO. 16 INLET)
THIS DIAGRAM IS PROVIDED FOR GENERAL GUIDANCE ONLY. THE DESIGNER IS RESPONSIBLE FOR VERIFYING PROJECT SPECIFIC GEOMETRY.

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.2

DENVER TYPE 16 DOUBLE NO. 16 INLET

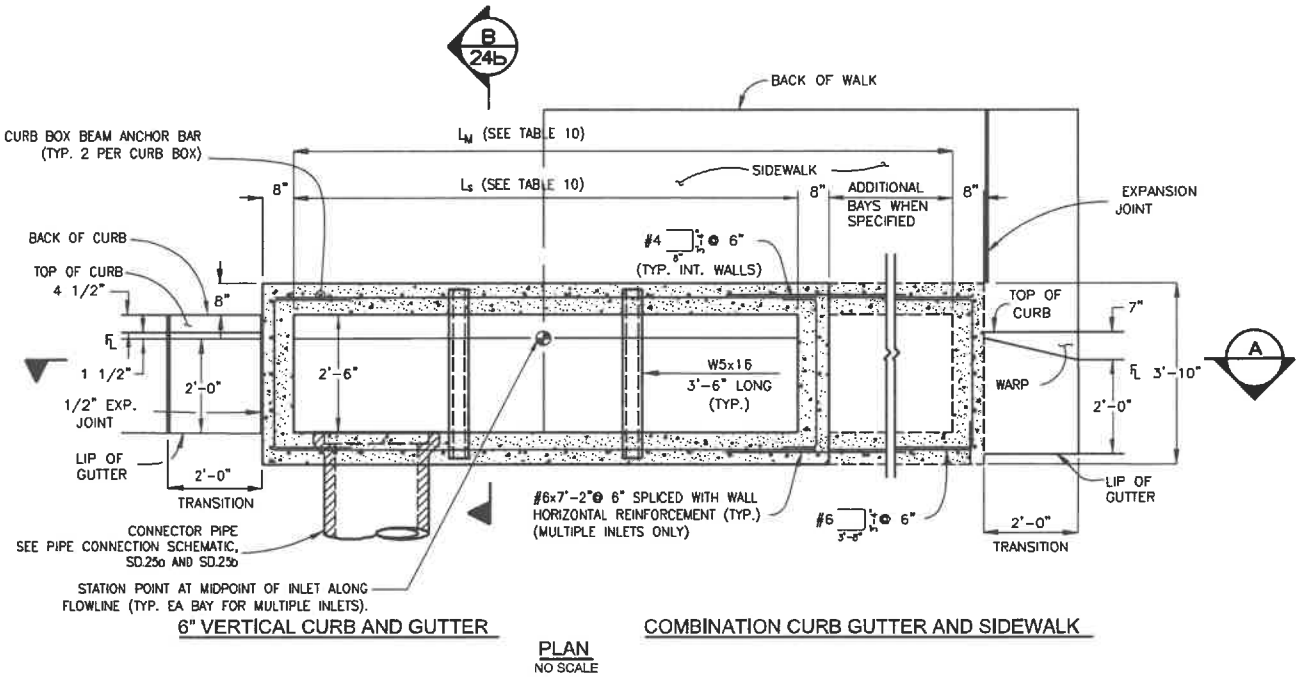
CITY OF CASTLE PINES

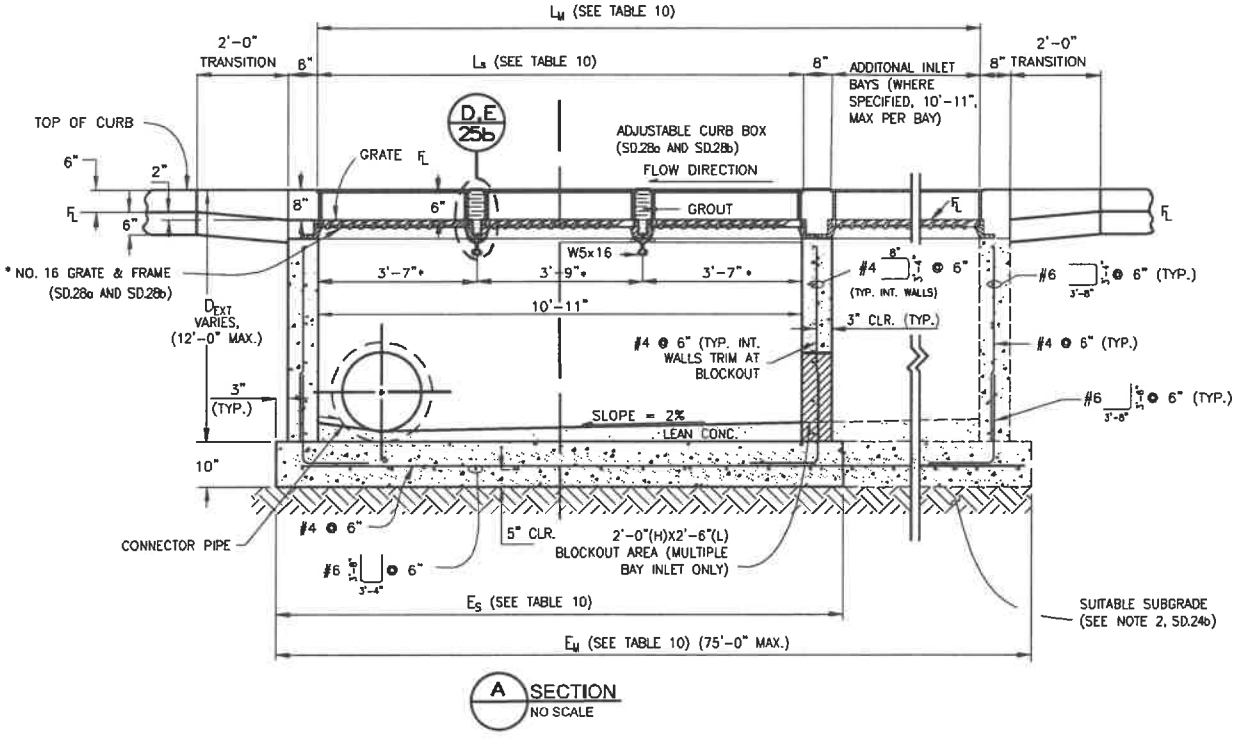
Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.25b





REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.3

DENVER TYPE 16
TRIPLE NO. 16 INLET

CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

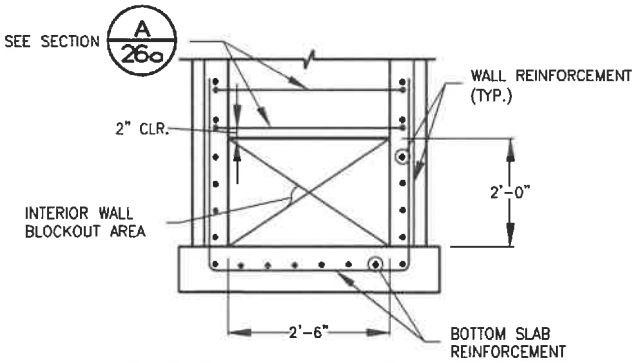
Standard Drawing No.

SD.26a

TRIPLE NUMBER 16 INLET NOTES

1. SEE WCPM STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAIL WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.
2. SEE GENERAL NOTES ON STANDARD DETAIL SD.24a AND SD.24b.
3. EXPANSION JOINT MATERIAL SHALL BE PLACED FULL DEPTH OF THE CURB AND GUTTER, SIDEWALK, CONCRETE PAVEMENT, AS APPLICABLE. THE TOP PORTION OF THE JOINT SHALL BE SEALED WITH SILICONE SEALANT.
4. SEE STANDARD DETAIL SD.25a AND SD.25b FOR REBAR PLACEMENT AROUND CONNECTOR PIPE.

* STANDARD DETAIL SD.28a AND SD.28b APPLIES TO ALL OF THE GRATE & FRAME GEOMETRIC DIMENSIONS FOR THE TRIPLE NUMBER 16 INLET EXCEPT FOR THE FRAME LENGTH. FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT ON THIS SHEET.



DETAIL - TYPICAL INTERIOR WALL BLOCK-OUT
NO SCALE

TABLE 10. NO. 16 TOTAL INLET LENGTH

INLET CONFIGURATION	L_a OR L_M INLET LENGTH	■ E_S OR E_M TOTAL BOTTOM SLAB LENGTH
TRIPLE NO. 16	10'-11"	12'-9"
NO. 16 3-3-2 (EXAMPLE CONFIGURATION)	10'-11", 10'-11", 7'-1"	32'-1"
NO. 16 __-__-__ (CONFIGURATION TEMPLATE)	L_a, L_a, L_a	=3"+8"+L_a+8"+L_a+8"+L_a+8"+3"

■MAX. BOTTOM SLAB LENGTH = 75'-0"

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.3

DENVER TYPE 16 TRIPLE NO. 16 INLET

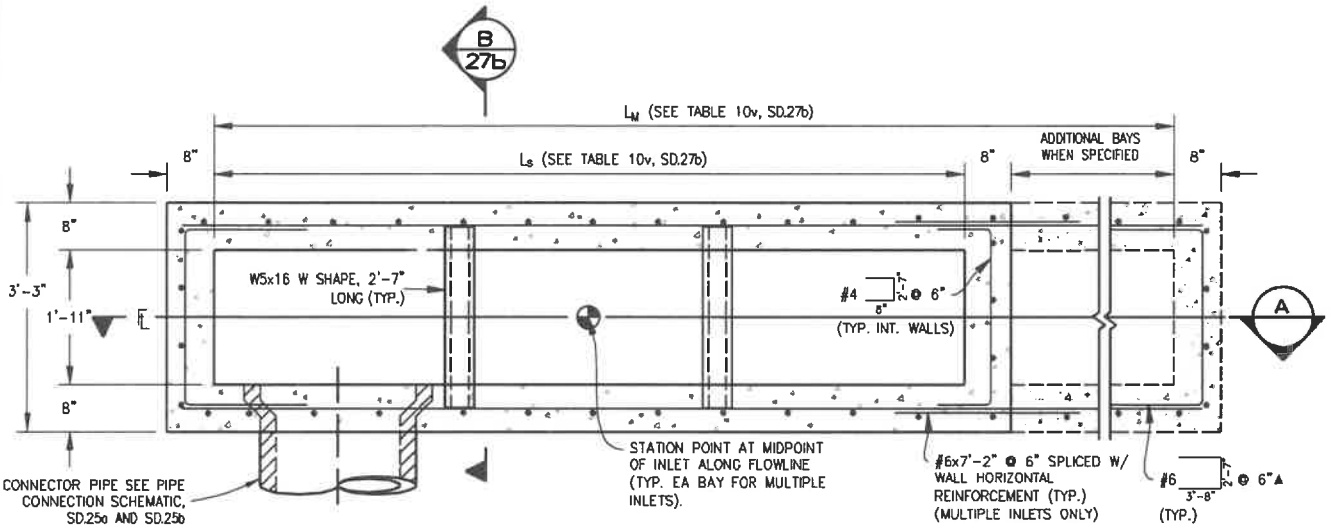
CITY OF CASTLE PINES

Issued: 6/15/2022

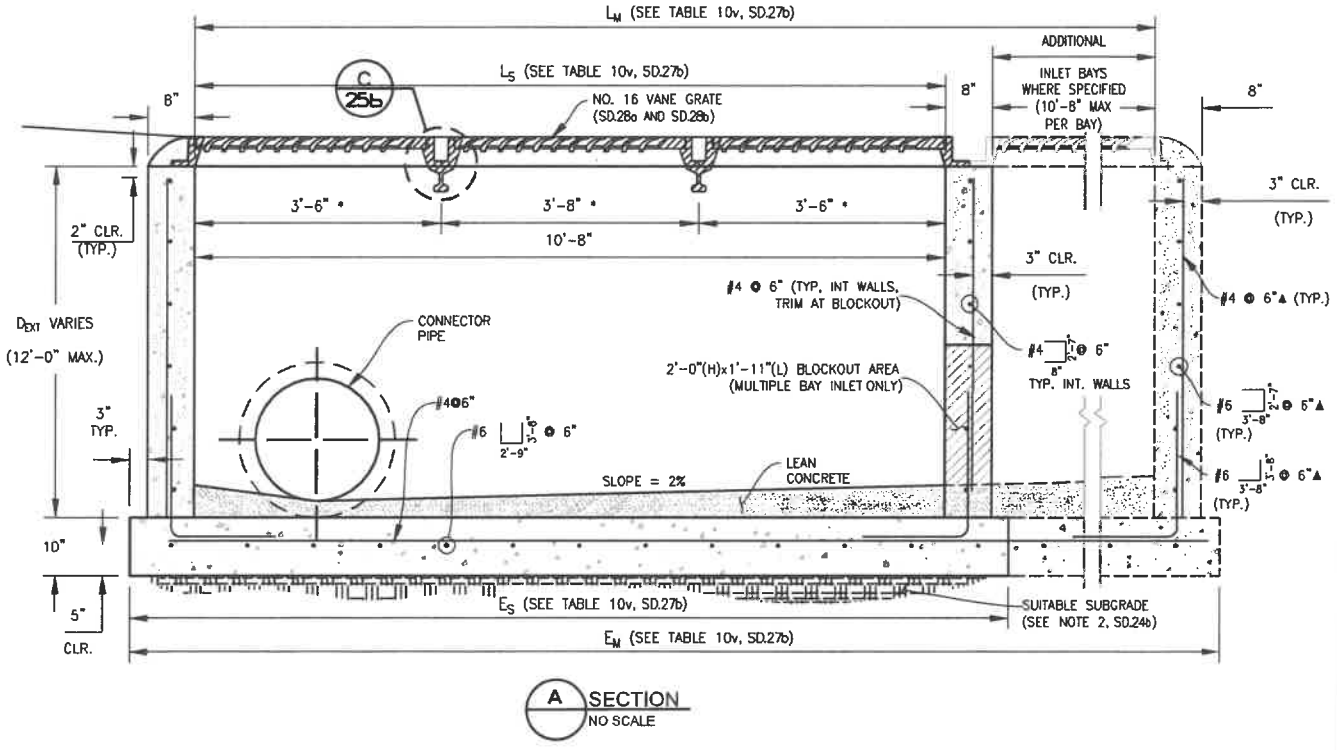
Revised: _____

Standard Drawing No.

SD.26b



PLAN
NO SCALE



A SECTION
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616V

DENVER TYPE 16 SINGLE, DOUBLE & TRIPLE NO. 16 INLET VALLEY

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.27a

TABLE 10v. NO. 16 VALLEY TOTAL INLET LENGTH		
INLET CONFIGURATION	L_S OR L_M INLET LENGTH	■E_S OR E_M TOTAL BOTTOM SLAB LENGTH
TRIPLE NO. 16 VALLEY	10'-8"	12'-6"
NO. 16 VALLEY 3-3-2 (EXAMPLE CONFIGURATION)	10'-8", 10'-8", 7'-0"	31'-6"
NO. 16 VALLEY __-__-__ (CONFIGURATION TEMPLATE)	L_a, L_a, L_a	=3"+8"+L_a+8"+L_a+8"+L_a+8"+3"

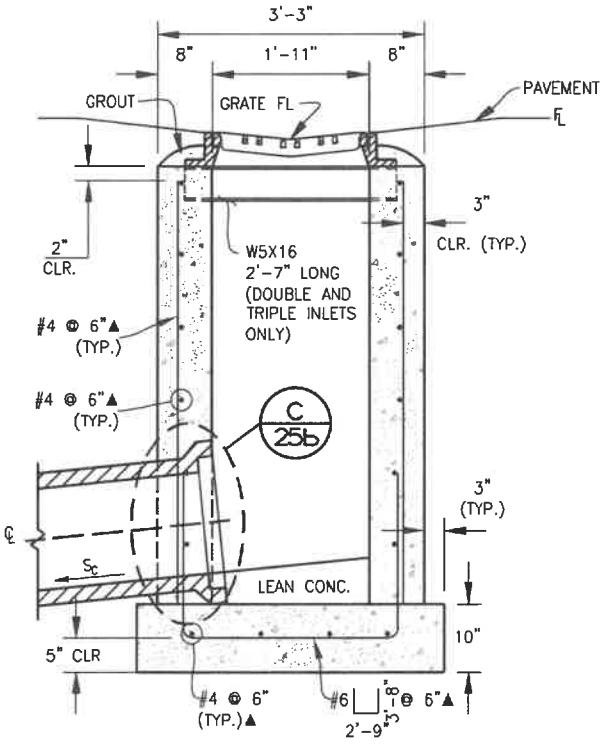
■MAX. BOTTOM SLAB LENGTH = 75'-0"

NUMBER VALLEY 16 INLET NOTES

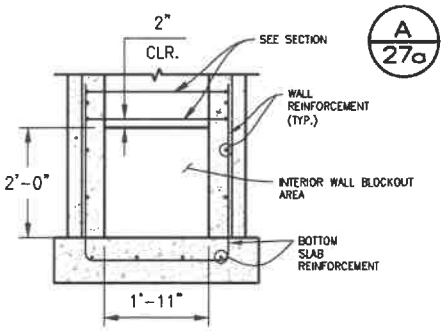
1. SEE WCPM STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAILS WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.
2. SEE GENERAL NOTES ON STANDARD DETAIL SD.24a AND SD.24b.
3. SEE STANDARD DETAIL SD.28a AND SD.28b FOR FRAME AND GRATE DETAILS.
4. SEE STANDARD DETAIL SD.24a AND SD.24b FOR ADDITIONAL STRUCTURE AND BACKFILL NOTES.

* STANDARD DETAIL SD.28a AND SD.28b APPLIES TO ALL OF THE GRATE AND FRAME GEOMETRIC DIMENSIONS FOR THE NUMBER 16 VALLEY INLET EXCEPT FOR THE FRAME LENGTH, FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT ON THIS SHEET.

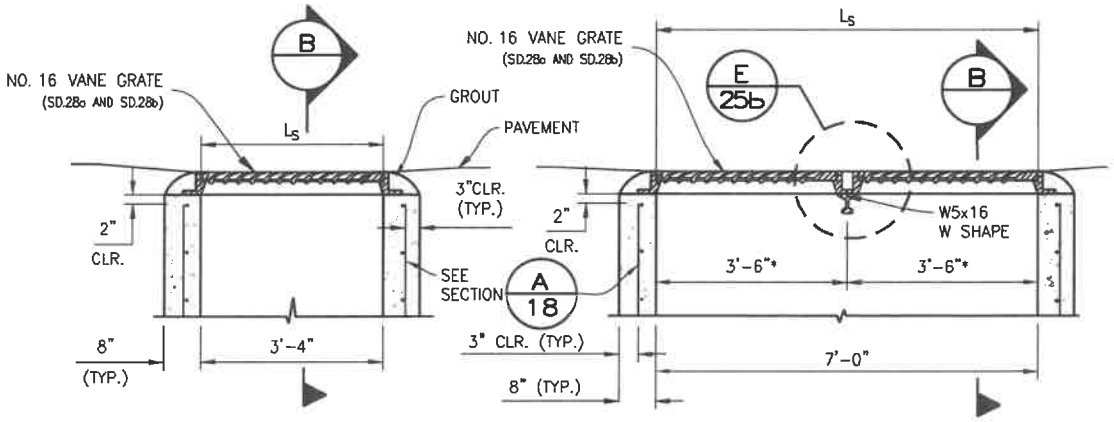
▲ REINFORCEMENT ALSO APPLICABLE TO SINGLE AND DOUBLE NO. 16 VALLEY INLETS.



B SECTION
NO SCALE



DETAIL-TYPICAL INTERIOR WALL BLOCK-OUT
NO SCALE



SINGLE NO. 16 VALLEY INLET
NO SCALE

DOUBLE NO. 16 VALLEY INLET
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616V

DENVER TYPE 16 SINGLE, DOUBLE & TRIPLE NO. 16 INLET VALLEY

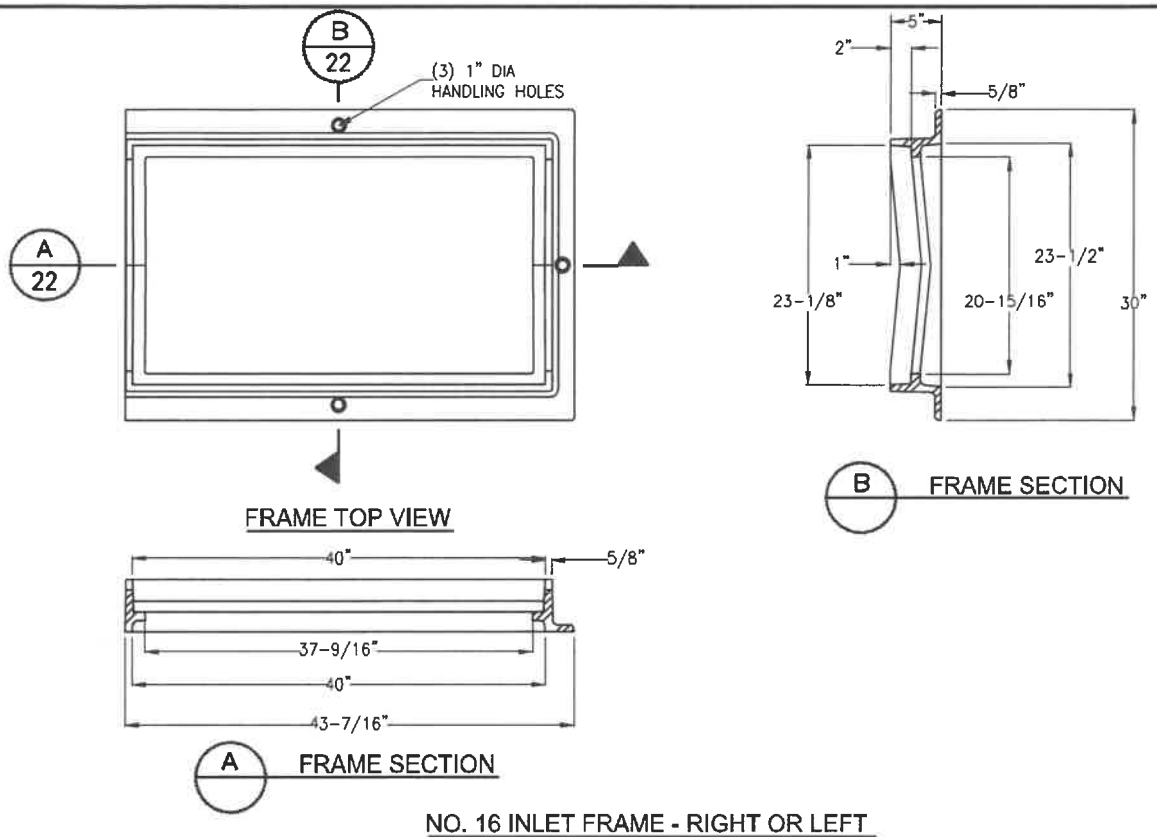
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

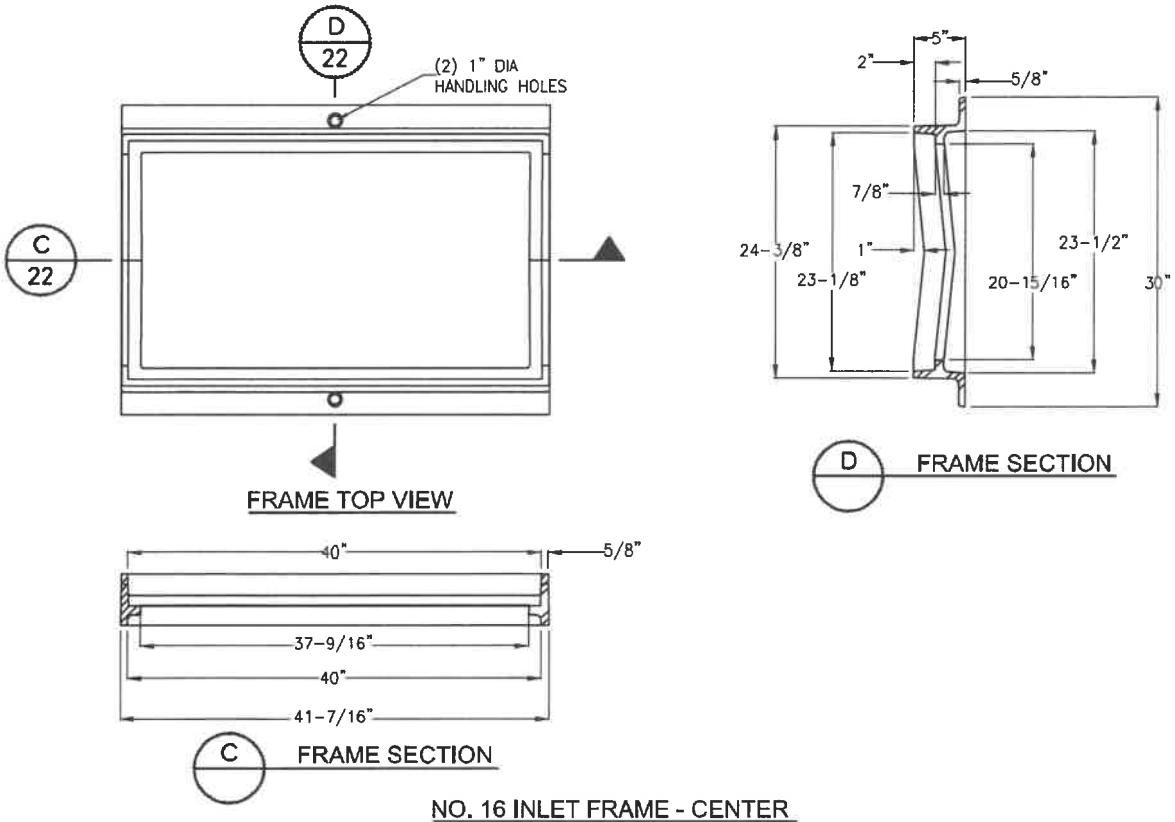
Standard Drawing No.

SD.27b



NO. 16 INLET FRAME - RIGHT OR LEFT

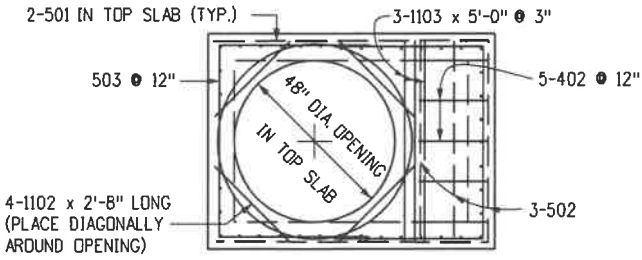
NO SCALE



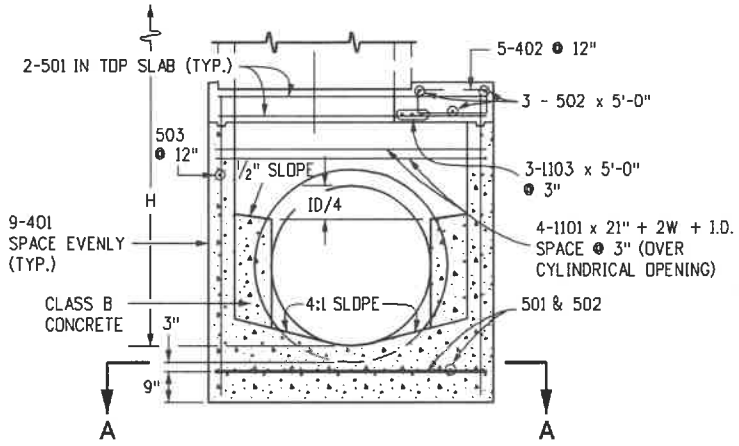
NO. 16 INLET FRAME - CENTER

NO SCALE

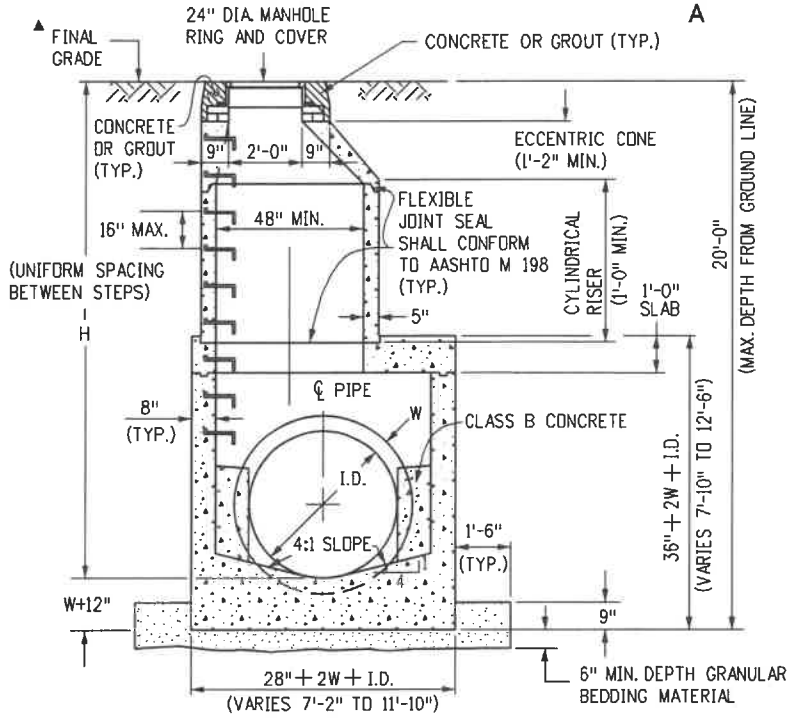
REFERENCE: CITY AND COUNTY OF DENVER DRAWING NUMBER S-716	DENVER GRATE & FRAME AND ADJUSTABLE CURB BOX CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.28a**



TOP SLAB PLAN



SECTION



SECTION

▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER 1/4" MIN. TO 1/2" MAX.

MANHOLE BOX BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

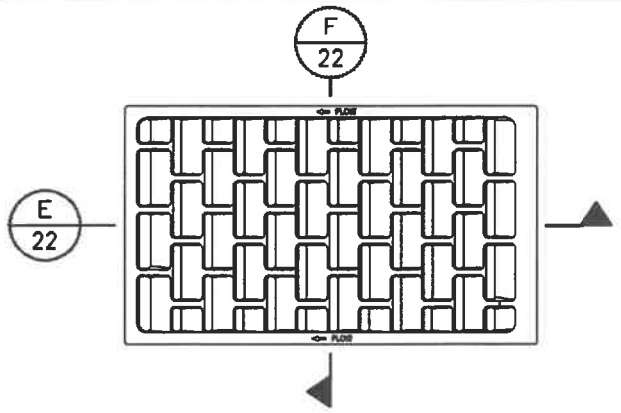
CITY OF CASTLE PINES

Issued: 6/15/2022

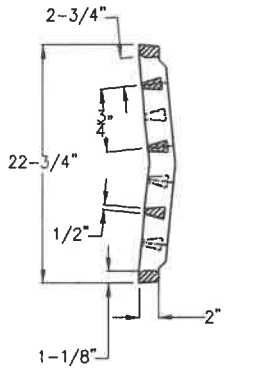
Revised:

Standard Drawing No.

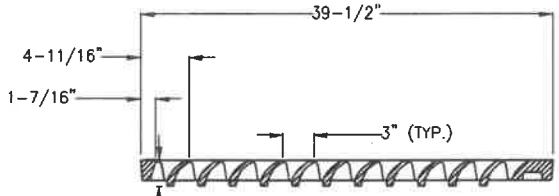
SD.29a



GRATE TOP VIEW



F GRATE SECTION

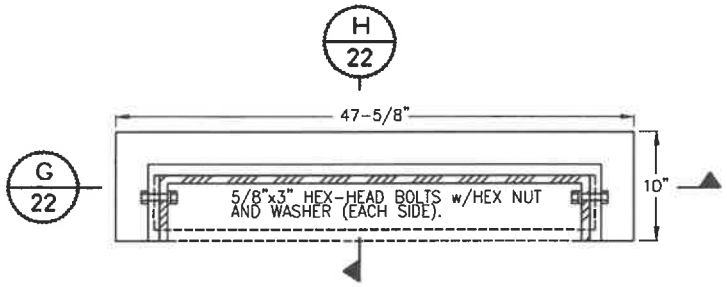


E GRATE SECTION

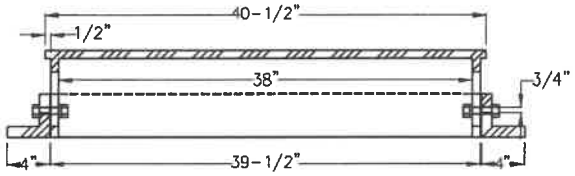
GRATE & FRAME NOTES

1. CAST IRON SHALL CONFORM TO ASTM A48. (CLASS 35B, MINIMUM)
2. CASTINGS SHALL COMPLY WITH FEDERAL SPECIFICATION RR-F-621D FOR CASTING PROOF LOADING (HEAVY DUTY).
3. ALL CASTINGS REQUIRE INDIVIDUAL APPROVAL/CERTIFICATION FROM THIS DIVISION.
4. CASTINGS SHALL NOT BE DIPPED OR PAINTED PRIOR TO FINAL INSPECTION, ONCE INDIVIDUAL CASTINGS ARE CHECKED, AND APPROVED BY THE DIVISION FOR PROJECT USAGE, THEY SHALL BE COATED WITH AN APPROVED MATERIAL.

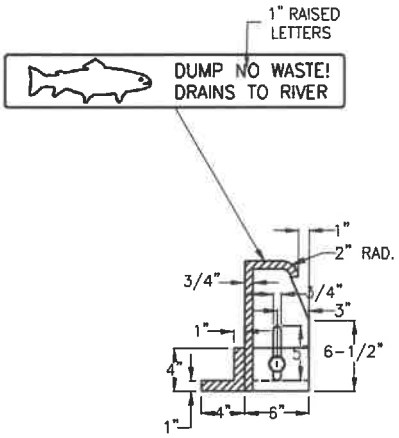
NO. 16 INLET GRATE
NO SCALE



PLAN



G SECTION



H SECTION

ADJUSTABLE CURB BOX
(MINIMUM CURB OPENING AREA = 150 In2)
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-716

DENVER GRATE & FRAME AND ADJUSTABLE CURB BOX

CITY OF
CASTLE PINES

Issued: 6/15/2022

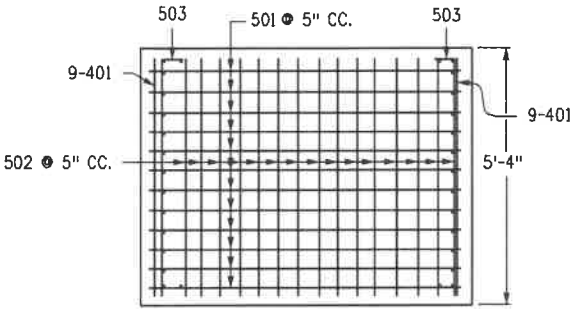
Revised: _____

Standard Drawing No.

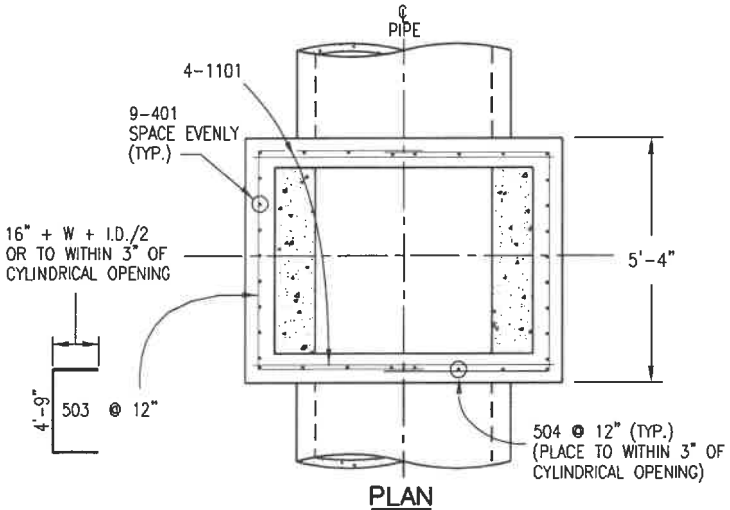
SD.28b

GENERAL NOTES

1. SINCE ALL PIPE ENTRIES INTO THE BASE ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK.
2. THE PRECAST FLAT TOP MAY BE USED ON ANY MANHOLE. THE ECCENTRIC CONE MAY BE USED WHEN THE MANHOLE "H" HEIGHT IS AT LEAST 8 FT.
3. THE MANHOLE RING FRAME SHALL BE SET IN A BED OF GROUT. THE FRAME SHALL BE SURROUNDED WITH A CEMENT GROUT IN UNPAVED AREA, OR A CONCRETE COLLAR IN PAVED AREA. SEE DETAILS ON STANDARD DETAIL SD.29e.
4. DESIGN OF BOX BASE IS BASED ON STRAIGHT RUNS OF PIPE OR CHANGE IN DIRECTION OF LESS THAN 45°. SPECIAL DESIGN IS REQUIRED FOR 45° OR GREATER.
5. PRECAST MANHOLES AND REINFORCEMENT SHALL CONFORM TO AASHTO M 199 (ASTM C 478).
6. CAST-IN-PLACE MANHOLES SHALL BE CLASS B CONCRETE.
7. STEPS SHALL BE REQUIRED WHEN THE MANHOLE DEPTH EXCEEDS 3 FT.-6 IN. AND SHALL CONFORM TO AASHTO M 199.
8. ALL REINFORCING STEEL SHALL BE GRADE 60 AND EPOXY COATED. VERTICAL STEEL SHALL BE PLACED AT CENTERLINE OF WALL. ALL BARS SHALL HAVE A 2 IN. MINIMUM CLEARANCE.
9. ALL PIPE ENTRIES INTO THE BASE OF MANHOLE SHALL BE CONNECTED BY OPEN CHANNELIZATION ADJUSTED FOR PIPE SIZE, SHAPE, SLOPE, AND DIRECTION OF FLOW. DETAILS SHOWN ARE TYPICAL FOR INSTALLATIONS WITH ALL INVERTS OF SAME RELATIVE ELEVATION. FOR EXCESSIVE ELEVATION DIFFERENCE BETWEEN INVERTS, SPECIAL BASE/CHANNEL DETAILS WILL BE SHOWN ON THE PLANS.
10. FLOW CHANNELS AND INVERTS SHALL BE FORMED BY SHAPING WITH CLASS B CONCRETE OR APPROVED GROUT.
11. STUB-OUTS SHALL EXTEND 2 FT. MINIMUM BEYOND OUTSIDE WALL SURFACE OF MANHOLE AND BE SATISFACTORILY PLUGGED.
12. THE SLOPE OF THE MANHOLE COVER SHALL MATCH THE ROADWAY PROFILE AND CROSS SLOPE.



SECTION A-A
(STEEL IN BOTTOM OF BASE)



PLAN

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

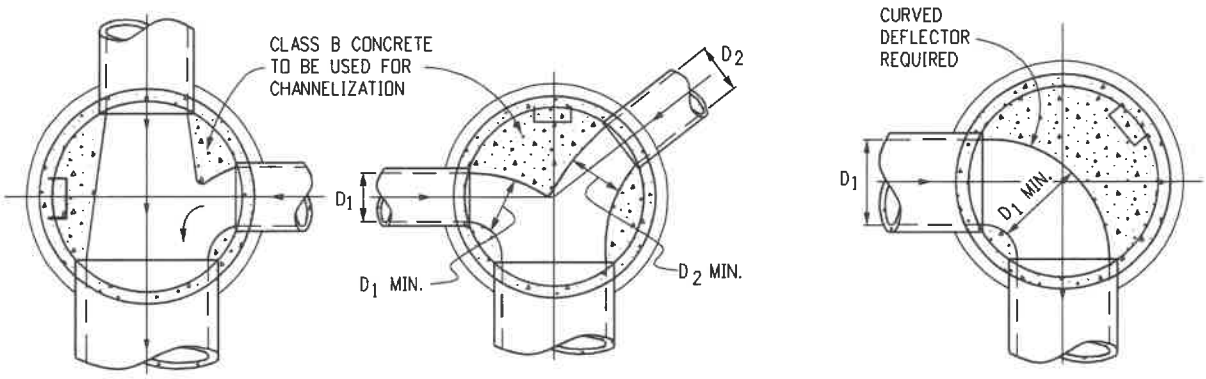
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.29b



THROUGH PIPE ONE LATERAL

ANGLED LATERALS

SHARP ANGLE

TYPICAL CHANNELIZATION DETAILS

MARK	SIZE	TYPE	WT. #/FT.	BARS	I.D. 54"	60"	66"	72"	84"	96"	FORMULAS
401	4	I	0.668	NO. REQ'D.	18	18	18	18	18	18	401 BAR LENGTH = 32" + 2W + I.D.
				LENGTH	8'-1"	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	
				WEIGHT *	97.2	104.2	111.2	118.2	132.3	146.3	
402	4	III	0.668	NO. REQ'D.	5	5	5	5	5	5	402 BAR LENGTH = I.D. + 2W
				LENGTH	5'-5"	6'-0"	6'-7"	7'-2"	8'-4"	9'-6"	
				WEIGHT *	18.1	20.0	22.0	23.9	27.8	31.7	
501	5	I	1.043	NO. REQ'D.	17	17	17	17	17	17	501 BAR LENGTH = 24" + I.D. + 2W
				LENGTH	7'-5"	8'-0"	8'-7"	9'-2"	10'-4"	11'-6"	
				WEIGHT *	131.5	141.8	152.2	162.5	183.2	203.9	
502	5	I	1.043	NO. REQ'D.	22	23	25	26	29	32	502 NUMBER BARS REQ'D. = $3 + \left(\frac{24+I.D.+2W}{@\ 5"} + 1\right)$
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	
				WEIGHT *	114.7	119.9	130.4	135.6	151.2	166.9	
503	5	II	1.043	NO. REQ'D.	16	16	18	18	20	24	503 NUMBER BARS REQ'D. = $2\left(\frac{13+I.D.+2W}{@\ 12"} + 1\right)$ BAR LENGTH = 4'-9"+2(16+W+I.D./2)
				LENGTH	12'-10"	13'-5"	14'-0"	14'-7"	15'-9"	16'-11"	
				WEIGHT *	214.2	223.9	262.8	273.8	328.5	423.5	
504	5	I	1.043	NO. REQ'D.	12	14	14	16	18	20	504 NUMBER BARS REQ'D. = $2\left(\frac{2W+I.D.-4}{@\ 12"} + 1\right)$ BAR LENGTH = 32"+2W+I.D.
				LENGTH	8'-1"	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	
				WEIGHT *	101.2	126.6	135.1	164.1	206.5	253.8	
1101	11	I	5.313	NO. REQ'D.	4	4	4	4	4	4	1101 BAR LENGTH = 21" + I.D. + 2W
				LENGTH	7'-2"	7'-9"	8'-4"	8'-11"	10'-1"	11'-3"	
				WEIGHT *	152.3	164.7	177.1	189.5	214.3	239.1	
1102	11	I	5.313	NO. REQ'D.	4	4	4	4	4	4	BENDING TYPE I — STRAIGHT
				LENGTH	2'-8"	2'-8"	2'-8"	2'-8"	2'-8"	2'-8"	
				WEIGHT *	56.7	56.7	56.7	56.7	56.7	56.7	
1103	11	I	5.313	NO. REQ'D.	3	3	3	3	3	3	TYPE II — 4'-9", 16"+W+I.D./2
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	
				WEIGHT *	79.7	79.7	79.7	79.7	79.7	79.7	
REINFORCING STEEL TOTAL *					965.6	1,037.5	1,127.2	1,204.0	1,380.2	1,601.6	TYPE III — 12", 12", 7", I.D.+2W-38"
CONCRETE - CUBIC YARDS - TOTAL					6.0	6.6	7.3	8.0	9.5	11.1	

NOTE: QUANTITIES ARE BASED ON SAME SIZE PIPE ENTRANCE TO AND EXIT FROM, BASE AND A 4 FT. MANHOLE ENTRANCE INTO TOP SLAB OF BASE.

QUANTITIES FOR CONCRETE MANHOLE BOX BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.29c

LEGEND

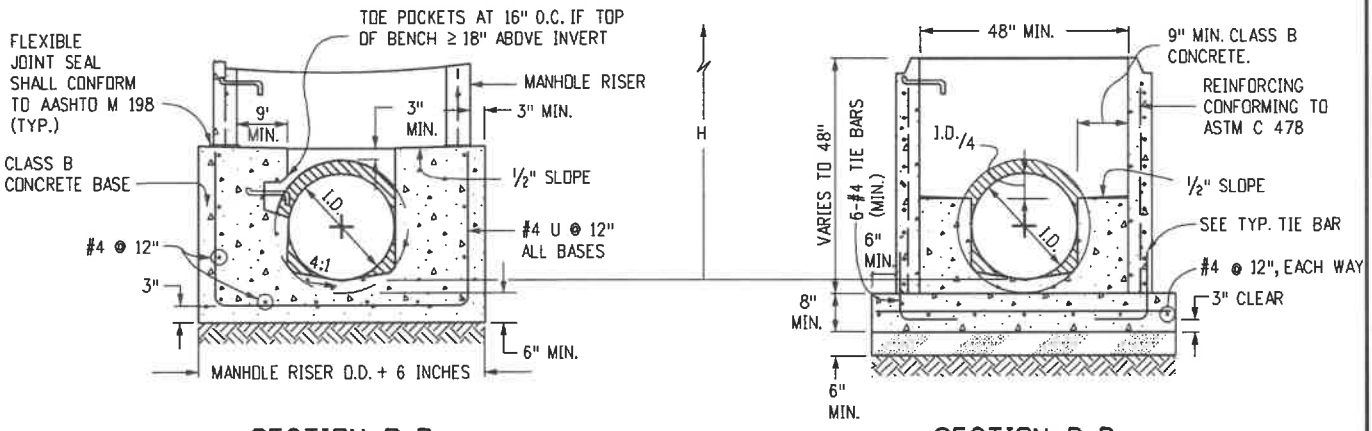
SUITABLE SUBGRADE

GRANULAR BEDDING MATERIAL

CONCRETE

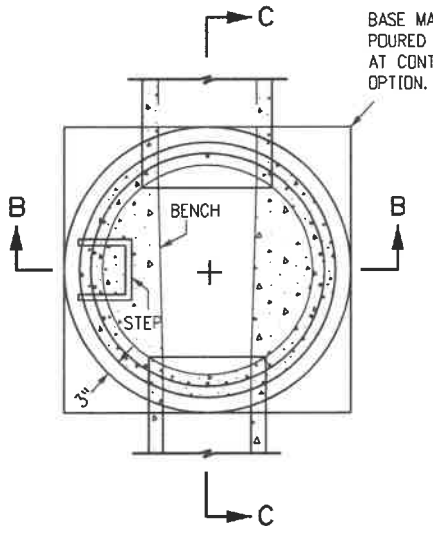
PRECAST MANHOLE BASES NOTES:

1. THE BASE SLAB SHALL BE POURED MONOLITHICALLY WITH BOTTOM RISER SECTION.
2. PRECAST MANHOLE BASES SHALL FIT THE CONDITIONS AND LOCATIONS FOR WHICH THEY ARE INTENDED WITHOUT ANY FIELD MODIFICATIONS. ANY MANHOLE BASE WHICH REQUIRES FIELD CUTTING OR MODIFICATION IN ORDER TO FIT THE LOCATIONS INTENDED WILL BE REJECTED BY THE ENGINEER AND REMOVED AND REPLACED BY THE CONTRACTOR AT NO COST TO THE DEPARTMENT.
3. PRECAST MANHOLE BASES SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SHOWN ABOVE.

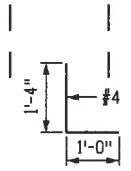


SECTION B-B

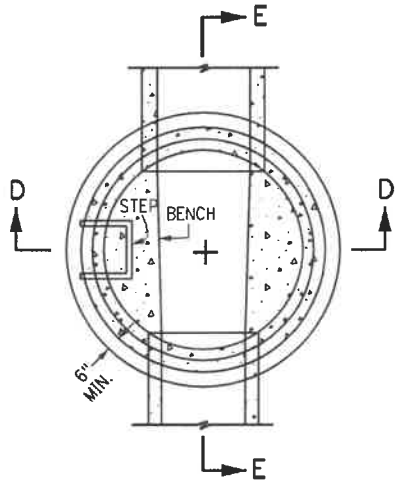
SECTION D-D



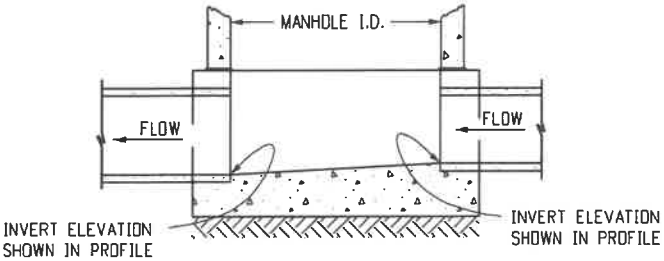
PLAN



TYPICAL TIE BAR

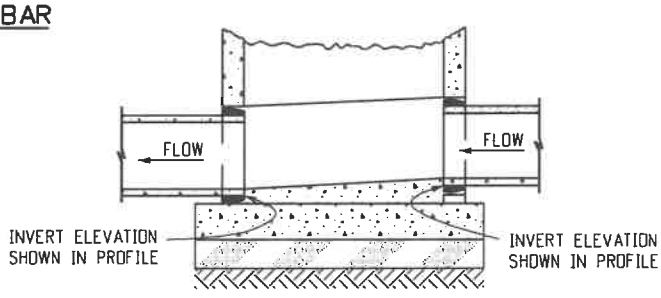


PLAN



SECTION C-C

CAST-IN-PLACE SLAB BASE



SECTION E-E

PRECAST SLAB BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

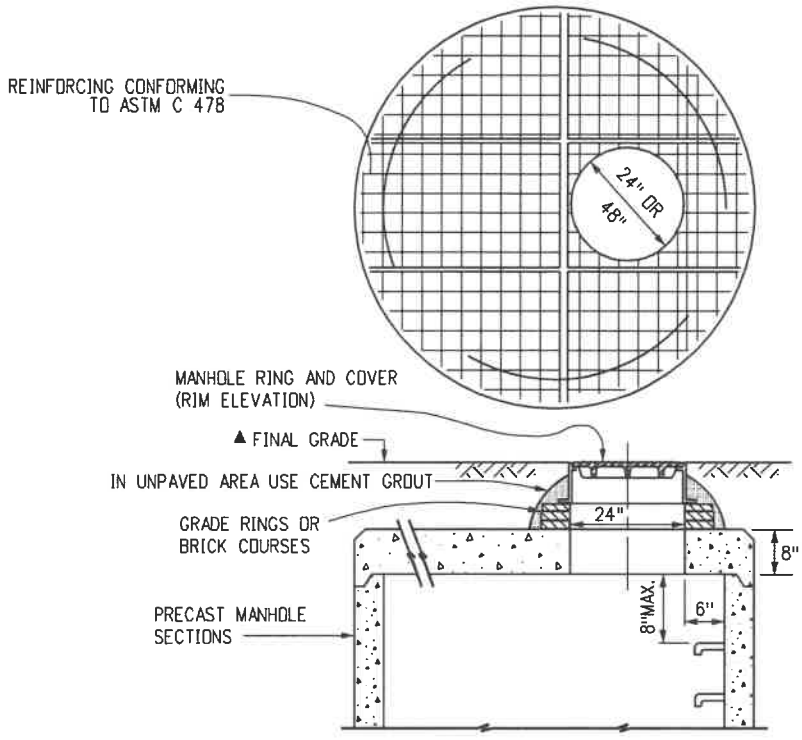
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

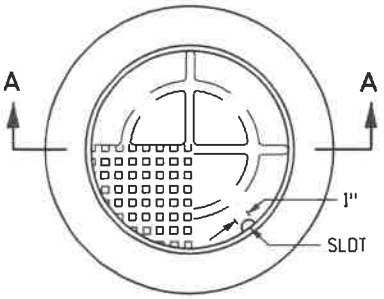
Standard Drawing No.

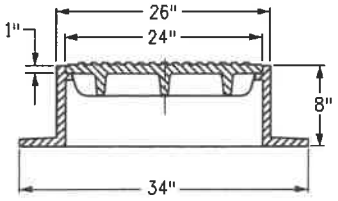
SD.29d



FLAT TOP SECTION DETAIL

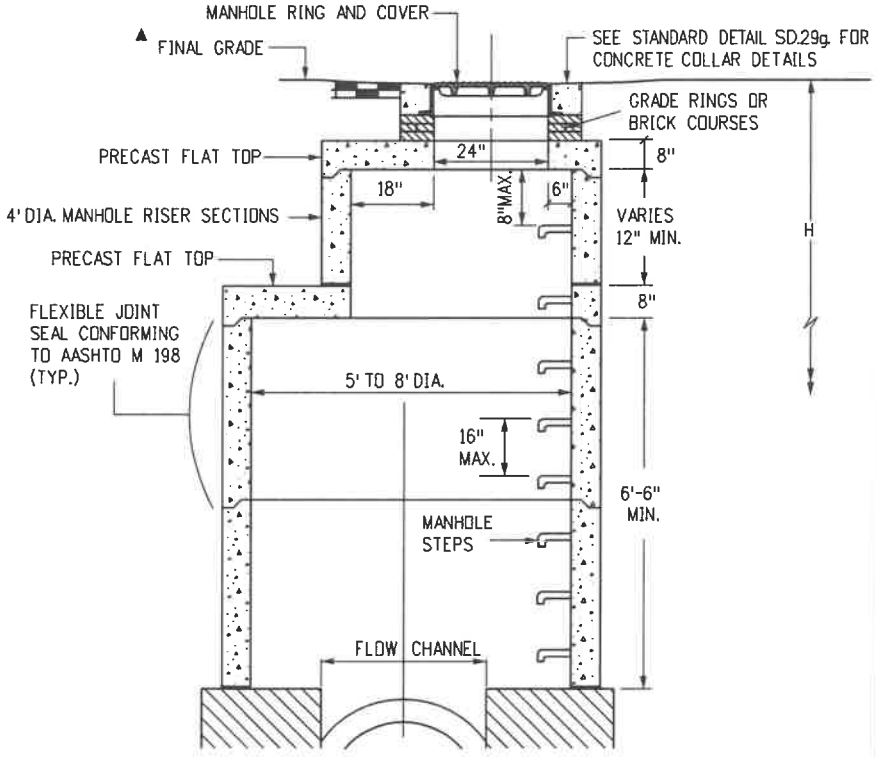
▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER 1/4" MIN. TO 1/2" MAX.





TOTAL WEIGHT: APPROXIMATELY 400 LBS. SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH CDOT SUBSECTION 712.06.

SECTION A-A
MANHOLE RING AND COVER



MANHOLE RISER DETAIL

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

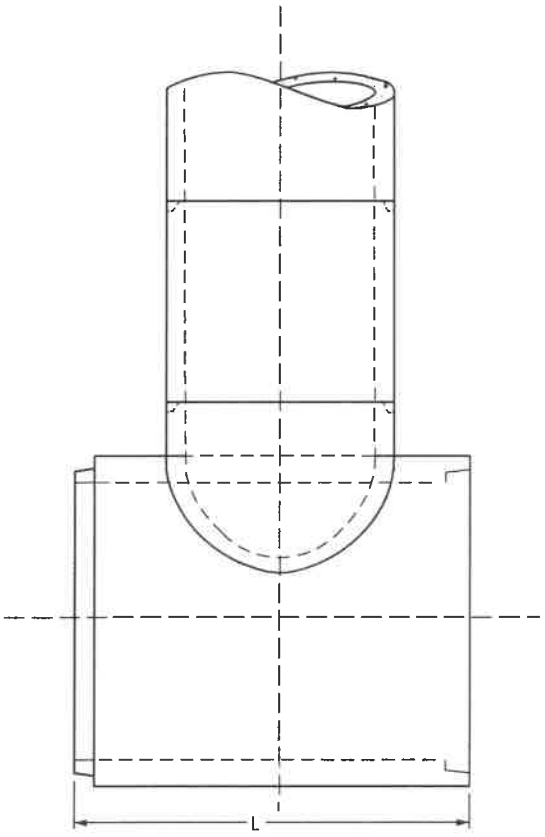
Standard Drawing No.

SD.29e

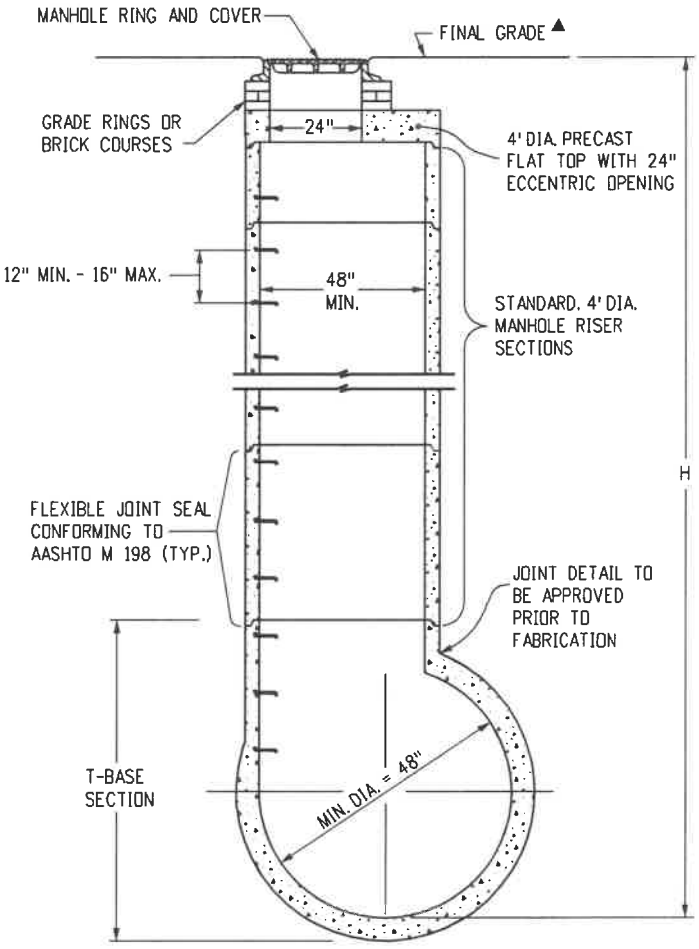
T-BASE MANHOLES NOTES:

1. THE T-BASE SECTION SHALL BE SHOP-FABRICATED FOR DELIVERY TO THE CONSTRUCTION SITE AS A COMPLETE UNIT.
2. THESE DETAILS SHOW ONLY THE CONCEPTUAL AND STANDARD DIMENSIONAL REQUIREMENTS FOR TYPE T-BASE MANHOLES. THE CONTRACTOR SHALL FURNISH DETAILED SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION. THE DETAILS SHOWN HEREIN APPLY ONLY TO 48 IN. AND GREATER DIAMETER PIPES.
3. EXCEPT FOR CLASS OF PIPE, SPECIFICATIONS FOR THE MANHOLE SHALL BE THE SAME AS THOSE REQUIRED FOR THE ADJOINING PIPE.
4. THE T-BASE SECTION SHALL MAINTAIN ITS INTERNAL SHAPE AND FLOW AREA. GROUTING OR FILLING SHALL BE APPLIED SO AS TO NOT DISTURB THE NORMAL FLOW OR REDUCE THE AREA.

▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER 1/4" MIN. TO 1/2" MAX.



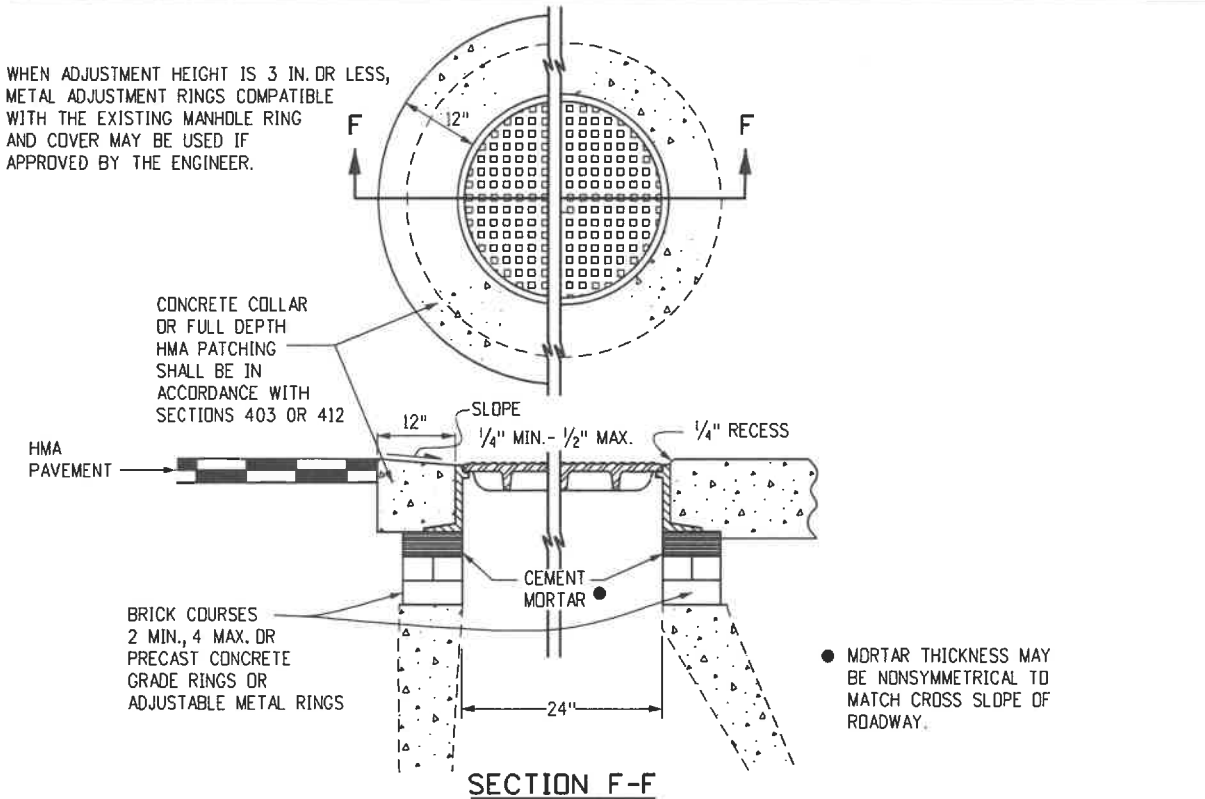
CIRCULAR RIGID PIPE
(LONGITUDINAL SECTION)



CIRCULAR RIGID PIPE
(TRANSVERSE SECTION)

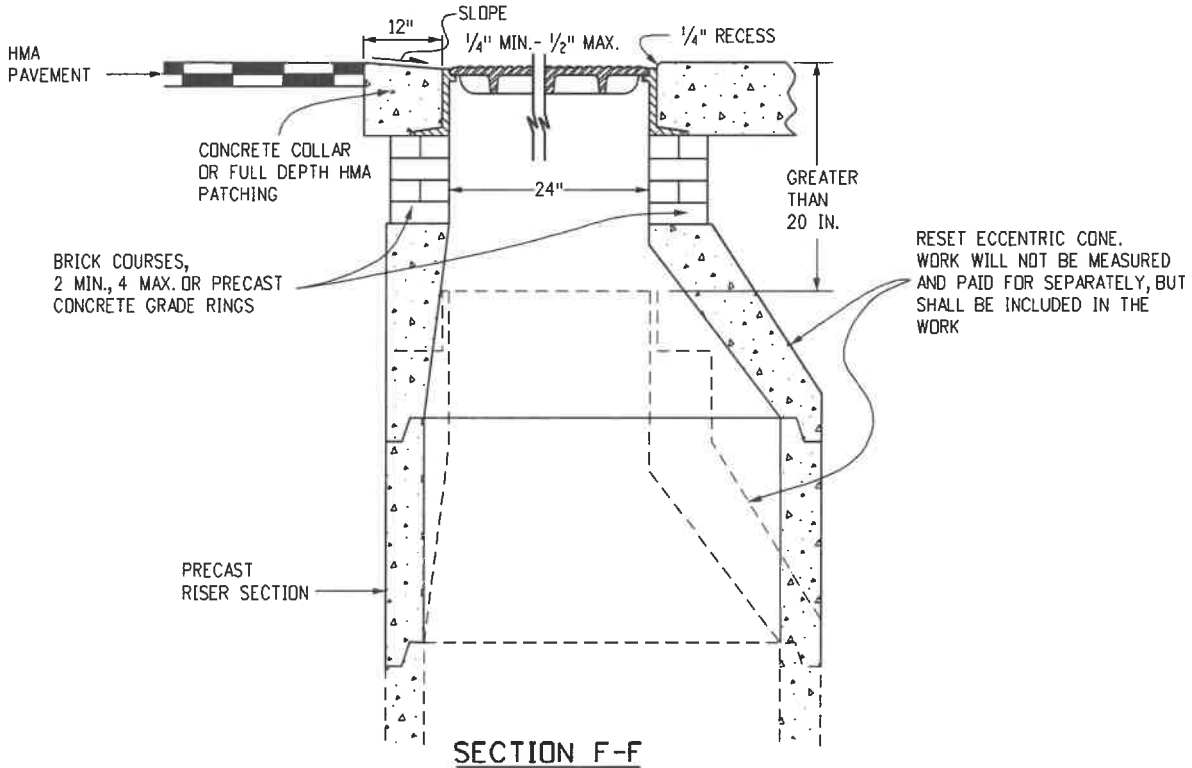
MANHOLE T-BASE

REFERENCE:	MANHOLES	Issued: 6/15/2022
CDOT M & S STANDARDS M-604-20	CITY OF CASTLE PINES	Revised:
		Standard Drawing No. SD.29f



SECTION F-F

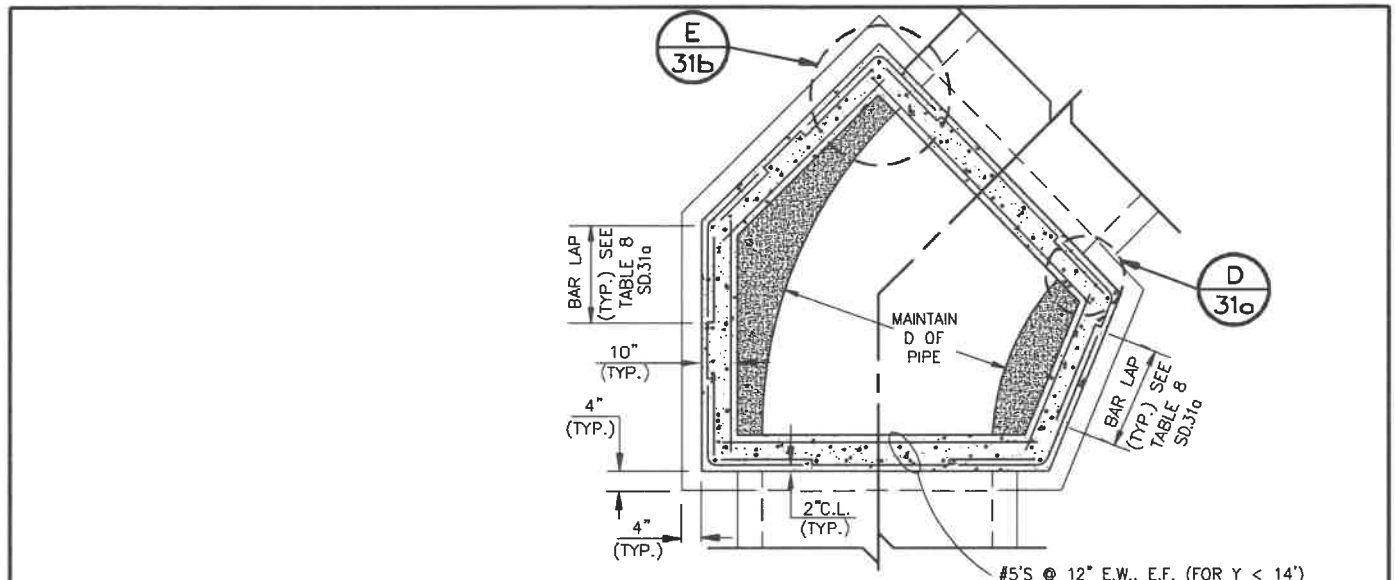
ADJUST MANHOLE 20 IN. OR LESS



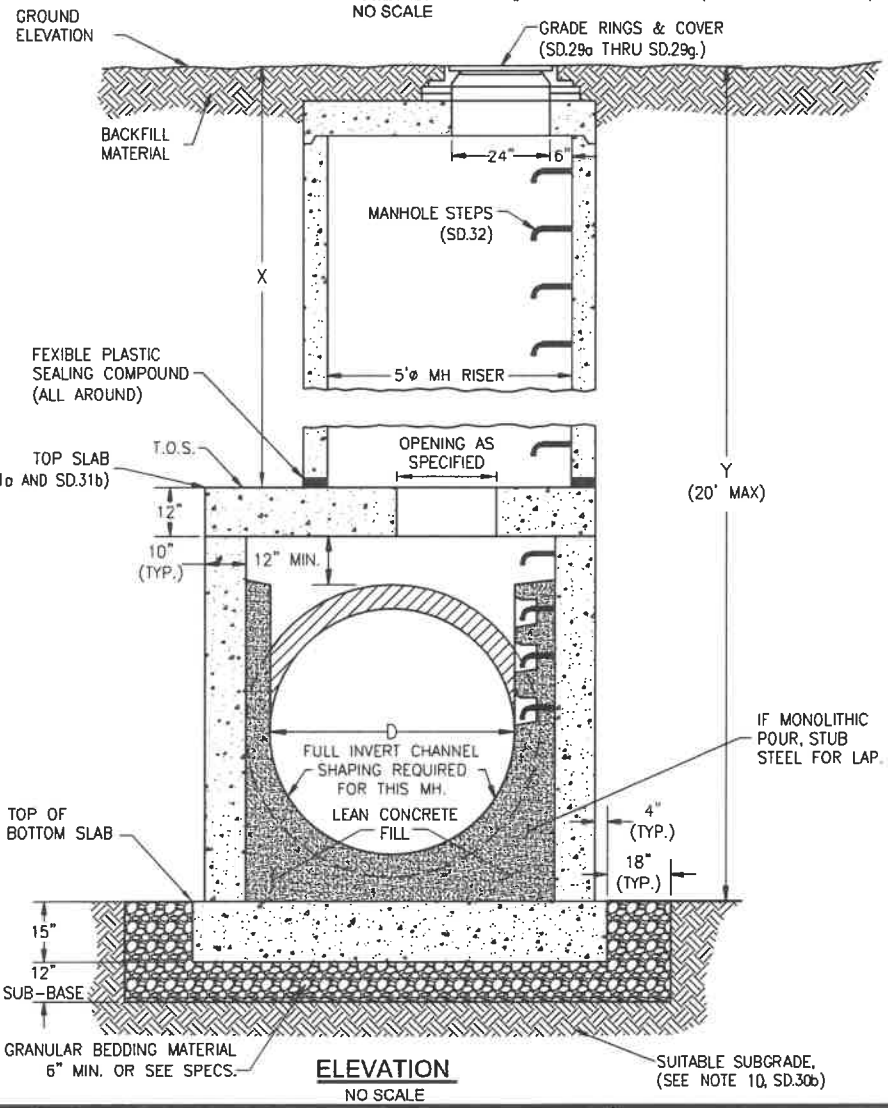
SECTION F-F

MODIFY MANHOLE GREATER THAN 20 IN.

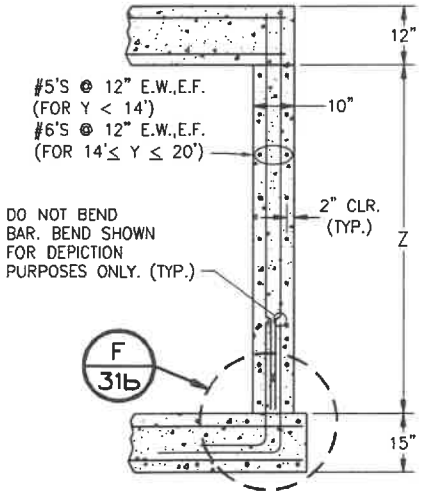
REFERENCE:	MANHOLES	Issued: 6/15/2022
CDOT M & S STANDARDS M-604-20	CITY OF CASTLE PINES	Revised:
		Standard Drawing No. SD.29g



PLAN
NO SCALE



ELEVATION
NO SCALE



SECTION - TYPICAL WALL
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

TYPE "P" MANHOLES

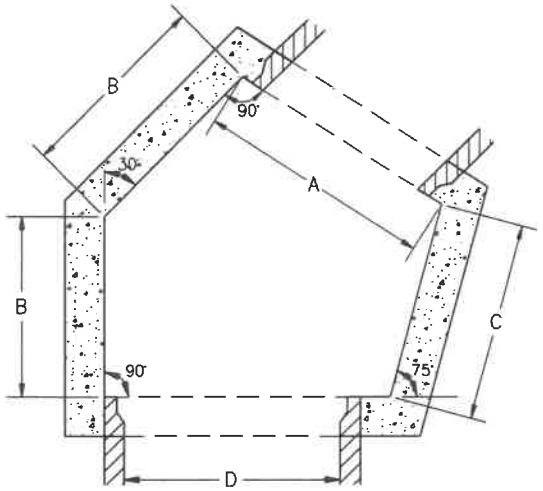
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.30a

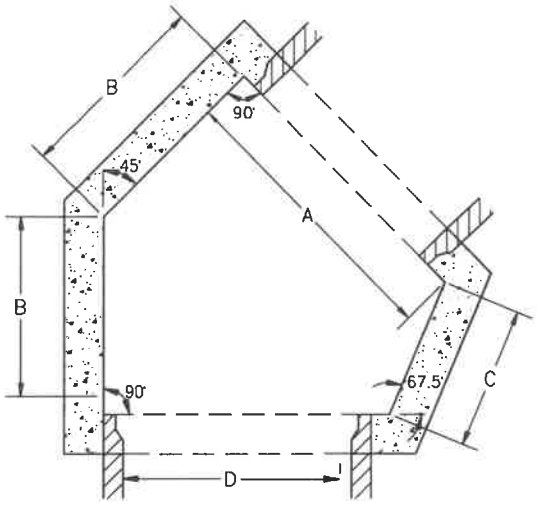


STRUCTURE PLAN VIEW - 30° BEND

NO SCALE

TABLE 7A. TYPE P MH - 30° BEND STRUCTURE DIMENSIONS

PIPE SIZE	A	B	C
42"	4' - 6"	3' - 4"	4' - 2"
48"	5' - 1"	3' - 6"	4' - 2"
54"	5' - 8"	3' - 8"	4' - 2"
60"	6' - 3"	3' - 10"	4' - 2"
66"	6' - 10"	4' - 0"	4' - 2"
72"	7' - 5"	4' - 2"	4' - 2"
78"	8' - 0"	4' - 4"	4' - 2"



STRUCTURE PLAN VIEW - 45° BEND

NO SCALE

TABLE 7B. TYPE P MH - 45° BEND STRUCTURE DIMENSIONS

PIPE SIZE	A	B	C
42"	4' - 6"	3' - 6"	3' - 0"
48"	5' - 1"	3' - 9"	3' - 0"
54"	5' - 8"	4' - 0"	3' - 0"
60"	6' - 3"	4' - 3"	3' - 0"
66"	6' - 10"	4' - 6"	3' - 0"
72"	7' - 5"	4' - 9"	3' - 0"
78"	8' - 0"	5' - 0"	3' - 0"

TYPE P MANHOLE NOTES

1. THIS STANDARD MANHOLE DETAIL IS APPLICABLE TO CIRCULAR PIPES WITH 42" I.D. AND LARGER, AND NON-CIRCULAR PIPES WITH A SPAN OF 42" I.D. AND LARGER.
2. FOR "Y" DEPTH OVER 20' SHOP DRAWINGS ALONG WITH CALCULATIONS FOR DESIGN OF WALLS, TOP AND BASE SLAB SHALL BE SUBMITTED FOR APPROVAL.
3. SET TOP SLAB TYPE B ELEVATION NO MORE THAN 12"± BELOW FINISHED GRADE I.E. ALLOW ENOUGH COVER TO ADD MH RINGS AND COVER.
4. PRECAST MANHOLE RISERS AND TOP SECTIONS SHALL CONFORM TO ASTM C-478. IN ADDITION MANHOLE STEPS, RISERS, SHIPLAP JOINTS, RING AND COVER SHALL CONFORM TO APPLICABLE WMD STANDARD DETAILS.
5. CONCRETE IN TOP SLAB AND WALLS SHALL BE CLASS D CONCRETE AND HAVE A 28 DAY STRENGTH OF 4500 PSI. PERMISSIBLE SLUMP WILL BE 3" TO 5", AND AIR ENTRAINMENT WILL BE 5% - 8%.
6. LEAN CONCRETE FILL SHALL HAVE A 28 DAY STRENGTH OF 2000 PSI. (TYPE II CEMENT).
7. REINFORCING STEEL BARS SHALL CONFORM TO ASTM A-615 GRADE 60 DEFORMED BARS. CLEAR COVER REQUIREMENT (UNLESS OTHERWISE NOTED) TO BE 2" (3" FROM BOTTOM OF FOUNDATION SLAB.) REINFORCING BARS WILL BE SPLICED ONLY AT LOCATIONS SHOWN AND DETAILED ON THE DRAWINGS. BARS WILL BE WIRE-TIED, NO TACK WELDING WILL BE PERMITTED.
8. ALL STRUCTURES SHALL BE BENCHED TO TOP OF PIPE.
9. ALL MANHOLES & SPECIAL STRUCTURES TO BE PLACED ON SUITABLE SUBGRADE MATERIAL. IF SUBGRADE CONDITIONS WARRANT, UNSUITABLE FOUNDATION MATERIAL WILL BE OVEREXCAVATED, & SELECT SUBGRADE MATERIAL WILL BE PLACED AS PER SECTION 5.00 OF THE WCPM STANDARD CONSTRUCTION SPECIFICATIONS.
10. GRANULAR BEDDING MATERIAL SHALL BE COMPACTED TO 90% MAXIMUM DRY DENSITY IN ACCORDANCE WITH AASHTO T-180.
11. STRUCTURE WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
12. LATERAL SUPPORT SHALL BE PROVIDED AND MAINTAINED FOR WALLS DURING BACKFILLING OPERATIONS.
13. MAX LATERAL SHALL BE 24" OR SMALLER. IF LARGER, A SPECIAL STRUCTURAL DESIGN IS REQUIRED. SEE STANDARD DETAIL SD.26a AND SD.26b. FOR PENETRATION DETAIL.
14. SEE STANDARD DETAIL SD.31a AND SD.31b. FOR REINFORCEMENT DETAILS.

LEGEND

D= INSIDE DIAMETER OF PIPE
X= DEPTH OF MANHOLE RISER
Y= TOTAL DEPTH OF MANHOLE
E.F.= EACH FACE
E.W.= EACH WAY

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

TYPE "P" MANHOLES

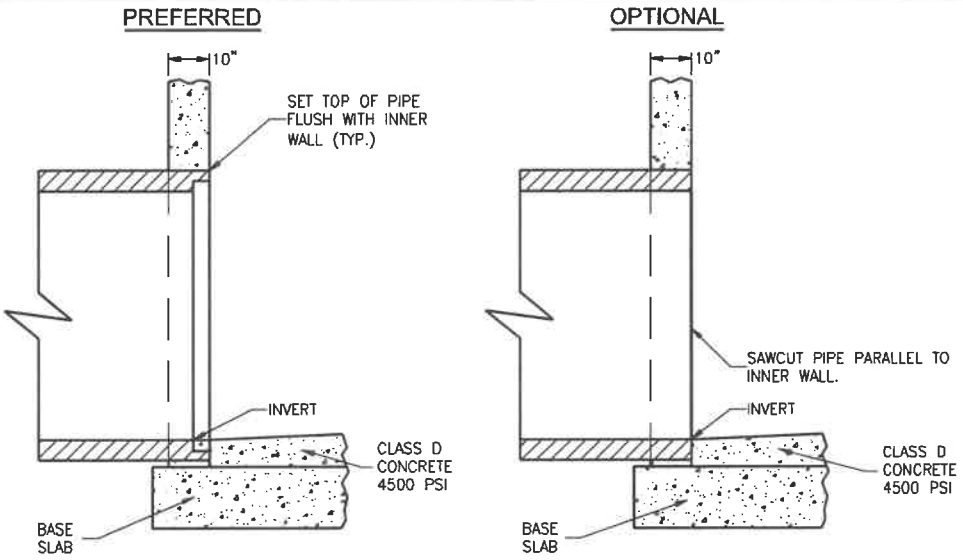
CITY OF
CASTLE PINES

Issued: 6/15/2022

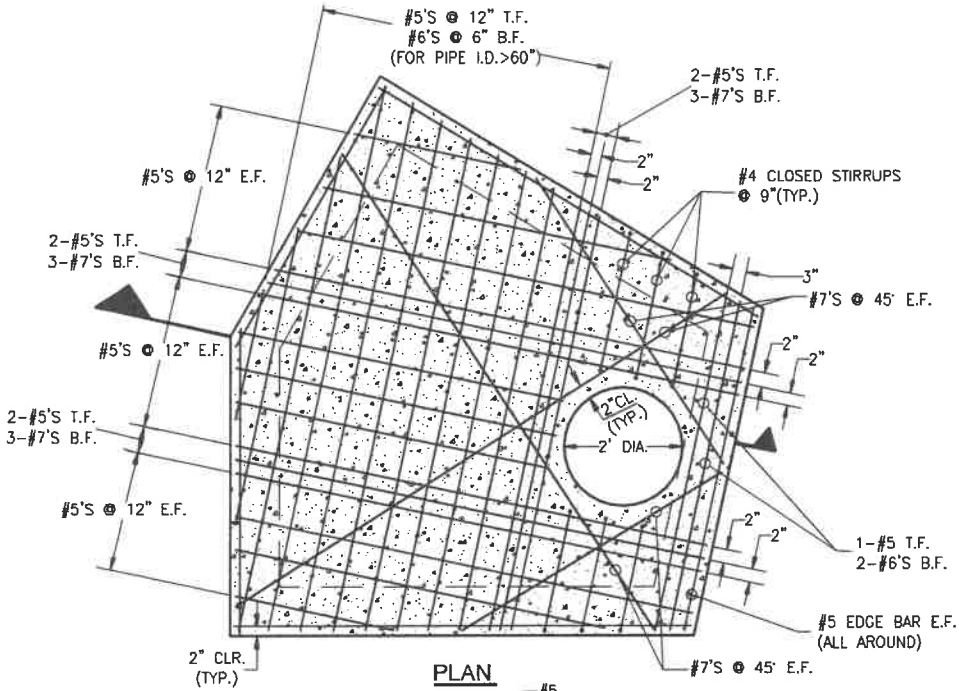
Revised: _____

Standard Drawing No.

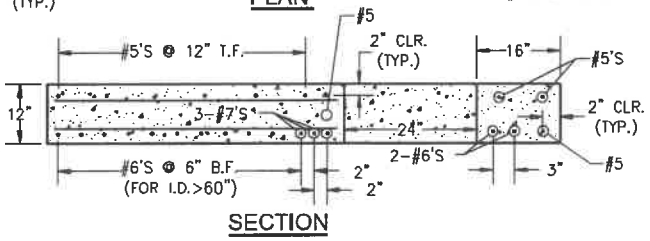
SD.30b



D PIPE END TREATMENT DETAIL
NO SCALE



PLAN



SECTION

TOP SLAB TYPE B (X<2')
NO SCALE

LEGEND
D= INSIDE DIAMETER OF PIPE
X= DEPTH OF MANHOLE RISER
Y= TOTAL DEPTH OF MANHOLE
E.F.= EACH FACE
E.W.= EACH WAY

TABLE 8. SPLICE LENGTH	
BAR SIZE	SPLICE LENGTH (LAP)
#5	21"
#6	26"

NOTE: BARS TO BE SPLICED ONLY AT LOCATIONS SHOWN.

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.2

TYPE P MANHOLE, TOP SLAB AND DETAILS

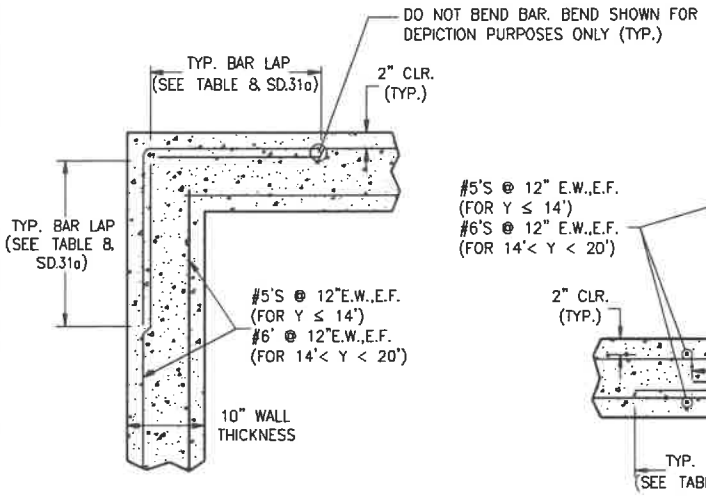
CITY OF CASTLE PINES

Issued: 6/15/2022

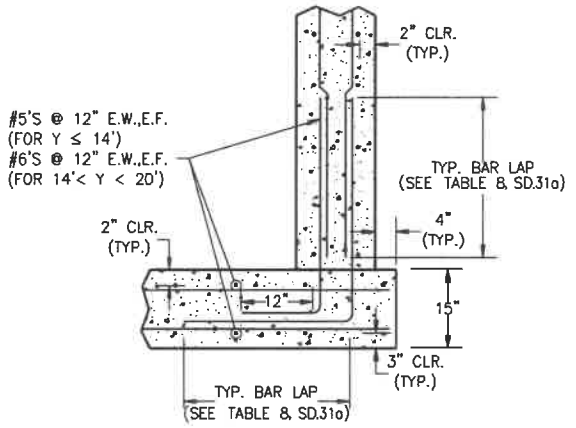
Revised: _____

Standard Drawing No.

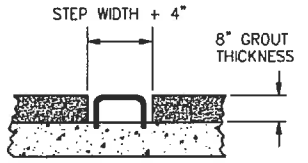
SD.31a



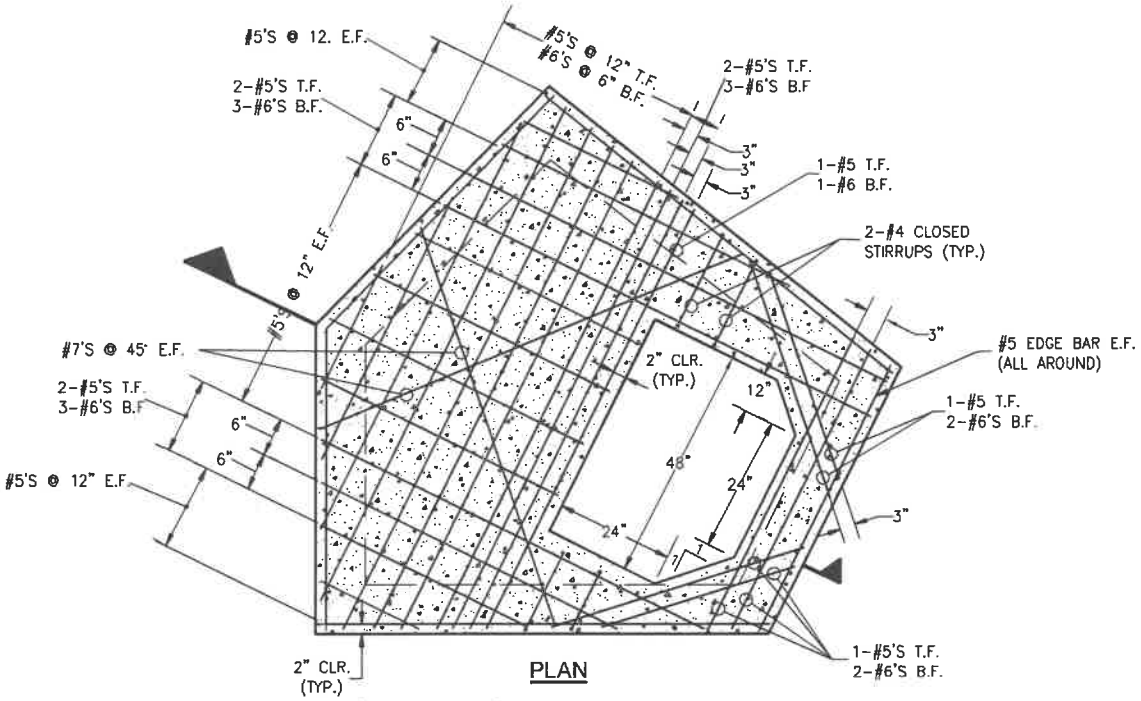
E CORNER DETAIL
NO SCALE



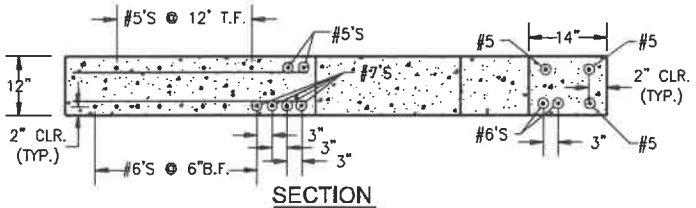
F WALL-TO-BASE JOINT DETAIL
NO SCALE



G STEP BLOCK OUT DETAIL
NO SCALE



PLAN



SECTION

TOP SLAB TYPE A (X≥2')
NO SCALE

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.2

TYPE P MANHOLE, TOP SLAB AND DETAILS

CITY OF CASTLE PINES

Issued: 6/15/2022

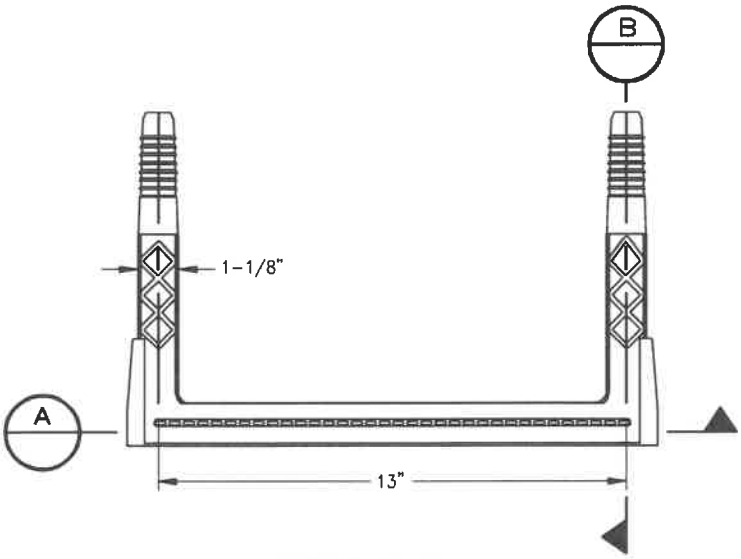
Revised: _____

Standard Drawing No.

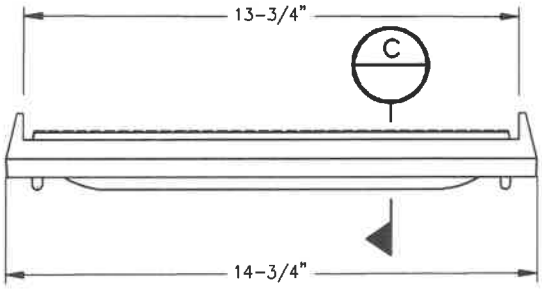
SD.31b

MANHOLE STEP NOTES

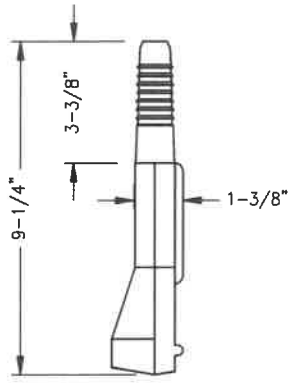
1. ASTM SPECIFICATIONS:
   (A) ASTM C-478 (MANHOLE STEPS AND LADDERS)
   (B) ASTM A-615 GRADE 60 (STEEL REBAR)
   (C) ASTM 4101 (POLYPROPYLENE)
2. STEPS SHALL BE INSTALLED BY THE "PRESS-FIT" METHOD UTILIZING A SPECIALLY TAPERED PIN TO FORM THE INSERT HOLE AS SHOWN, FOLLOWING MANUFACTURER'S RECOMMENDED PROCEDURE AND SHALL NOT BE GROUTED IN PLACE.
3. INSTALLED STEPS SHALL BE CAPABLE OF WITHSTANDING A PULL OUT FORCE OF 2500 LB. PER LEG FOR A MINIMUM PERIOD OF TWO MINUTES.
4. PINS MUST BE SMOOTH AND CONTINUOUSLY TAPERED. W.M.D. INSTALLATIONS REQUIRE A MATCHED COMBINATION OF A TAPERED INSERT PIN AMD MANHOLE STEP, AS RECOMMENDED OR REQUIRED BY SPECIFIC MANUFACTURER OF THE STEP TO BE USED.
5. THIS STEP CAN ALSO BE USED IN TOE POCKET INSTALLATIONS PROVIDED 5" TOE CLEARANCE IS ALLOWED. MANHOLE STEPS SHALL NOT BE INSTALLED OVER THE FLOW CHANNEL. THEY SHALL BE PLACED 12" MINIMUM OR 16" MAXIMUM IN STRAIGHT VERTICAL ALIGNMENT WITH THE BOTTOM STEP 8" ABOVE THE BENCH MINIMUM. SEE THE CITY AND COUNTY OF DENVER STANDARD DETAIL S-502.



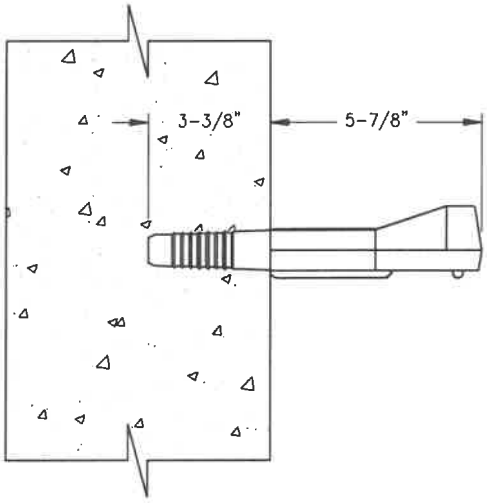
STEP TOP VIEW

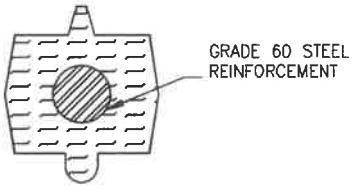


A STEP SECTION



B STEP SECTION





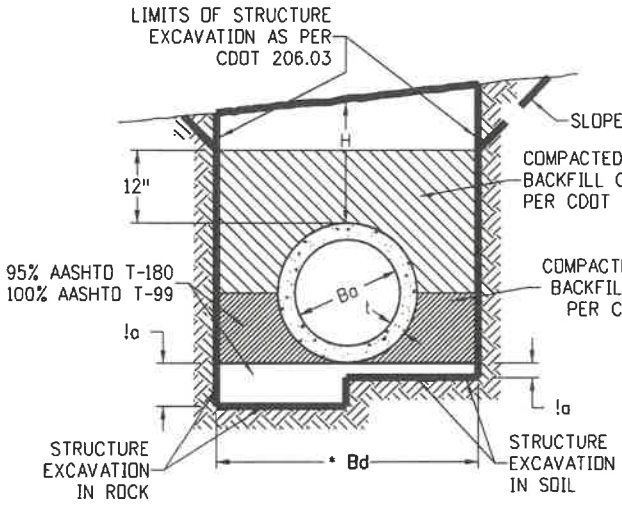
C STEP CROSS-SECTION

POLYPROPYLENE REINFORCED PLASTIC STEP

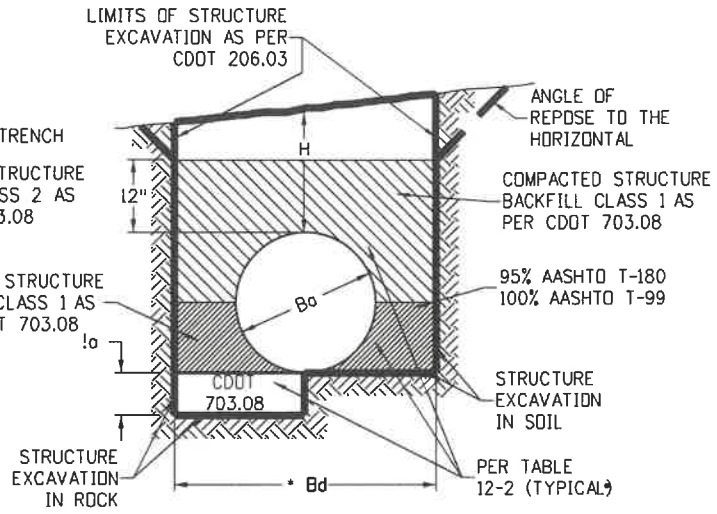
NO SCALE

REFERENCE: CITY AND COUNTY OF DENVER DRAWING NUMBER S-750	MANHOLES AND INLET STEPS CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.32**

RIGID PIPE



FLEXIBLE PIPE



MAXIMUM HEIGHT OF FILL OVER TOP OF PIPE IN FEET

REINFORCED CONCRETE

Ba in.	Min. Bd in. **	.01 INCH CRACK D-LOAD 1350	2000	3000
		PIPE CLASS III	IV	V
18	35	19	28	43
24	42	18	28	42
30	50	18	28	42
36	59	18	27	41
42	68	18	27	41
48	78	18	27	41
54	89	17	26	40
60	98	17	26	40
66	108	17	26	40
72	117	17	26	40
78	125	17	26	40
84	135	17	26	40
90	154	17	26	40
96	163	17	26	40
108	173	17	26	40
120	191	17	26	40
132	208	17	26	40
144	224	17	26	40

** BASED ON Bd=1.33(Ba+2t). WALL THICKNESS CAN VARY BETWEEN MANUFACTURERS.

STEEL - 2 2/3" x 1/2" CORRUGATIONS

Ba in.	Bd ft.	H ABOVE TOP OF PIPE IN FEET 1-15	16-20	21-25	26-30	31-35	36-40
		THICKNESS IN INCHES					
18-48	4-7	.064	.064	.064	.064	.064	.064
54	7.50	.079	.079	.079	.079	.079	.079
60	8.00	.079	.079	.079	.079	.109	.109
66	8.50	.079	.079	.109	.109	.138	.138
72	9.00	.079	.109	.109	.138	.168	.168
78	9.50	.109	.138	.168	.168		
84	10.00	.109	.138	.168			

LEGEND

H = HEIGHT OF FILL OVER TOP OF PIPE
Ba = INSIDE DIAMETER (I.D.) OF PIPE
* Bd = TRENCH WIDTH
t = WALL THICKNESS OF PIPE
CLSM = CONTROLLED LAW STRENGTH MATERIAL
a = LOOSE GRANULAR BEDDING, AS FOLLOWS:
a=0" FOR FLEXIBLE CULVERTS IN SOIL.
a=3" FOR RCP CULVERTS IN SOIL.
a=12" FOR CULVERTS IN ROCK.

* TRENCH WIDTHS
RCP: Bd = MIN. OF 1.33(Ba+2t), OR (Ba+2t)+12" (PER AASHTO SECTION 17)
CSP: Bd = MIN. OF Ba+4' (PER AASHTO SECTION 12)

! BEDDING MATERIAL FOR SOIL SHALL BE STRUCTURAL BACKFILL CLASS 1 OR 2.
! BEDDING MATERIAL FOR ROCK SHALL BE STRUCTURAL BACKFILL CLASS 1.

RCP DESIGN CRITERIA

SAFETY FACTOR = PER ASTM C76
SOIL WEIGHT = 120 LB. PER CU. FT.
BEDDING = TYPE 2

CSP DESIGN CRITERIA

(3"x1" CORRUGATIONS: 60 TO 84 PIPE SHALL BE .064" THICK (16 GAUGE) TO H=40 FT.)

SOIL WEIGHT = 120 LB. PER CU. FT.
SAFETY FACTOR FOR SEAM STRENGTH = 2.00
BUCKING STRESS LEVEL = 1/2 YIELD STRENGTH
LOAD FACTOR (BACKFILL) = 95% STANDARD DENSITY, AASHTO-T 99 (K=0.86)

ALL UTILITY REPAIRS MUST BE BACKFILLED WITH CLSM. SEE CITY OF CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL FOR SPECIFIC DETAILS.

NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2. ALL TRENCH INSTALLATIONS SHALL BE IN ACCORDANCE WITH OSHA AND COLORADO DEPARTMENT OF TRANSPORTATION REGULATIONS.
3. THE USE OF NON-REINFORCED CONCRETE PIPE WILL NOT BE ALLOWED IN THE CITY OF CASTLE PINES.

NOTE: ALL TRENCHING SHALL COMPLY WITH ALL STATE, FEDERAL AND O.S.H.A. SAFETY REQUIREMENTS. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MEET ALL SAFETY REQUIREMENTS.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/09/22

PIPE INSTALLATION IN TRENCH

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised:

Standard Drawing No.

SD.33a

NOTES:

1. THIS TRENCH BACKFILL DETAIL SPECIFIES REQUIREMENTS IN ADDITION TO THOSE SPECIFIED IN THE LATEST EDITION OF THE COLORADO DEPARTMENT OF TRANSPORTATION'S STANDARD FOR ROAD AND BRIDGE CONSTRUCTION.

2. A CONSTRUCTION TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO AND APPROVED BY THE CITY OF CASTLE PINES PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS IN THE CITY RIGHT-OF-WAY.

3. TRENCH SHALL BE BRACED OR SHORED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND PROTECTION OF OTHER UTILITIES OR STRUCTURES IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL SAFETY REGULATIONS.

4. THE TRENCH WIDTH SHALL BE CONFINED TO THOSE MINIMUM DIMENSIONS, WHICH WILL PERMIT PROPER INSTALLATION AND ACCEPTABLE PIPE LOADING AS ESTABLISHED BY CURRENT LOCAL STATE AND FEDERAL SAFETY REGULATIONS.

5. BACKFILL COMPACTION REQUIREMENTS: MINIMUM DENSITY WILL BE DETERMINED IN ACCORDANCE WITH AASHTO T 99 OR T 180 AS DEFINED BY CDOT STANDARD SPECIFICATIONS SECTION 203.07 AND CDOT 703.03. EXCEPT FOR CLSM.

6. PAVEMENT EDGES SHALL BE SAW-CUT. EDGES SHALL BE TACK COATED PRIOR TO PATCHING.

7. ALL STORM SEWERS SHALL BE CONSTRUCTED SO THAT A MINIMUM COVER IS MAINTAINED TO WITHSTAND AASHTO HS-20 LOADING ON THE PIPE. THE MINIMUM COVER TO WITHSTAND LIVE LOADING DEPENDS UPON THE PIPE SIZE, TYPE AND CLASS, AND SOIL BEDDING CONDITION, BUT SHALL BE NOT LESS THAN 1-FOOT AT ANY POINT ALONG THE PIPE. OTHER FACTERS THAT AFFECT THE DEPTH OF THE PIPE ARE HYDRAULIC GRADE LINE ELEVATIONS, INLET DEPTHS, ADJACENT UTILITIES OR UTILITY CROSSING, INCLUDING WATER AND SEWER SERVICES LINES ALONG RESIDENTIAL STREETS, AND CONNECTIONS TO EXISTING STORM SEWER SYSTEMS. THE ROADWAY SUBGRADE, WHICH SUPPORTS THE PAVEMENT SECTION IS TYPICALLY PLOWED TO A CERTAIN DEPTH, MOISTURE TREATED AND COMPACTED PRIOR TO THE PLACEMENT OF THE SUB-BASE, BASE COURSE, AND SURFACING. THERE ARE ALSO INSTANCES WHERE THE SUBGRADE MATERIAL MUST BE EXCAVATED AND REPLACED OR TREATED TO A CERTAIN DEPTH TO MITIGATE SWELLING SOILS. THESE EFFORTS CAN IMPACT THE STORM SEWER SYSTEM IF IT HAS NOT BEEN DESIGNED WITH ADEQUATE DEPTH. THE DESIGN ENGINEER SHALL USE THE BEST INFORMATION AVAILABLE, INCLUDING PAVEMENT DESIGN OR SOILS REPORTS (IF AVAILABLE) TO ENSURE THAT STORM SEWER PIPES HAVE ADEQUATE DEPTH.

8. CHANGES IN DESIGN CRITERIA WILL REQUIRE COMPENSATING CHANGE IN PIPE DESIGN.

9. WHEN PIPE SEWER IS TO BE EXTENDED OR REPLACED WITH PIPE OF DIFFERENT MATERIAL, THE CONNECTIONS SHALL CONFORM TO THE DETAIL SHOWN ON PLANS OR BE APPROVED THROUGH CASTLE PINES PUBLIC WORKS.

10. WHEN TWO OR MORE CONDUITS ARE LAID SIDE-BY-SIDE, THEY SHALL BE PLACED SO THAT THEY ARE ½ OUTSIDE DIAMETER, OR ½ OUTSIDE SPAN, OR 3' APART, WHICHEVER IS LESS. HOWEVER, IF END SECTIONS ARE USED, THE MINIMUM SPACING SHALL BE 1' BETWEEN THE OUTSIDE EDGE OF END SECTIONS.

11. TRENCH INSTALLATION (PER OSHA STANDARDS):

    a. TRENCHES OVER 5 FEET IN DEPTH SHALL BE EITHER SHORED OR THE TRENCH WALLS SHALL BE SLOPED NO STEEPER THAN 3:1 TO THE ANGLE OF REPOSE. IF SLOPED, THE BOTTOM OF THE SLOPE SHALL BE A MINIMUM OF 1 FOOT ABOVE THE TOP OF THE PIPE.

    b. SHORING WILL BE REQUIRED WHEN THE BOTTOM OF THE SLOPE IS MORE THAN 3 FEET ABOVE THE BOTTOM OF THE TRENCH.

    c. ALL SHEETING OR SHORING TO BE REMOVED.

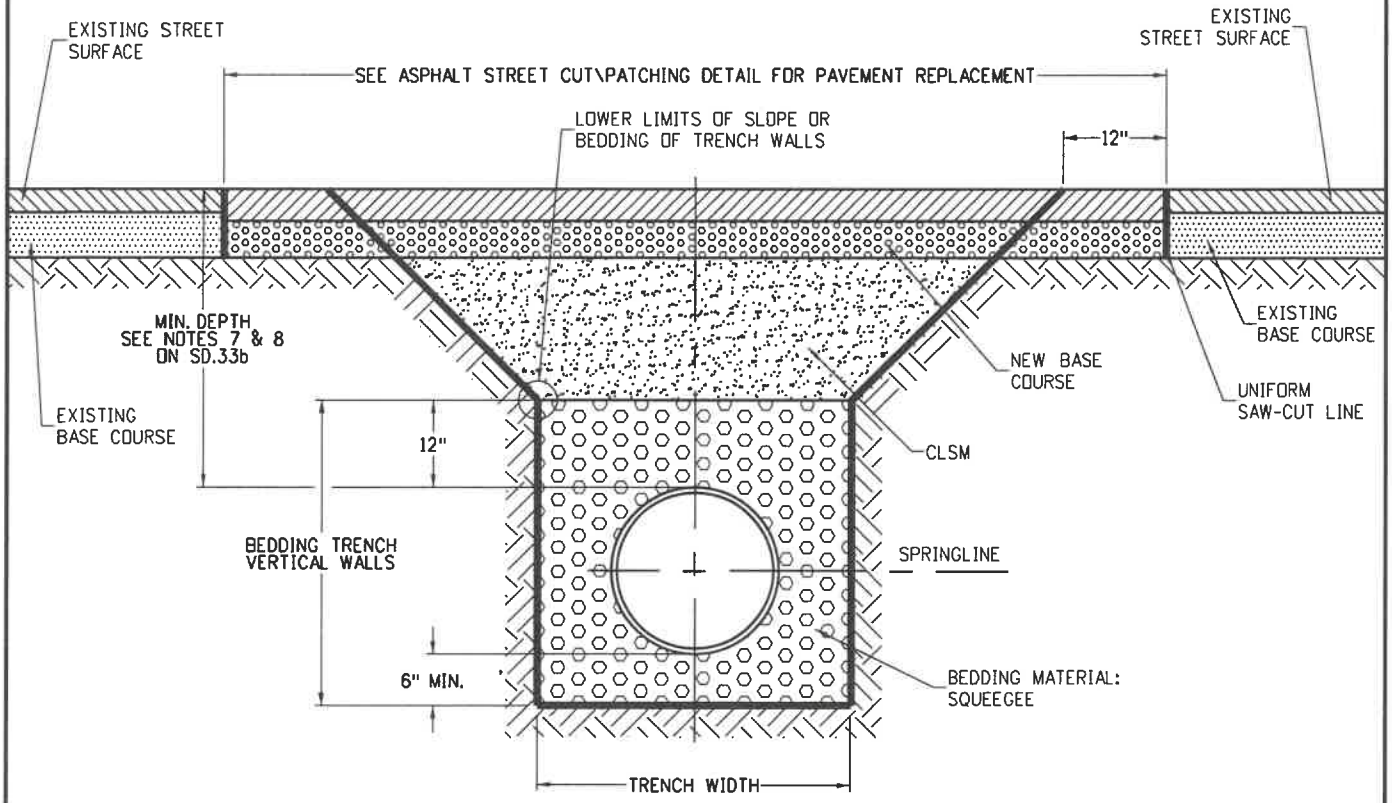
12. CLSM MAY USED IN PLACE OF STRUCTURAL BACKFILL.

13. CLSM SHALL NOT EXCEED A STRENGTH OVER 100 P.S.I.

REFERENCE: CITY OF CASTLE PINES DRAINAGE MANUAL AND COLORADO DEPARTMENT OF TRANSPORTATION "M" STANDARDS.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 6/14/22	PIPE INSTALLATION IN TRENCH NOTES CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.33b**



NOTES: SEE NOTES ON SD.33b

TO BE USED FOR STREET CUT ONLY

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/19/22

PIPE INSTALLATION IN TRENCH FOR STREET CUT

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.34a

NOTES:

1. THIS PIPE INSTALLATION DETAIL SPECIFIES REQUIREMENTS IN ADDITION TO THOSE SPECIFIED IN THE LATEST EDITION OF THE COLORADO DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. A CONSTRUCTION TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO AND APPROVED BY THE CITY OF CASTLE PINES PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS IN THE CITY RIGHT-OF-WAY.
3. PIPE SHALL BE BEDDED FROM 6" BELOW THE BOTTOM OF THE PIPE TO 12" ABOVE THE TOP OF PIPE.
4. TRENCH WIDTH SHALL NOT BE MORE THAN 16" AND NOT LESS THAN 12" WIDER THAN THE LARGEST OUTSIDE DIAMETER OF THE PIPE.
5. ALL STORM SEWERS SHALL BE CONSTRUCTED SO THAT A MINIMUM COVER IS MAINTAINED TO WITHSTAND AASHTO HS-20 LOADING ON THE PIPE. THE MINIMUM COVER TO WITHSTAND LIVE LOADING DEPENDS UPON THE PIPE SIZE, TYPE AND CLASS, AND SOIL BEDDING CONDITION, BUT SHALL BE NOT LESS THAN 2-FOOT AT ANY POINT ALONG PIPE.
6. FOR WATER AND SANITARY SEWER PIPES, REFER TO THE MAINTAINING DISTRICT STANDARDS FOR PIPE BEDDING MATERIALS.
7. PAVEMENT EDGES SHALL BE SAW-CUT AND KEPT TO A NEAT VERTICAL EDGE PRIOR TO PAVING.
8. EDGES SHALL BE TACK COATED PRIOR TO PATCHING.
9. WHEN STORM SEWER PIPE IS TO BE EXTENDED OR REPLACED WITH PIPE OF DIFFERENT MATERIAL, THE CONNECTIONS SHALL CONFORM TO THE DETAIL SHOWN ON PLANS OR BE APPROVED THROUGH CASTLE PINES PUBLIC WORKS.
10. WHEN TWO OR MORE CONDUITS ARE LAID SIDE-BY-SIDE, THEY SHALL BE PLACED SO THAT THEY ARE ½ OUTSIDE DIAMETER, OR ½ OUTSIDE SPAN, OR 3' APART, WHICHEVER IS LESS. HOWEVER, IF END SECTIONS ARE USED, THE MINIMUM SPACING SHALL BE 1' BETWEEN THE OUTSIDE EDGE OF END SECTIONS.
11. TRENCH INSTALLATION PER OSHA STANDARDS.

TO BE USED FOR STREET CUT ONLY

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

PIPE INSTALLATION IN TRENCH FOR STREET CUT

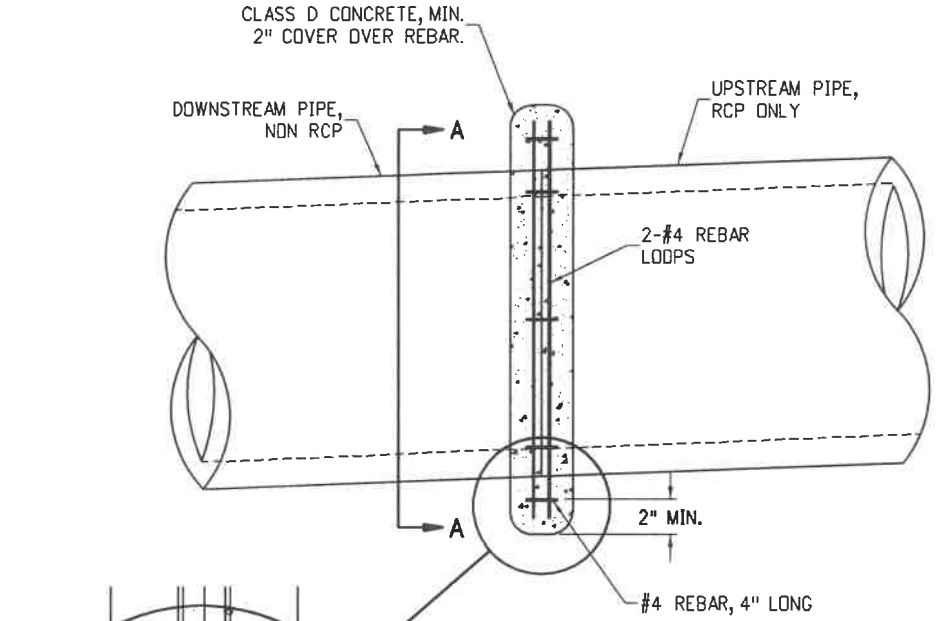
CITY OF CASTLE PINES

Issued: 6/15/2022

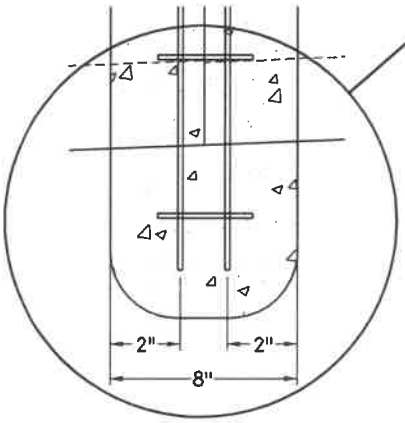
Revised: _____

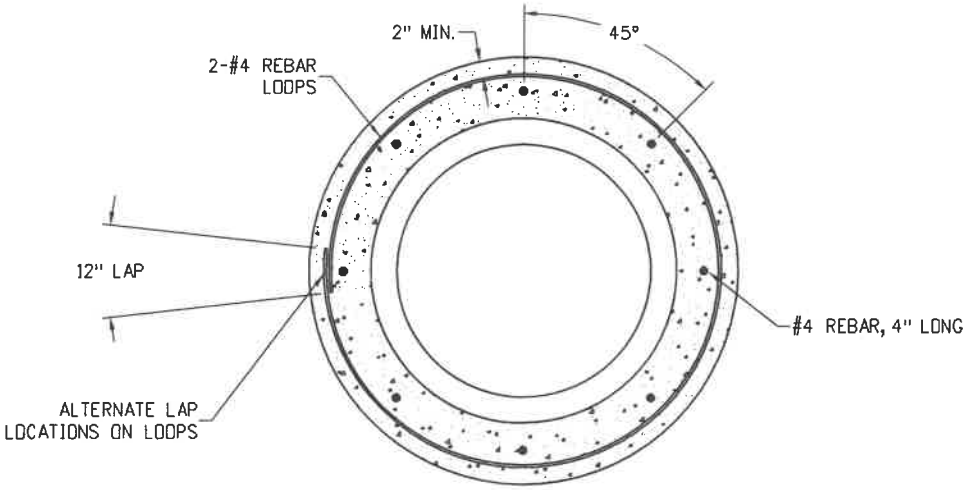
Standard Drawing No.

SD.34b



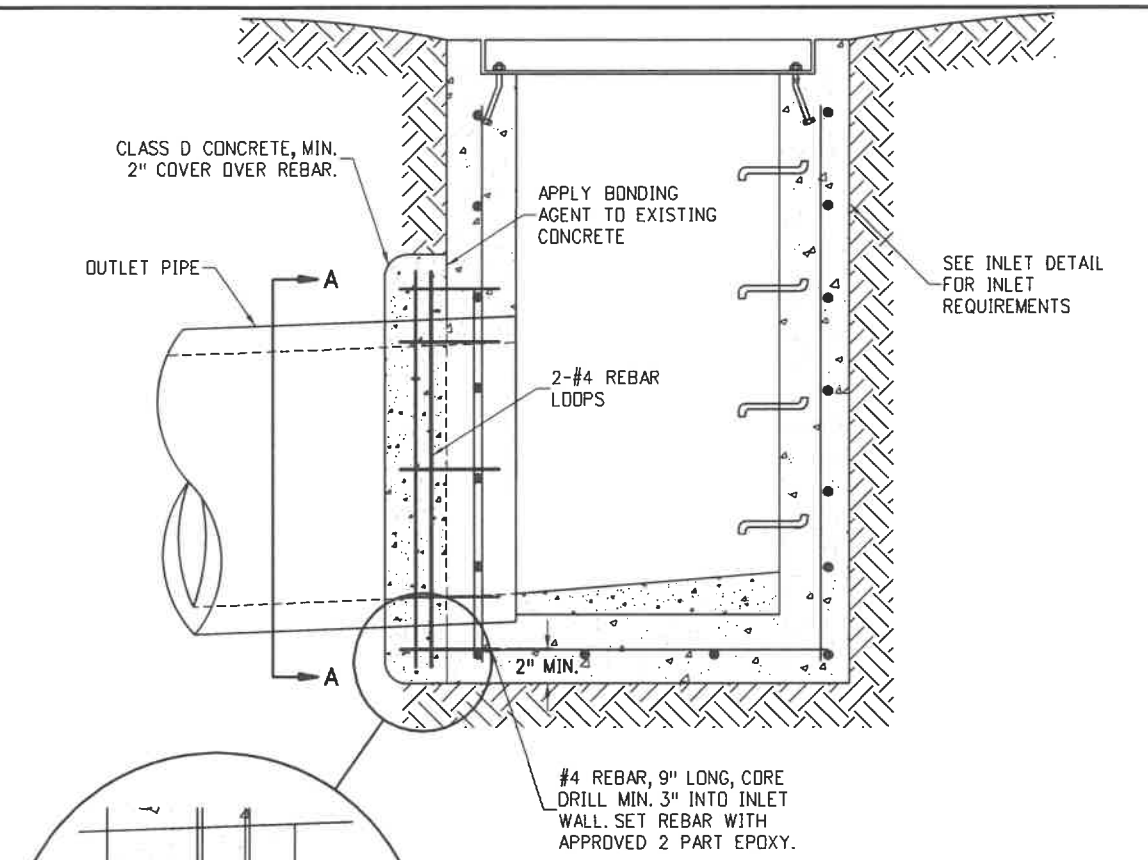
CROSS SECTION





SECTION A-A

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	PIPE CONNECTION DETAIL TO EXISTING PIPE CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.35a**



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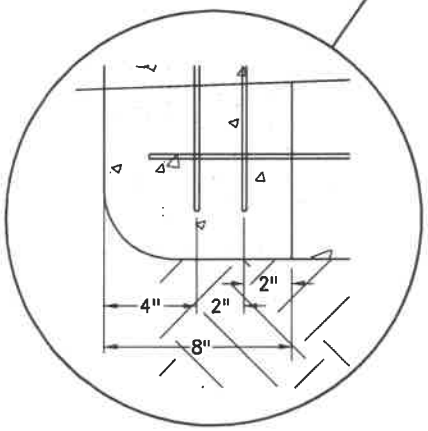
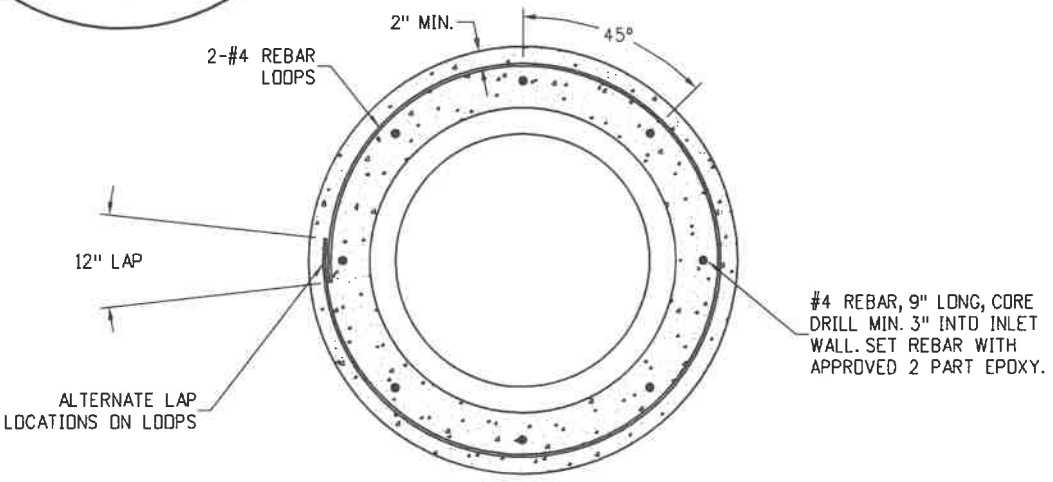
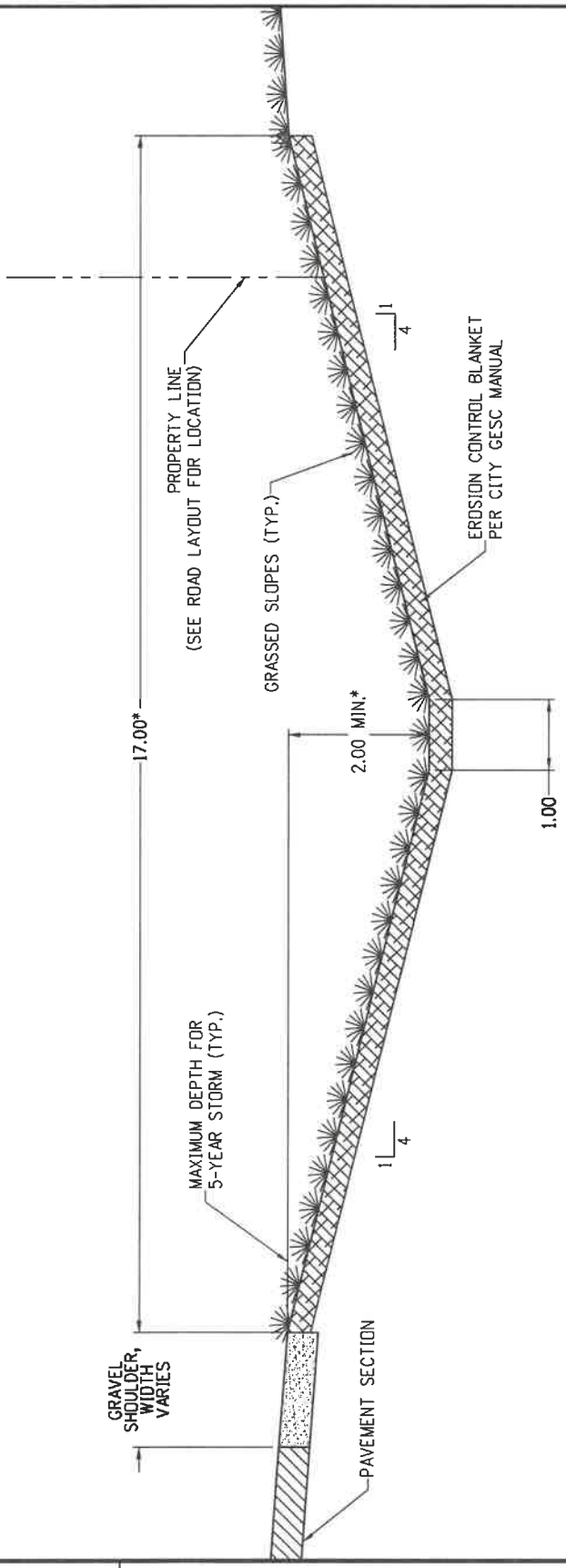




SECTION A-A

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	PIPE CONNECTION DETAIL TO EXISTING INLET CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.35b**



ALLOWABLE LONGITUDINAL SLOPE FROM 0.5% TO 3.0%

* - MINIMUM WIDTH AND DEPTH OF DITCH VARIES BASED ON DRIVEWAY CULVERT SIZE.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

ROADSIDE DITCH SECTION

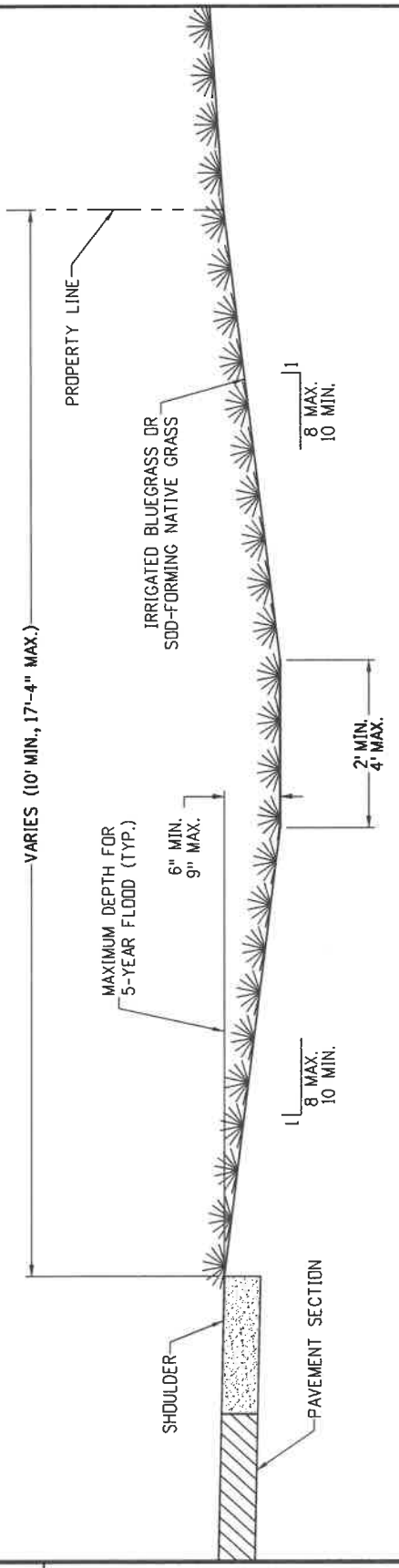
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.36



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

URBAN ROADSIDE SWALE

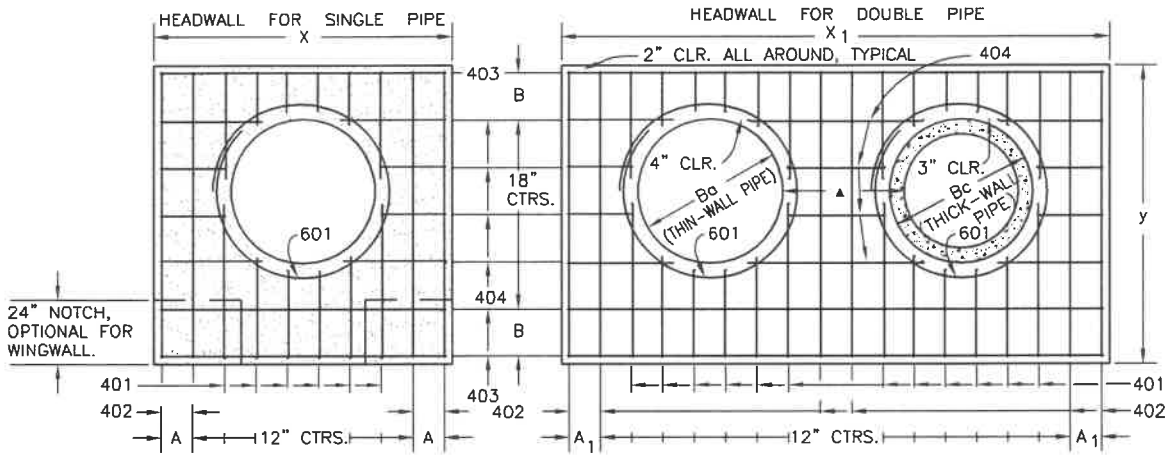
CITY OF
CASTLE PINES

Issued: 6/15/2022

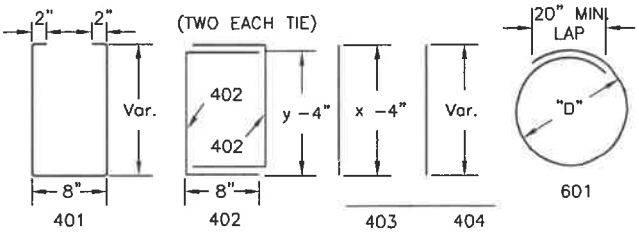
Revised: _____

Standard Drawing No.

SD.37



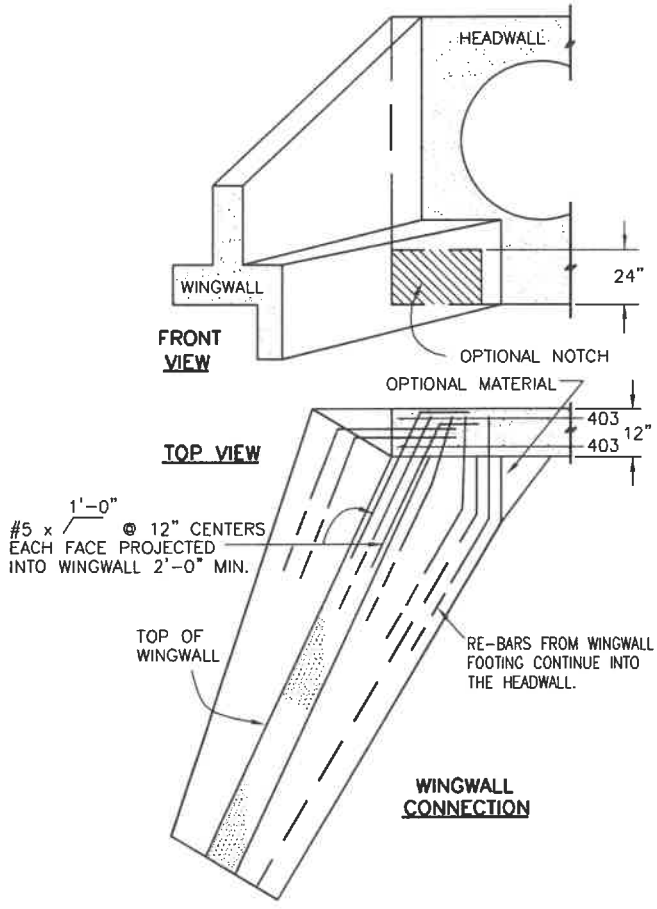
TYPICAL BAR LAYOUT FOR CONCRETE HEADWALLS



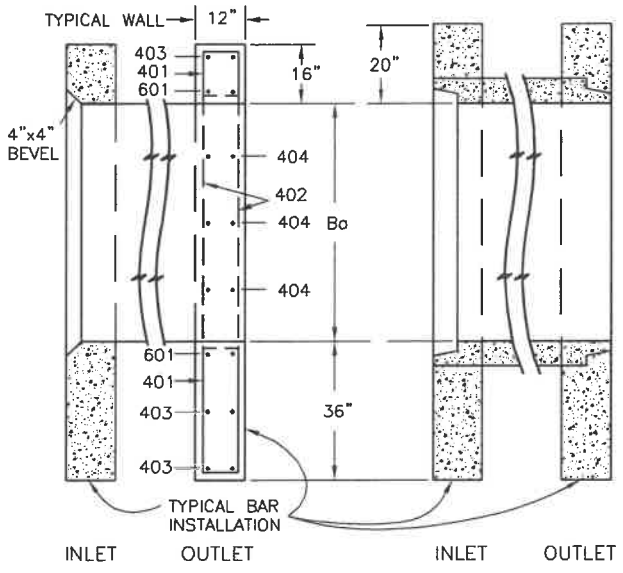
"D" FOR

THICK-WALL PIPE, = Bc + 6"
THIN-WALL PIPE, = Bo + 8"
THIN-WALL PIPE-ARCH = SPAN + 8"
STRUCTURAL PLATE-ARCH = RISE + 8"

BAR BENDING



WINGWALL CONNECTION



ENDS OF THIN-WALL PIPE

ENDS OF THICK-WALL PIPE

REFERENCE:

CDOT M & S STANDARDS
M-601-10

HEADWALLS FOR PIPE CULVERTS

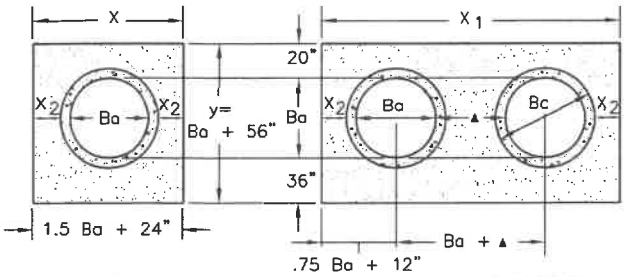
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

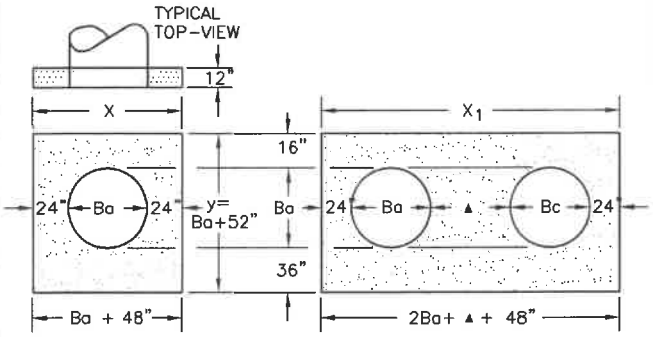
SD.38a



DIMENSIONS / **QUANTITIES**

Ba in.	Bc in.	X ft.-in	A in.	X_1 ft.-in.	A_1 in.	y ft.-in	B in.	X_2 in.	CONCRETE SGL cu.yd	CONCRETE DBL cu.yd	STEEL ■ SGL lbs.	STEEL ■ DBL lbs.
54	65	8-9	8 1/2	15-6	7	9-2	17	20	2.12	3.55	209	364
60	72	9-6	7	17-0	10	9-8	11	21	2.35	3.99	236	414
66	79	10-3	11 1/2	18-6	7	10-2	14	22	2.60	4.44	249	453
72	86	11-0	10	20-0	10	10-8	17	23	2.85	4.91	270	476
78	93	11-9	8 1/2	21-3	11	11-2	11	24	3.11	5.29	306	527
84	100	12-6	7	22-6	7	11-8	14	25	3.38	5.68	333	572
90	107	13-3	11 1/2	23-9	8 1/2	12-2	17	26	3.66	6.08	335	593
96	114	14-0	10	25-0	10	12-8	11	27	3.94	6.48	379	649
102	121	14-9	8 1/2	26-3	11 1/2	13-2	14	28	4.24	6.89	400	664
108	128	15-6	7	27-6	7	13-8	17	29	4.54	7.30	424	707

HEADWALL FOR THICK - WALL ROUND PIPE



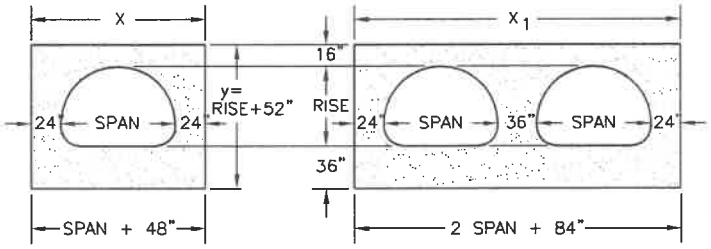
DIMENSIONS / **QUANTITIES**

Ba in.	X ft.-in.	A in.	X_1 ft.-in.	A_1 in.	y ft.-in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ■ SGL lbs.	STEEL ■ DBL lbs.
54	8-6	7	15-3	11 1/2	8-10	15	2.19	3.81	211	358
60	9-0	10	16-6	7	9-4	18	2.38	4.25	217	396
66	9-6	7	17-9	8 1/2	9-10	12	2.58	4.70	252	454
72	10-0	10	19-0	10	10-4	15	2.78	5.17	255	472
78	10-6	7	20-0	10	10-10	18	2.98	5.56	276	499
84	11-0	10	21-0	10	11-4	12	3.19	5.95	297	553
90	11-6	7	22-0	10	11-10	15	3.40	6.36	317	571
96	12-0	10	23-0	10	12-4	18	3.62	6.79	321	597
102	12-6	7	24-0	10	12-10	12	3.84	7.21	364	663
108	13-0	10	25-0	10	13-4	15	4.06	7.63	362	678

HEADWALL FOR THIN - WALL ROUND PIPE

DIMENSIONS / **QUANTITIES**

EQUIV Ba in.	SPAN in.	RISE in.	X ft.-in	A in.	X_1 ft.-in.	A_1 in.	y ft.-in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ■ SGL lbs.	STEEL ■ DBL lbs.
72	81	59	10-9	8 1/2	20-6	7	9-3	17 1/2	2.72	5.10	250	467
78	87	63	11-3	11 1/2	21-6	7	9-7	10 1/2	2.85	5.34	275	531
84	95	67	11-9	8 1/2	22-10	9	9-11	12 1/2	3.08	5.79	290	547
90	103	71	12-7	7 1/2	24-2	11	10-3	15	3.30	6.21	321	591
96	112	75	13-4	12	25-8	8	10-7	16 1/2	3.52	6.65	314	606
102	117	79	13-9	8 1/2	26-6	7	10-11	9 1/2	3.63	6.86	356	672
108	128	83	14-8	8	28-4	12	11-3	11 1/2	3.96	7.51	376	699



HEADWALL FOR THIN - WALL PIPE ARCH

DIMENSIONS / **QUANTITIES**

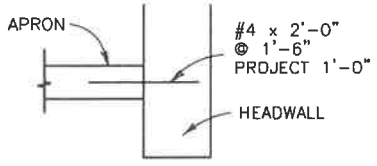
EQV. Ba in.	SPAN ft.-in.	RISE ft.-in	X ft.-in.	A in.	X_1 ft.-in.	A_1 in.	y ft.-in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ■ SGL lbs.	STEEL ■ DBL lbs.
66	6-1	4-7	10-1	10 1/2	19-2	11	8-11	15 1/2	2.52	4.70	232	424
75	7-0	5-1	11-0	10	21-0	10	9-5	9 1/2	2.80	5.25	282	509
84	7-11	5-7	11-11	9 1/2	22-10	9	9-11	12 1/2	3.08	5.79	291	540
93	8-10	6-1	12-10	9	24-8	8	10-5	15 1/2	3.36	6.33	309	622
102	9-9	6-7	13-9	8 1/2	26-6	7	10-11	9 1/2	3.63	6.86	379	673
111	10-11	7-1	14-11	9 1/2	28-10	9	11-5	12 1/2	4.05	7.67	377	711
120	11-10	7-7	15-10	9	30-8	8	11-11	15 1/2	4.36	8.28	395	731
132	12-10	8-4	16-10	9	32-8	8	12-8	11	4.75	9.03	441	839
141	14-1	8-9	18-1	10 1/2	35-2	11	13-1	13 1/2	5.17	9.86	448	931
150	15-4	9-3	19-4	12	37-8	8	13-7	16 1/2	5.69	10.88	490	953
159	15-10	9-10	19-10	9	38-8	8	14-2	11	5.89	11.25	534	1019

HEADWALL FOR STRUCTURAL PLATE ARCH

SKEW ANGLE A°	FACTOR (cosecA°)
90	1.000
85	1.004
80	1.015
75	1.035
70	1.064
65	1.103
60	1.155
55	1.221
50	1.305
45	1.414
40	1.556
35	1.743
30	2.000

SKEW FACTOR TABLE

HEADWALL SHALL BE PERPENDICULAR TO THE CULVERT CENTERLINE UNLESS OTHERWISE SPECIFIED. TABULATED DIMENSIONS AND QUANTITIES MUST BE ADJUSTED FOR SKEWED INSTALLATIONS.



WHEN APRON IS REQUIRED

▲ WHEN TWO OR MORE CONDUITS ARE LAID SIDE BY SIDE, THEY SHALL BE PLACED SO THAT THE ADJACENT PIPES WILL BE 1/2 INSIDE DIAMETER OR 1/2 INSIDE SPAN OR 3 FEET APART (INCLUDING WALL THICKNESS) WHICHEVER IS LESS.

■ ADD 0.89 x (X OR X_1) (LB.) WHEN APRON IS REQUIRED.

GENERAL NOTES

1. CONCRETE SHALL BE CLASS D.
2. HEADWALL SHALL BE PERPENDICULAR TO THE CULVERT ℄ UNLESS OTHERWISE SHOWN ON THE PLANS. TABULATED DIMENSIONS AND QUANTITIES MUST BE ADJUSTED FOR SKEWED INSTALLATIONS.
3. FOR WINGWALL DETAILS, SEE STANDARD M-601-20.
4. VOLUME OCCUPIED BY PIPE HAS BEEN DEDUCTED FROM STEEL AND CONCRETE QUANTITIES.
5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
6. ALL BARS SHALL HAVE A 2" MINIMUM CLEARANCE.
7. YEAR OF CONSTRUCTION STAMPED ON DOWNSTREAM HEADWALL PER CASTLE PINES.

REFERENCE:

CDOT M & S STANDARDS
M-601-10

HEADWALLS FOR PIPE CULVERTS

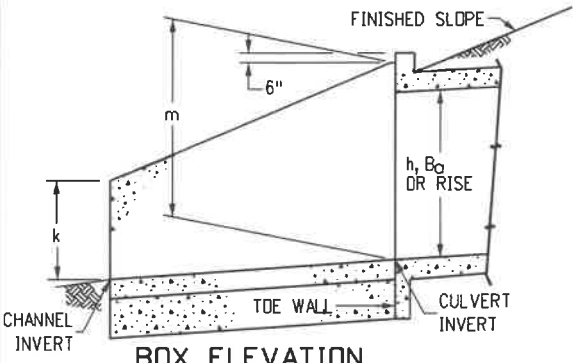
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

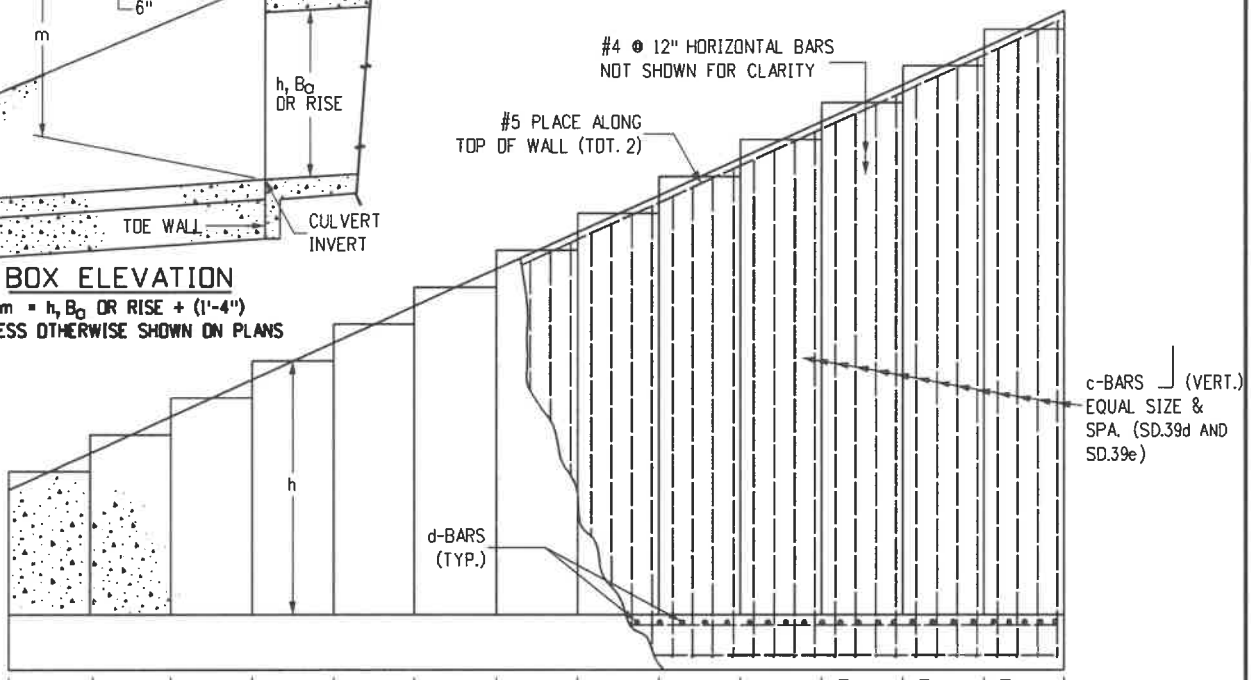
Standard Drawing No.

SD.38b



BOX ELEVATION

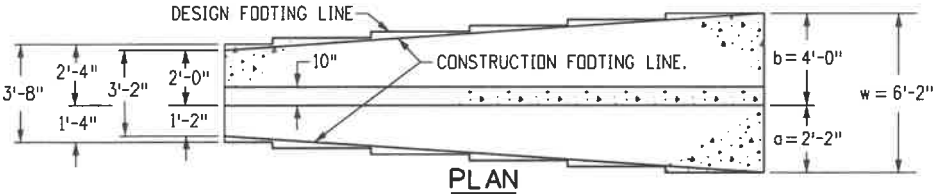
m = h, B_O OR RISE + (1'-4") UNLESS OTHERWISE SHOWN ON PLANS



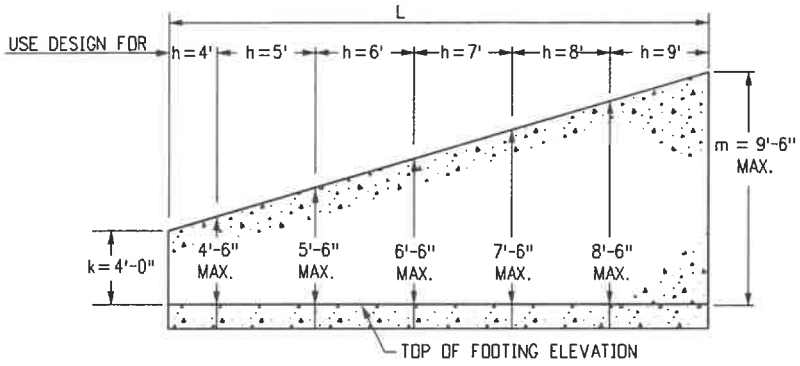
h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	■ 12'	■ 13'	■ 14'
a =	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
b =	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	5'-8"
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"
d-BARS	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#5 @ 11"	#5 @ 10"	#5 @ 10"	#5 @ 8"	#6 @ 8"	#7 @ 9"	#7 @ 7"
* CONC. CY/LF	0.161	0.210	0.259	0.309	0.358	0.407	0.457	0.506	0.556	0.605	0.654	0.704	0.753

* DOES NOT INCLUDE TOE WALL QUANTITIES
SEE STANDARD DETAIL SD.39d AND SD.39e FOR REINFORCING STEEL QUANTITY

■ REQUIRED DRAINAGE BEHIND WINGWALLS
SEE NOTE 6, SD.39c



PLAN



ELEVATION
DESIGN EXAMPLE

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

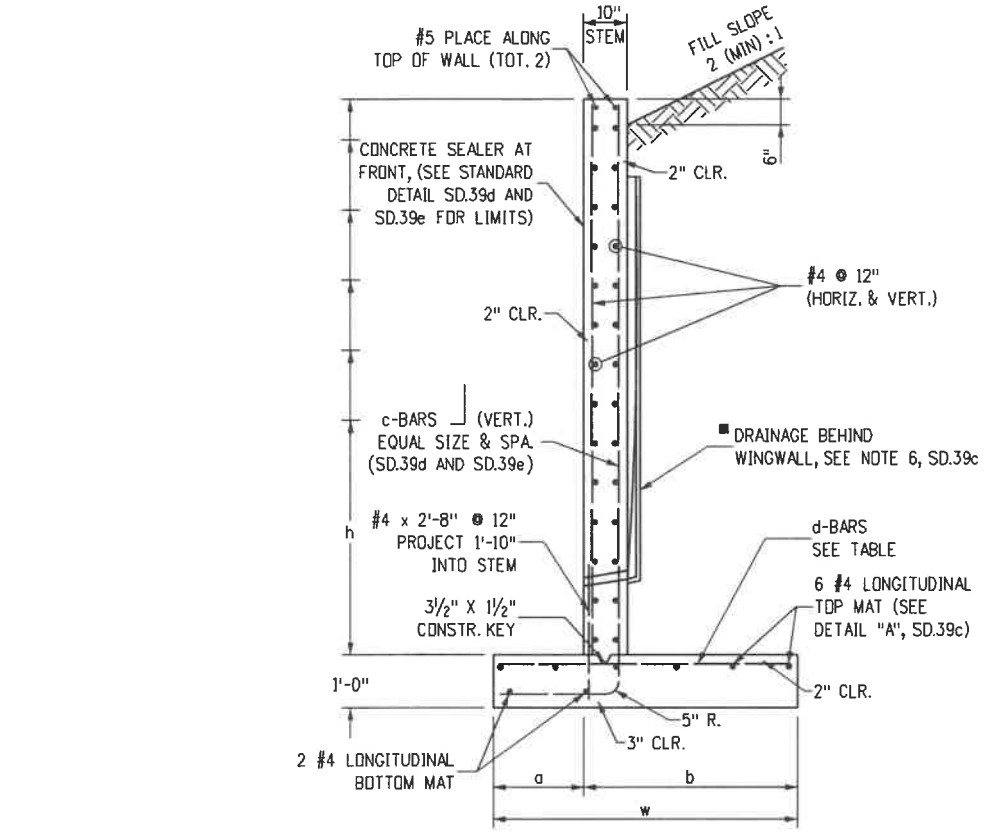
CITY OF
CASTLE PINES

Issued: 6/15/2022

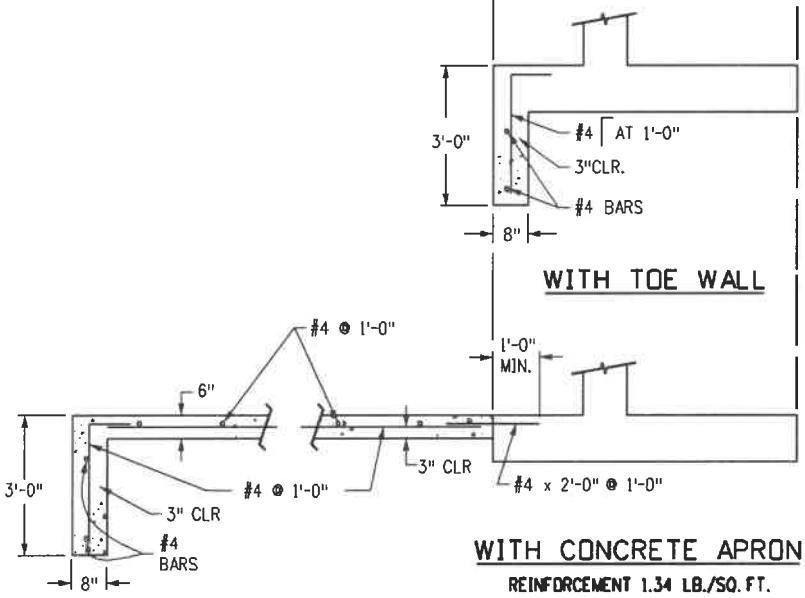
Revised: _____

Standard Drawing No.

SD.39a



TYPICAL SECTION



WITH TOE WALL

WITH CONCRETE APRON

REINFORCEMENT 1.34 LB./SQ. FT.

APRON TOE WALL

QUANTITIES FOR TOE WALL ONLY
CONCRETE 0.049 CU. YD./LIN. FT.
REINFORCEMENT 5.1 LB./LIN. FT.

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.39b

DESIGN DATA:

AASHTO LRFD EIGHTH EDITION, 2017
DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN, YIELD LINE METHOD

REINFORCED CONCRETE:
CONCRETE CLASS D (BOX CULVERT): f'_c = 4,500 PSI
REINFORCING STEEL: f_y = 60,000 PSI

LOADING:
AT-REST EARTH (FLUID) PRESSURE FOR CONCRETE STEM DESIGN = 55 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL

ACTIVE EARTH (FLUID) PRESSURE FOR CONCRETE FOOTING DESIGN = 40 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL

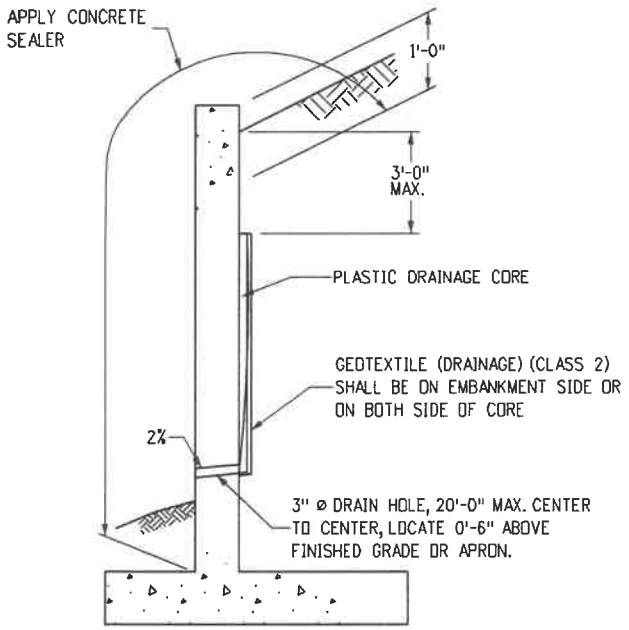
LIVE LOAD SURCHARGE = 2'
MINIMUM RESISTANCE FOR SOIL BEARING = 5.5 KSF
SOIL BEARING RESISTANCE FACTOR = 0.45

GENERAL NOTES:

1. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ IN.
2. WINGWALL FOOTING AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
3. DIMENSIONS "h", "k", "L", "m" AND ANGLE "θ" FOR WINGWALL SHALL BE AS SHOWN ON THE PLANS.
4. MINIMUM CLASS B LAP SPLICE LENGTH FOR BLACK REINFORCING BARS:

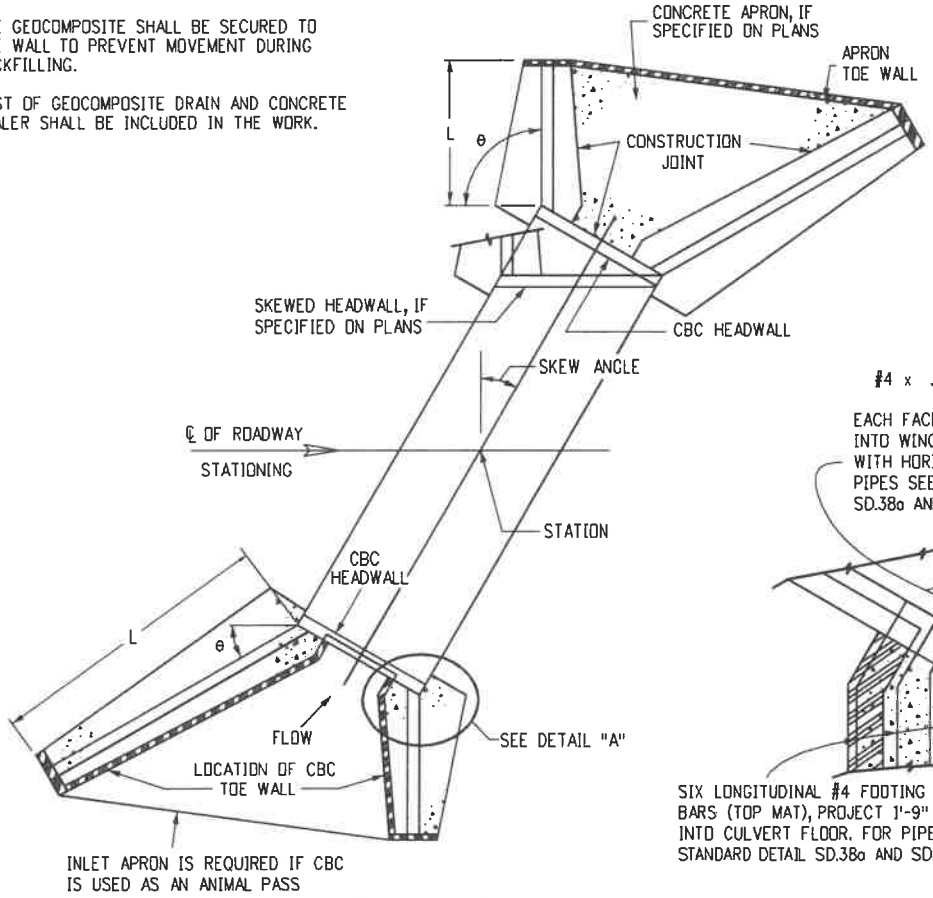
BAR SIZE:	#4	#5	#6	#7
SPLICE LENGTH:	1'- 6"	1'-11"	2'-3"	2'-7"

5. DESIGN DOES NOT CONSIDER ANY SCOUR EFFECTS.
6. WINGWALL DRAIN SHALL BE REQUIRED IF "h" ≥ 12.0 FT., SEE STANDARD DETAIL SD.39d AND SD.39e FOR DETAILS.

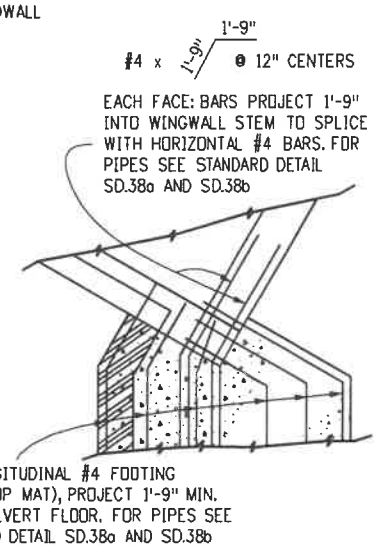


LIMITS OF CONCRETE SEALER AND WINGWALL DRAIN DETAILS

NOTES:
1. THE GEOCOMPOSITE SHALL BE SECURED TO THE WALL TO PREVENT MOVEMENT DURING BACKFILLING.
2. COST OF GEOCOMPOSITE DRAIN AND CONCRETE SEALER SHALL BE INCLUDED IN THE WORK.



TYPICAL CULVERT LAYOUT



DETAIL "A"

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.39c

c-BARS AND REINFORCING STEEL QUANTITY
(EXCLUDE TOE WALL)

L (MULTIPLE OF m)		≤ (1.0 x m)		≤ (1.25 x m)		≤ (1.5 x m)		≤ (1.75 x m)	
m (FT)	k (FT)	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.
14	4	#4 @ 10"	53.60	#5 @ 10"	57.95	#5 @ 10"	57.10	#5 @ 8"	60.22
	5	#4 @ 10"	55.86	#5 @ 10"	60.46	#5 @ 10"	59.60	#5 @ 8"	62.89
	6	#5 @ 10"	64.43	#6 @ 10"	70.60	#6 @ 10"	69.69	#6 @ 8"	74.93
	7	#5 @ 10"	67.29	#6 @ 10"	73.76	#6 @ 10"	72.83	#6 @ 8"	78.32
	8	#5 @ 8"	74.71	#6 @ 8"	83.46	#6 @ 7"	87.09	#6 @ 6"	92.54
	9	#5 @ 8"	78.10	#6 @ 8"	87.23	#6 @ 7"	91.03	#6 @ 6"	96.72
13	4	#4 @ 10"	50.51	#4 @ 10"	49.25	#5 @ 10"	53.71	#5 @ 10"	53.09
	5	#4 @ 10"	52.66	#4 @ 10"	51.37	#5 @ 10"	56.09	#5 @ 10"	55.46
	6	#4 @ 10"	54.92	#5 @ 10"	59.48	#5 @ 9"	60.31	#6 @ 9"	67.56
	7	#4 @ 10"	57.36	#5 @ 10"	62.16	#5 @ 9"	63.05	#6 @ 9"	70.66
	8	#5 @ 10"	66.39	#6 @ 10"	72.82	#6 @ 8"	77.97	#6 @ 7"	81.68
	9	#5 @ 10"	69.37	#6 @ 10"	76.10	#6 @ 8"	81.49	#6 @ 7"	85.37
12	2	#4 @ 10"	43.91	#4 @ 10"	42.65	#4 @ 10"	41.82	#4 @ 10"	41.22
	3	#4 @ 10"	45.82	#4 @ 10"	44.55	#4 @ 10"	43.71	#4 @ 10"	43.11
	4	#4 @ 10"	47.80	#4 @ 10"	46.51	#4 @ 10"	45.65	#5 @ 10"	50.06
	5	#4 @ 10"	49.84	#4 @ 10"	48.53	#4 @ 10"	47.66	#5 @ 10"	52.33
	6	#4 @ 10"	51.99	#4 @ 10"	50.65	#5 @ 10"	55.34	#5 @ 8"	58.41
	7	#4 @ 10"	54.30	#5 @ 10"	58.80	#5 @ 10"	57.87	#5 @ 8"	61.10
	8	#5 @ 10"	62.91	#5 @ 10"	61.45	#5 @ 7"	67.46	#5 @ 6"	70.68
	9	#5 @ 10"	65.64	#5 @ 10"	64.15	#5 @ 7"	70.44	#5 @ 6"	73.82
11	2	#4 @ 10"	41.70	#4 @ 10"	40.42	#4 @ 10"	39.57	#4 @ 10"	38.96
	3	#4 @ 10"	43.57	#4 @ 10"	42.27	#4 @ 10"	41.40	#4 @ 10"	40.79
	4	#4 @ 10"	45.48	#4 @ 10"	44.16	#4 @ 10"	43.28	#4 @ 10"	42.66
	5	#4 @ 10"	47.46	#4 @ 10"	46.10	#4 @ 10"	45.21	#4 @ 10"	44.58
	6	#4 @ 10"	49.52	#4 @ 10"	48.14	#4 @ 9"	48.23	#5 @ 10"	51.88
	7	#4 @ 10"	51.73	#4 @ 10"	50.31	#4 @ 9"	50.43	#5 @ 10"	54.29
	8	#4 @ 10"	54.00	#5 @ 10"	58.44	#5 @ 10"	57.45	#5 @ 8"	60.64
	9	#4 @ 10"	56.20	#5 @ 10"	60.87	#5 @ 10"	59.85	#5 @ 8"	63.21
10	2	#4 @ 10"	39.84	#4 @ 10"	38.53	#4 @ 10"	37.65	#4 @ 10"	37.03
	3	#4 @ 10"	41.68	#4 @ 10"	40.35	#4 @ 10"	39.47	#4 @ 10"	38.84
	4	#4 @ 10"	43.58	#4 @ 10"	42.22	#4 @ 10"	41.31	#4 @ 10"	40.67
	5	#4 @ 10"	45.53	#4 @ 10"	44.14	#4 @ 10"	43.21	#4 @ 10"	42.56
	6	#4 @ 10"	47.58	#4 @ 10"	46.14	#4 @ 10"	45.20	#4 @ 10"	44.53
	7	#4 @ 10"	49.79	#4 @ 10"	48.31	#4 @ 10"	47.34	#5 @ 10"	51.97
	8	#4 @ 10"	52.06	#4 @ 10"	50.54	#4 @ 10"	49.54	#5 @ 10"	54.43
9	2	#4 @ 10"	38.01	#4 @ 10"	36.75	#4 @ 10"	35.85	#4 @ 10"	35.21
	3	#4 @ 10"	39.93	#4 @ 10"	38.56	#4 @ 10"	37.64	#4 @ 10"	36.99
	4	#4 @ 10"	41.81	#4 @ 10"	40.40	#4 @ 10"	39.47	#4 @ 10"	38.81
	5	#4 @ 10"	43.75	#4 @ 10"	42.30	#4 @ 10"	41.35	#4 @ 10"	40.67
	6	#4 @ 10"	45.79	#4 @ 10"	44.30	#4 @ 10"	43.31	#4 @ 10"	42.62
	7	#4 @ 10"	48.04	#4 @ 10"	46.50	#4 @ 10"	45.49	#4 @ 10"	44.77
	8	#4 @ 10"	50.43	#4 @ 10"	48.84	#4 @ 10"	47.80	#4 @ 10"	47.06
8	2	#4 @ 10"	36.41	#4 @ 10"	35.01	#4 @ 10"	34.08	#4 @ 10"	33.42
	3	#4 @ 10"	38.23	#4 @ 10"	36.80	#4 @ 10"	35.85	#4 @ 10"	35.18
	4	#4 @ 10"	40.09	#4 @ 10"	38.61	#4 @ 10"	37.64	#4 @ 10"	36.95
	5	#4 @ 10"	41.99	#4 @ 10"	40.47	#4 @ 10"	39.47	#4 @ 10"	38.76
	6	#4 @ 10"	43.97	#4 @ 10"	42.40	#4 @ 10"	41.36	#4 @ 10"	40.64
	7	#4 @ 10"	46.19	#4 @ 10"	44.56	#4 @ 10"	43.49	#4 @ 10"	42.74
7	2	#4 @ 10"	34.90	#4 @ 10"	33.44	#4 @ 10"	32.47	#4 @ 10"	31.78
	3	#4 @ 10"	36.73	#4 @ 10"	35.23	#4 @ 10"	34.23	#4 @ 10"	33.53
	4	#4 @ 10"	38.59	#4 @ 10"	37.04	#4 @ 10"	36.01	#4 @ 10"	35.29
	5	#4 @ 10"	40.48	#4 @ 10"	38.86	#4 @ 10"	37.80	#4 @ 10"	37.06
	6	#4 @ 10"	42.39	#4 @ 10"	40.71	#4 @ 10"	39.61	#4 @ 10"	38.84

* REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

EXAMPLE:

SELECT THE c-BARS SIZE, SPACING AND STEEL QUANTITY FOR A 25.0 FEET LONG WINGWALL WITH m = 11.8 FT. AND k = 6.3 FT.

SOLUTION:

1. DETERMINE WINGWALL LENGTH IN MULTIPLE OF m:
   L / m = 25.0 / 11.8 = 2.12
   L = (2.12 x m), USE L ≤ (2.25 x m)
2. ROUND TO REAREST WHOLE NUMBER FOR m AND k:
   m = 11.8 FT., USE m = 12.0 FT.
   k = 6.3 FT., USE k = 6.0 FT.
3. DETERMINE c-BARS BY USING THE TABLE:
   L ≤ (2.25 x m)
   m = 12
   k = 6
   c-BARS: #6 @ 10"
   REINF. STEEL = 60.60 LB / LF
4. DETERMINE REINFORCING STEEL QUANTITY OF WHOLE WINGWALL:
   REINFORCING STEEL QUANTITY =
   25.0 x 60.60 = 1,515 LB.

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

CITY OF CASTLE PINES

Issued: 6/15/2022

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Standard Drawing No.

SD.39d

c-BARS AND REINFORCING STEEL QUANTITY
(EXCLUDE TOE WALL)

L (MULTIPLE OF m)		≤ (2.0 x m)		≤ (2.25 x m)		≤ (2.5 x m)		≤ (2.75 x m)		≤ (3.0 x m)		≤ (3.25 x m)		≤ (3.5 x m)	
m (FT)	k (FT)	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.
14	4	#5 @ 7"	62.43	#5 @ 7"	62.09	#5 @ 6"	65.38	#5 @ 6"	65.15	#6 @ 8"	67.10	#6 @ 8"	66.94	#6 @ 7"	70.66
	5	#5 @ 7"	65.23	#5 @ 7"	64.88	#5 @ 6"	68.34	#5 @ 6"	68.11	#6 @ 8"	70.17	#6 @ 8"	70.00	#6 @ 7"	73.90
	6	#6 @ 8"	74.45	#6 @ 7"	78.30	#6 @ 6"	83.64	#6 @ 6"	83.40	#6 @ 6"	83.22	#6 @ 6"	83.05	#7 @ 7"	89.64
	7	#6 @ 8"	77.84	#6 @ 7"	81.87	#6 @ 6"	87.45	#6 @ 6"	87.21	#6 @ 6"	87.02	#6 @ 6"	86.86	#7 @ 7"	93.73
	8	#7 @ 7"	99.47	#7 @ 7"	99.08	#7 @ 6"	107.11	#7 @ 6"	106.86	#7 @ 6"	106.66	#7 @ 6"	106.49	#7 @ 6"	106.35
	9	#7 @ 7"	103.93	#7 @ 7"	103.54	#7 @ 6"	111.90	#7 @ 6"	111.65	#7 @ 6"	111.45	#7 @ 6"	111.28	#7 @ 6"	111.13
13	4	#5 @ 10"	52.36	#5 @ 9"	53.85	#5 @ 8"	55.54	#5 @ 7"	57.85	#5 @ 7"	57.67	#5 @ 7"	57.51	#6 @ 9"	59.93
	5	#5 @ 10"	54.99	#5 @ 9"	56.29	#5 @ 8"	58.08	#5 @ 7"	60.51	#5 @ 7"	60.33	#5 @ 7"	60.17	#6 @ 9"	62.72
	6	#6 @ 9"	67.08	#6 @ 9"	66.70	#6 @ 8"	69.53	#6 @ 8"	69.28	#6 @ 7"	73.12	#6 @ 7"	72.95	#6 @ 7"	72.81
	7	#6 @ 9"	70.16	#6 @ 9"	69.78	#6 @ 8"	72.75	#6 @ 8"	72.50	#6 @ 7"	76.52	#6 @ 7"	76.35	#6 @ 7"	76.20
	8	#6 @ 7"	81.19	#6 @ 6"	86.67	#6 @ 6"	86.37	#7 @ 7"	93.18	#7 @ 7"	92.97	#7 @ 7"	92.80	#7 @ 7"	92.64
	9	#6 @ 7"	84.87	#6 @ 6"	90.59	#6 @ 6"	90.29	#7 @ 7"	97.39	#7 @ 7"	97.18	#7 @ 7"	97.00	#7 @ 7"	96.85
12	2	#4 @ 10"	40.78	#4 @ 9"	41.29	#5 @ 10"	44.61	#5 @ 10"	44.37	#5 @ 10"	44.18	#5 @ 10"	44.01	#5 @ 10"	43.87
	3	#4 @ 10"	42.66	#4 @ 9"	43.22	#5 @ 10"	46.75	#5 @ 10"	46.51	#5 @ 10"	46.32	#5 @ 10"	46.15	#5 @ 10"	46.01
	4	#5 @ 10"	49.59	#5 @ 10"	49.23	#5 @ 10"	48.94	#5 @ 10"	48.69	#5 @ 9"	50.00	#5 @ 8"	51.72	#5 @ 8"	51.57
	5	#5 @ 10"	51.85	#5 @ 10"	51.48	#5 @ 10"	51.19	#5 @ 10"	50.94	#5 @ 9"	52.33	#5 @ 8"	54.14	#5 @ 8"	54.00
	6	#5 @ 8"	57.93	#6 @ 10"	60.60	#6 @ 10"	60.29	#6 @ 9"	62.42	#6 @ 9"	62.22	#6 @ 9"	62.04	#6 @ 8"	64.89
	7	#5 @ 8"	60.61	#6 @ 10"	63.43	#6 @ 10"	63.11	#6 @ 9"	65.35	#6 @ 9"	65.15	#6 @ 9"	64.97	#6 @ 8"	67.96
	8	#5 @ 6"	70.20	#6 @ 7"	76.44	#6 @ 7"	76.13	#6 @ 7"	75.87	#6 @ 6"	81.30	#6 @ 6"	81.12	#6 @ 6"	80.98
	9	#5 @ 6"	73.33	#6 @ 7"	79.86	#6 @ 7"	79.54	#6 @ 7"	79.28	#6 @ 6"	84.95	#6 @ 6"	84.77	#6 @ 6"	84.62
11	2	#4 @ 10"	38.50	#4 @ 10"	38.15	#4 @ 10"	37.87	#4 @ 10"	37.63	#4 @ 9"	38.25	#5 @ 10"	41.46	#5 @ 10"	41.31
	3	#4 @ 10"	40.33	#4 @ 10"	39.97	#4 @ 10"	39.69	#4 @ 10"	39.45	#4 @ 9"	40.12	#5 @ 10"	43.54	#5 @ 10"	43.39
	4	#4 @ 9"	43.09	#5 @ 10"	46.57	#5 @ 10"	46.27	#5 @ 10"	46.02	#5 @ 10"	45.82	#5 @ 10"	45.65	#5 @ 10"	45.50
	5	#4 @ 9"	45.06	#5 @ 10"	48.74	#5 @ 10"	48.44	#5 @ 10"	48.19	#5 @ 10"	47.99	#5 @ 10"	47.81	#5 @ 10"	47.67
	6	#5 @ 10"	51.38	#5 @ 9"	52.57	#5 @ 9"	52.27	#5 @ 8"	53.99	#5 @ 8"	53.79	#5 @ 7"	56.16	#5 @ 7"	56.01
	7	#5 @ 10"	53.78	#5 @ 9"	55.04	#5 @ 9"	54.73	#5 @ 8"	56.55	#5 @ 8"	56.35	#5 @ 7"	58.84	#5 @ 7"	58.70
	8	#5 @ 7"	62.92	#5 @ 6"	66.25	#5 @ 6"	65.94	#5 @ 6"	65.69	#6 @ 8"	67.76	#6 @ 8"	67.57	#6 @ 7"	71.45
	9	#5 @ 7"	65.60	#5 @ 6"	69.09	#5 @ 6"	68.78	#5 @ 6"	68.52	#6 @ 8"	70.69	#6 @ 8"	70.51	#6 @ 7"	74.57
10	2	#4 @ 10"	36.57	#4 @ 10"	36.20	#4 @ 10"	35.91	#4 @ 10"	35.67	#4 @ 10"	35.48	#4 @ 9"	36.07	#4 @ 9"	35.93
	3	#4 @ 10"	38.36	#4 @ 10"	38.00	#4 @ 10"	37.71	#4 @ 10"	37.46	#4 @ 10"	37.27	#4 @ 9"	37.91	#4 @ 9"	37.76
	4	#4 @ 10"	40.19	#4 @ 10"	39.82	#4 @ 10"	39.53	#4 @ 10"	39.28	#4 @ 10"	39.08	#4 @ 9"	39.77	#4 @ 9"	39.63
	5	#4 @ 10"	42.07	#5 @ 10"	46.44	#5 @ 10"	46.13	#5 @ 10"	45.87	#5 @ 10"	45.67	#5 @ 10"	45.49	#5 @ 10"	45.34
	6	#4 @ 10"	44.03	#5 @ 10"	48.67	#5 @ 10"	48.35	#5 @ 10"	48.08	#5 @ 10"	47.88	#5 @ 10"	47.69	#5 @ 10"	47.54
	7	#5 @ 10"	51.45	#5 @ 10"	51.04	#5 @ 9"	52.29	#5 @ 9"	52.03	#5 @ 8"	53.79	#5 @ 8"	53.61	#5 @ 7"	56.00
	8	#5 @ 10"	53.89	#5 @ 10"	53.47	#5 @ 9"	54.80	#5 @ 9"	54.53	#5 @ 8"	56.39	#5 @ 8"	56.20	#5 @ 7"	58.72
9	2	#4 @ 10"	34.73	#4 @ 10"	34.36	#4 @ 10"	34.06	#4 @ 10"	33.81	#4 @ 10"	33.61	#4 @ 10"	33.44	#4 @ 10"	33.30
	3	#4 @ 10"	36.51	#4 @ 10"	36.13	#4 @ 10"	35.83	#4 @ 10"	35.58	#4 @ 10"	35.38	#4 @ 10"	35.21	#4 @ 10"	35.06
	4	#4 @ 10"	38.31	#4 @ 10"	37.93	#4 @ 10"	37.63	#4 @ 10"	37.37	#4 @ 10"	37.17	#4 @ 10"	36.99	#4 @ 10"	36.84
	5	#4 @ 10"	40.17	#4 @ 10"	39.78	#4 @ 10"	39.47	#4 @ 10"	39.20	#4 @ 9"	39.86	#5 @ 10"	43.28	#5 @ 10"	43.12
	6	#4 @ 10"	42.10	#4 @ 10"	41.71	#4 @ 10"	41.39	#4 @ 10"	41.12	#4 @ 9"	41.82	#5 @ 10"	45.46	#5 @ 10"	45.30
	7	#5 @ 10"	49.29	#5 @ 10"	48.86	#5 @ 10"	48.53	#5 @ 10"	48.24	#5 @ 10"	48.03	#5 @ 10"	47.84	#5 @ 10"	47.67
	8	#5 @ 10"	51.83	#5 @ 10"	51.40	#5 @ 10"	51.05	#5 @ 10"	50.77	#5 @ 10"	50.54	#5 @ 10"	50.35	#5 @ 10"	50.18
8	2	#4 @ 10"	32.92	#4 @ 10"	32.54	#4 @ 10"	32.23	#4 @ 10"	31.97	#4 @ 10"	31.77	#4 @ 10"	31.59	#4 @ 10"	31.44
	3	#4 @ 10"	34.67	#4 @ 10"	34.28	#4 @ 10"	33.97	#4 @ 10"	33.70	#4 @ 10"	33.50	#4 @ 10"	33.32	#4 @ 10"	33.17
	4	#4 @ 10"	36.44	#4 @ 10"	36.04	#4 @ 10"	35.72	#4 @ 10"	33.45	#4 @ 10"	35.25	#4 @ 10"	35.07	#4 @ 10"	34.91
	5	#4 @ 10"	38.24	#4 @ 10"	37.83	#4 @ 10"	37.50	#4 @ 10"	37.23	#4 @ 10"	37.02	#4 @ 10"	36.84	#4 @ 10"	36.68
	6	#4 @ 10"	40.10	#4 @ 10"	39.68	#4 @ 10"	39.35	#4 @ 10"	39.07	#4 @ 9"	43.33	#5 @ 10"	43.13	#5 @ 10"	42.96
	7	#4 @ 10"	42.18	#4 @ 10"	41.75	#4 @ 10"	41.41	#4 @ 10"	41.13	#4 @ 9"	45.65	#5 @ 10"	45.45	#5 @ 10"	45.28
7	2	#4 @ 10"	31.27	#4 @ 10"	30.86	#4 @ 10"	30.54	#4 @ 10"	30.27	#4 @ 10"	30.06	#4 @ 10"	29.88	#4 @ 10"	29.72
	3	#4 @ 10"	33.00	#4 @ 10"	32.59	#4 @ 10"	32.26	#4 @ 10"	31.99	#4 @ 10"	31.78	#4 @ 10"	31.59	#4 @ 10"	31.43
	4	#4 @ 10"	34.75	#4 @ 10"	34.33	#4 @ 10"	33.99	#4 @ 10"	33.71	#4 @ 10"	33.50	#4 @ 10"	33.31	#4 @ 10"	33.14
	5	#4 @ 10"	36.50	#4 @ 10"	36.07	#4 @ 10"	35.73	#4 @ 10"	35.44	#4 @ 10"	35.22	#4 @ 10"	35.03	#4 @ 10"	34.86
	6	#4 @ 10"	38.26	#4 @ 10"	37.82	#4 @ 10"	37.47	#4 @ 10"	37.17	#4 @ 10"	36.95	#4 @ 10"	36.75	#4 @ 10"	36.58

* REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

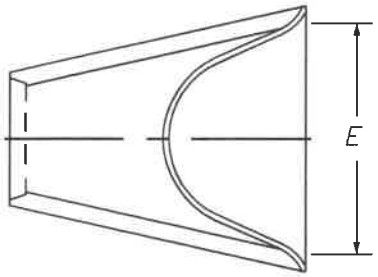
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

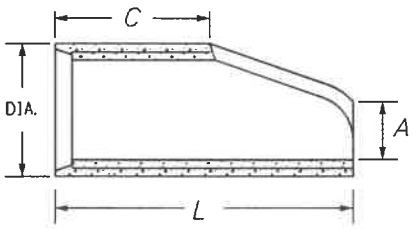
SD.39e



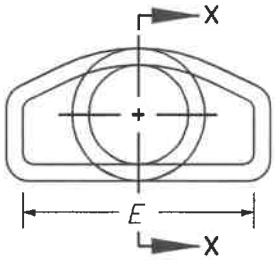
PLAN

PIPE I.D.	DIMENSIONS			
	A	C	L	E
	IN.			
18	10	48	78	36
24	10	48	78	48
30	14	36	96	60
36	18	36	96	72
42	24	36	96	78
48	28	24	96	84
54	30	36	96	90
60	36	36	96	96
72	34	20	96	108

REINFORCED CONCRETE CIRCULAR PIPE



SECTION X-X



END VIEW

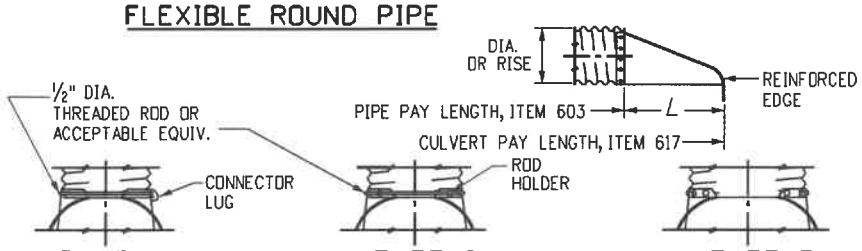
GENERAL NOTES

1. DIMENSIONS OF END SECTIONS MAY VARY SLIGHTLY FROM THOSE SHOWN ON THE TABLES DUE TO DIFFERENT MANUFACTURERS' CONFIGURATIONS.
2. CONCRETE END SECTIONS SHALL BE FURNISHED WITH TONGUE OR GROOVE AS REQUIRED.
3. DESIGN LENGTH OF PIPE OR SIDE DRAIN IS BASED ON LENGTH OF END SECTION SHOWN IN TABLE. ANY ADDITIONAL PIPE REQUIRED TO PROVIDE THE DESIGN LENGTH SHALL BE FURNISHED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE PROJECT.
4. THE INSIDE CONFIGURATION AND THE JOINT OF CONCRETE END SECTION AND PIPE SHALL MATCH.
5. END SECTIONS FOR CMP ARCH PIPE SHALL MATCH THE DIMENSIONS OF THE PIPE SHOWN ON THE PLANS.
6. GALVANIZED TOE PLATE AS SHOWN IS REQUIRED ON END SECTIONS FOR CORRUGATED STEEL PIPE AND SHALL BE THE SAME THICKNESS AS END SECTIONS. TOE PLATE SHALL BE FIELD-BOLTED TO END SECTION WITH ⅜ IN. GALVANIZED BOLTS, NUTS AND WASHERS.
7. GALVANIZED STEEL SHALL CONFORM TO AASHTO M 111, M 218 OR M 232.
8. CONCRETE PIPE JOINT FASTENERS, WHERE SHOWN ON PLANS, SHALL BE INSTALLED SO THAT A MINIMUM OF 15 LINEAR FEET OF THE OUTLET END OF THE PIPE ARE MECHANICALLY LOCKED TOGETHER. END SECTION LENGTHS WHEN USED, SHALL BE INCLUDED IN THE 15 LF REQUIREMENT.
9. CONNECTIONS OF METAL END SECTIONS TO PLASTIC PIPE SHALL BE APPROVED BY THE ENGINEER. PLASTIC END SECTIONS SHALL NOT BE USED.
10. THE END SECTION STYLE, EITHER REGULAR OR SAFETY, SHALL BE AS SHOWN ON THE PLANS.
11. AT THE OPTION OF THE CONTRACTOR AND APPROVAL OF THE CDOT PROJECT ENGINNER, REINFORCED CONCRETE END SECTIONS MAY BE MADE WITH SYNTHETIC FIBERS INSTEAD OF STEEL FOR PIPES 36 INCHES IN DIAMETER AND SMALLER, AND CONFORM TO AASHTO M 86 AND SUBSECTION 601.03.

END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE

PIPE DIA.	THICKNESS	DIMENSIONS					
		A	B	H	L	W	T
		IN.					
12	0.064	6	6	6	21	24	34
18	0.064	8	10	6	31	36	46
21	0.064	9	12	6	36	42	52
24	0.064	10	13	6	41	48	58
30	0.079	12	16	8	51	60	70
36	0.079	14	19	9	60	72	94
42	0.109	16	22	11	69	84	106
48	0.109	18	27	12	78	90	112
54	0.109	18	30	12	84	102	124
60	0.109	18	33	12	87	114	136
66	0.109	18	36	12	87	120	142
72	0.109	18	39	12	87	126	148
78	0.109	18	42	12	87	132	154
84	0.109	18	45	12	87	138	160

FLEXIBLE ROUND PIPE



TYPE 1

FOR 18 IN. THRU 24 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY-FORMED PIPE UNLESS RECORRUGATED.

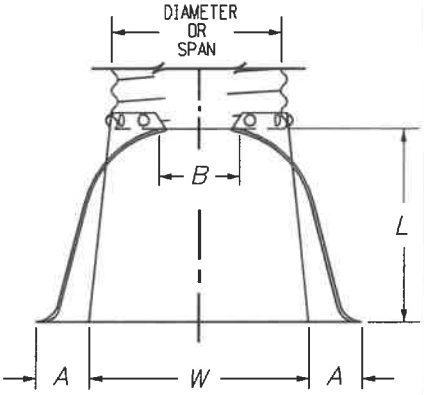
TYPE 2

FOR 30 IN. THRU 36 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY-FORMED PIPE UNLESS RECORRUGATED.

TYPE 3

FOR 42 IN. THRU 84 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS AND ALL SIZES WITH HELICAL CORRUGATIONS AND FOR ALL METAL PIPE ARCH CULVERTS. SHOP ATTACH A 24 IN. MIN. LENGTH OF ANNULAR PIPE WITH GALV. RIVETS OR BOLTS, SPOT WELDS, OR 2 IN. LONG SKIP WELDS ON 8 IN. CTRS. REPAIR BURNT GALVANIZING IN ACCORDANCE WITH SUBSECTION 707.09.

TYPICAL CONNECTIONS



PLAN VIEW

END SECTION AND CONNECTION DETAILS FOR ROUND AND ARCH METAL PIPES

REFERENCE:

CDOT M & S STANDARDS
M-603-10

CONCRETE OR METAL END SECTIONS

CITY OF CASTLE PINES

Issued: 6/15/2022

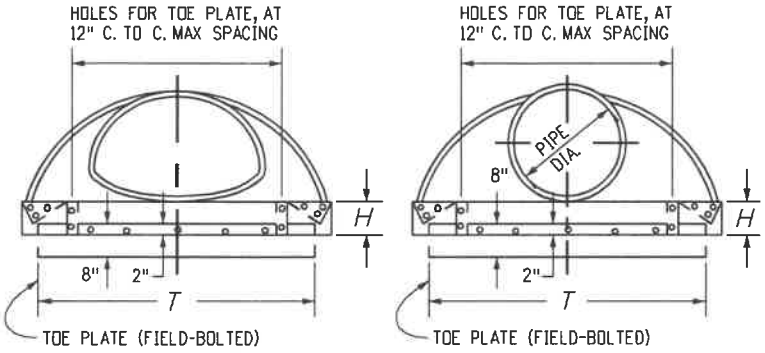
Revised: _____

Standard Drawing No.

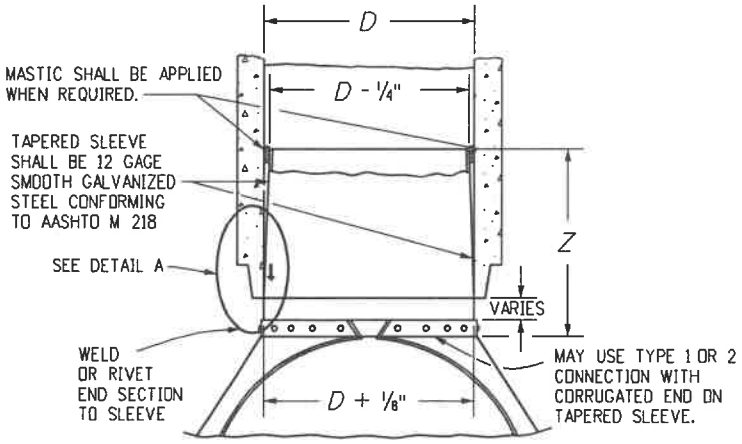
SD.40a

PIPE ARCH SPAN x RISE	THICK-NESS	DIMENSIONS A (±1")	B (MAX.)	H (±1")	L (±1.5")	W (±2")	T
		IN.					
21 x 15	0.064	7	10	6	23	36	46
24 x 18	0.064	8	12	6	28	42	52
28 x 20	0.064	9	14	6	32	48	58
35 x 24	0.079	10	16	6	39	60	70
42 x 29	0.079	12	18	8	46	75	85
49 x 33	0.109	13	21	9	53	85	103
57 x 38	0.109	18	26	12	63	90	108
64 x 43	0.109	18	30	12	70	102	120
71 x 47	0.109	18	33	12	77	114	132

FLEXIBLE PIPE ARCH



ELEVATIONS

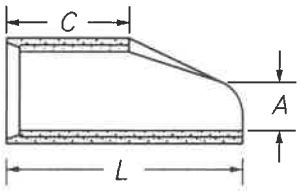


NOTE: METAL END SECTION SHALL BE FIRMLY WEDGED INTO PIPE END BEFORE BACKFILLING.

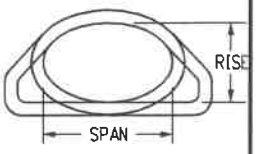
D	Z (MIN.)
IN.	
18 - 24	12
30 AND 36	16
42 AND LARGER	24

STEEL END SECTION FOR CONCRETE CIRCULAR PIPE

(ALTERNATIVE FOR CONCRETE END SECTION)



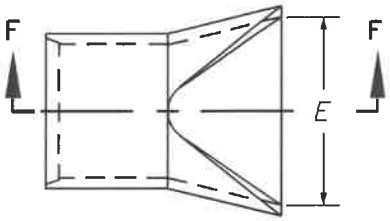
SECTION F-F



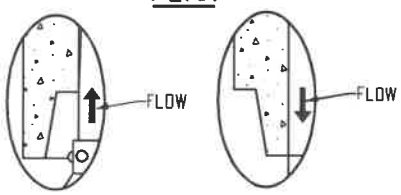
END VIEW

EQUIVALENT CIRCULAR DIA.	DIMENSIONS NOMINAL SPAN x RISE	A	C	L	E
	IN.				
24	30	19	9	33	72	48
30	38	24	10	18	72	60
36	45	29	12	24	84	72
42	53	34	16	36	96	78
48	60	38	21	36	96	84
54	68	43	26	36	96	90
60	76	48	30	36	96	96

END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE



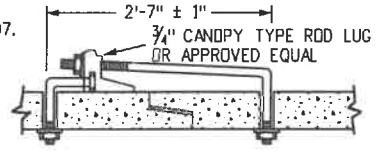
PLAN

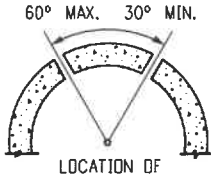


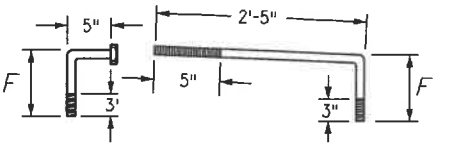
DETAIL A

PIPE DIAMETER	F
IN.	
18 - 30	5
36 - 42	6
48 - 60	7
72 - 84	9

¾" GALVANIZED ANCHOR BOLTS, NUTS AND WASHERS, MILD STEEL, ASTM A 307. ROD LUG SHALL BE GALVANIZED OR COATED WITH EPOXY PAINT OR APPROVED EQUAL.







CONCRETE JOINT FASTENER (TWO PER JOINT)

REFERENCE:

CDOT M & S STANDARDS
M-603-10

CONCRETE OR METAL END SECTIONS

CITY OF CASTLE PINES

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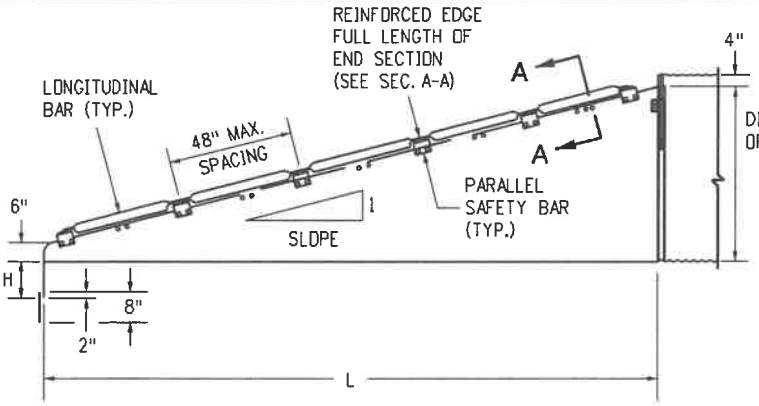
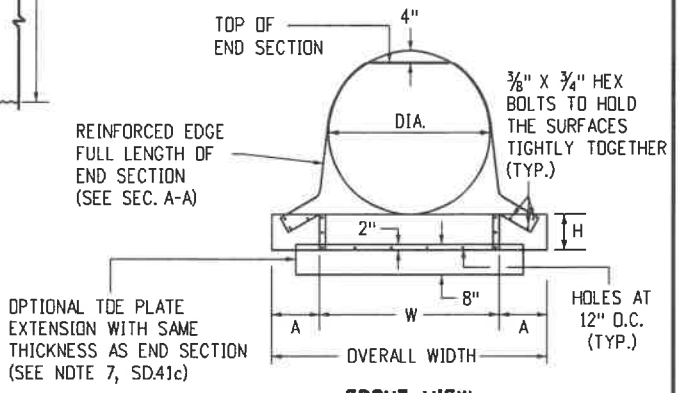
Standard Drawing No.

SD.40b



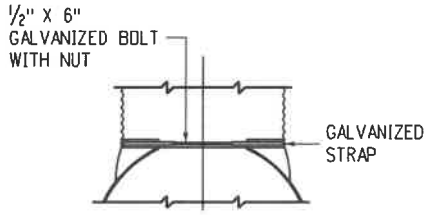
ELEVATION VIEW

CROSS DRAINAGE END SECTION



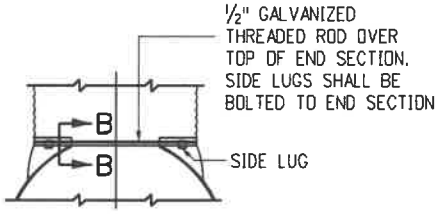
FRONT VIEW

ROUND PIPE CULVERT



FOR ROUND AND ELLPTICAL PIPES
WITH 24 INCHES OR LESS DIAMETERS

TYPE 1

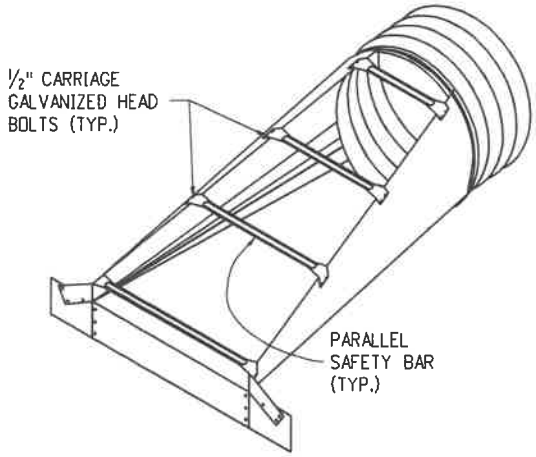


FOR ROUND AND ELLPTICAL PIPES
WITH 30 INCHES OR GREATER DIAMETERS

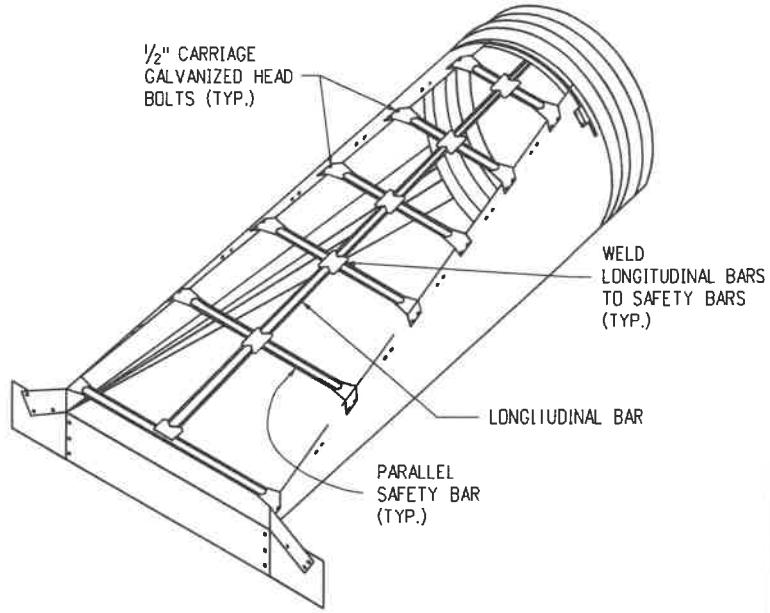
TYPE 2

CONNECTOR DETAILS

NOTE: SIZES THRU 24" ATTACH TO PIPE WITH TYPE 1 STRAPS.
ALL OTHER SIZES ATTACH WITH TYPE 2 RODS AND LUGS.



PARALLEL DRAINAGE END SECTION

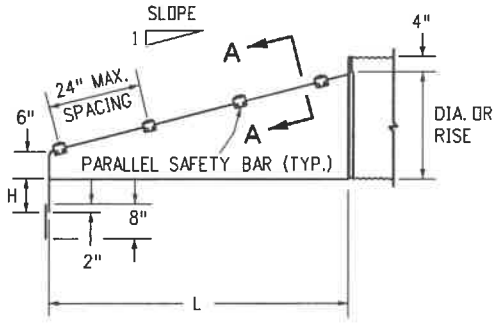


CROSS DRAINAGE END SECTION

REFERENCE:	TRAVERSABLE END SECTIONS AND SAFETY GRATES	Issued: 6/15/2022
CDOT M & S STANDARDS M-603-12	CITY OF CASTLE PINES	Revised:
		Standard Drawing No. SD.41a

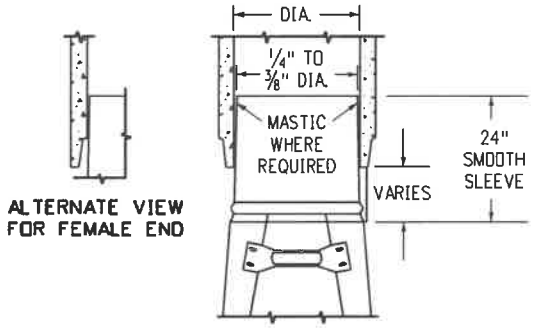
GENERAL NOTES

1. USE END SECTIONS ON 1V:4H TO 1V:6H SLOPES ONLY. USE TOE PLATE EXTENSION WHERE SHOWN ON THE PLANS.
2. FABRICATE SAFETY AND LONGITUDINAL BARS FROM STEEL PIPE CONFORMING TO ASTM A53 SCHEDULE 40 SPECIFICATIONS. GALVANIZE BARS HOT DIPPED AFTER FABRICATION.
3. A LONGITUDINAL BAR IS REQUIRED FOR CROSS DRAINAGE END SECTIONS WHEN THE SPAN IS GREATER THAN 30 INCHES. USE ADDITIONAL LONGITUDINAL BARS IF SPACING EXCEEDS 30 INCHES ON LARGER END SECTIONS.
4. SAFETY AND LONGITUDINAL BARS ARE NOT REQUIRED ON 30 INCHES AND SMALLER CROSS DRAINAGE END SECTIONS.
5. SAFETY BARS ARE NOT REQUIRED ON 18 INCHES AND SMALLER PARALLEL DRAINAGE END SECTIONS.
6. WHEN REQUIRED, TOE PLATE EXTENSIONS SHALL BE THE SAME GAGE AS END SECTIONS. DIMENSIONS SHALL BE OVERALL WIDTH LESS 6 INCHES BY 8 INCHES HIGH.



ELEVATION VIEW

PARALLEL DRAINAGE END SECTION

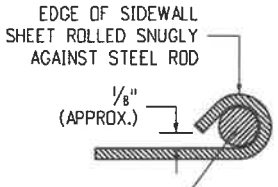


FOR ALL SIZES OF CONCRETE ROUND OR PIPE ARCHES

TAPER SLEEVE CONNECTION

METAL END SECTIONS FOR ROUND PIPE CULVERT

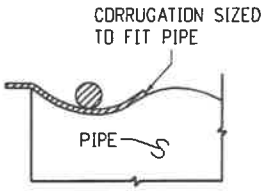
PIPE DIA. SIZE (INCHES)	METAL THICK MIN. (INCH/GAGE)	DIMENSIONS IN INCHES					
		A	H	W	OVERALL WIDTH	L	
						Slope = 4	Slope = 6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295



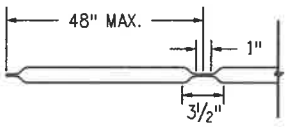
SECTION A-A

METAL END SECTIONS FOR PIPE ARCH CULVERT

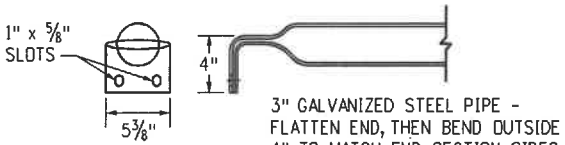
PIPE SIZE (INCHES)			METAL THICK MIN. (INCH/GAGE)	DIMENSIONS (INCHES)					
EQUIV. DIA.	SPAN	RISE		A	H	W	OVERALL WIDTH	L	
								Slope = 4	Slope = 6
18	21	15	0.064/16	8	6	27	43	20	30
24	28	20	0.064/16	8	6	33	49	40	60
30	35	24	0.109/12	12	9	40	64	55	83
36	41	29	0.109/12	12	9	47	71	75	112
42	48	32	0.109/12	16	12	54	86	90	136
48	56	37	0.109/12	16	12	62	94	110	165
54	63	42	0.109/12	16	12	69	101	130	195
60	70	46	0.109/12	16	12	76	107	146	218
72	82	56	0.109/12	16	12	88	120	185	278



SECTION B-B



LONGITUDINAL DRAINAGE BAR



PARALLEL BARS

SAFETY BAR DETAILS

REFERENCE:

CDOT M & S STANDARDS
M-603-12

TRAVERSABLE END SECTIONS AND SAFETY GRATES

CITY OF CASTLE PINES

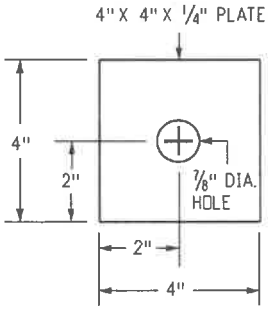
Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SD.41b

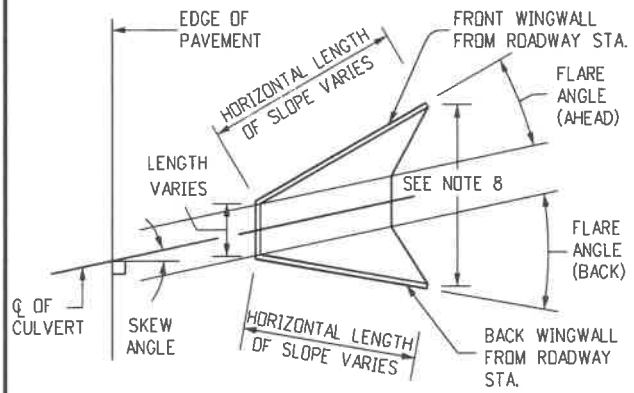
GRATE & CROSS BAR SIZE REQUIREMENTS		
LENGTH OF SPAN	NOMINAL PIPE SIZE (SEE NOTE 7)	O.D. SIZE
LESS THAN 12'	3.0"	3.0"
12' - 16'	3.5"	3.5"
GREATER THAN 16'	4.0"	4.0"



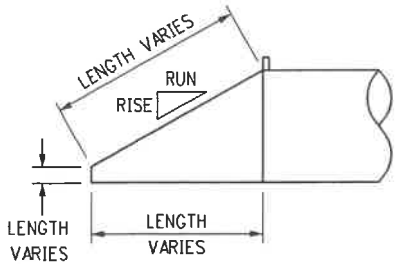
SHIM DETAIL

NOTES

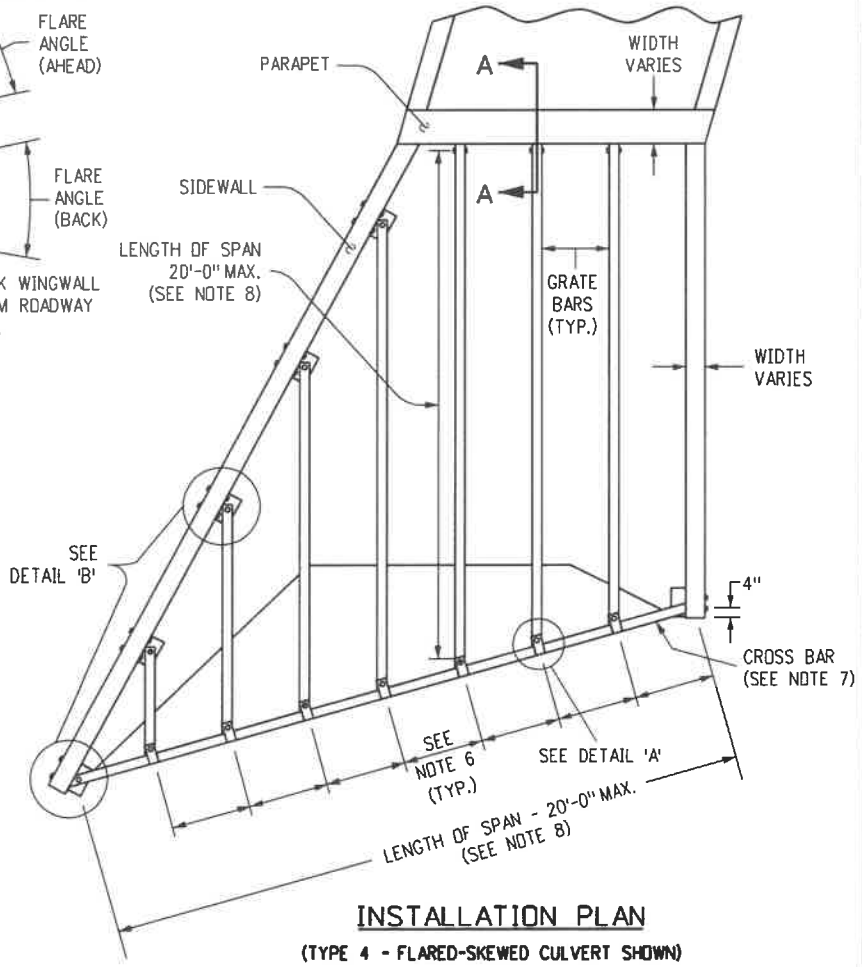
1. SHOP DRAWINGS SHALL BE SUBMITTED PER 105.02
2. HARDWARE SUCH AS BOLTS, WASHERS, AND LOCK NUTS SHALL BE HOT-DIPPED GALVANIZED PER ASTM A123
3. INTENDED FOR USE ON TERRAIN XX SLOPES WITH A CLEAR RUNOUT FOR ERRANT VEHICLES. GUARDRAIL IS THE PREFERRED OPTION ON STEEPER TERRAIN OR WITH HIGHER TRAFFIC VOLUMES
4. MINIMUM SCHEDULE 40 PIPE SHALL BE UED. GALVANIZE ALL PIPES, FITTINGS AND HARDWARE AFTER ALL CUTTING, WELDING, DRILLING, AND FABRICATION.
5. BOTH ENDS OF CULVERT SHALL BE TREATED TO PREVENT DEBRIS FROM ENTERING
6. EQUALLY SPACED 24 INCHES MIN. TO 30 INCHES MAX. FROM EDGE OF SIDEWALL TO CENTER OF BRACKET, OR FROM CENTER TO CENTER OF BRACKET.
7. THE CROSS BAR DIAMETER SHALL BE EQUAL TO OR GREATER THAN THE GRATE BAR DIAMETER.
8. IF MORE THAN 20 FEET THAN A MIDSPAN SUPPORT SHALL BE REQUIRED. SEE SHEETS 3 AND 4.
9. DRILL HOLES USING EQUIPMENT DESIGNED TO CUT THROUGH CONCRETE AND REINFORCING STEEL
10. A 3/4 INCH BOLT, LOCK NUT AND WASHERS. ALL HOLES ARE TO BE 7/8 INCH IN DIAMETER.
11. BEND PLATES OR STRIPS WITHOUT CRACKING MATERIAL.
12. SHIM THICKNESS EQUALS THE DIFFERENCE IN DIAMETERS OF THE GRATE BAR AND CROSS BAR.



TOP VIEW



SIDE VIEW



INSTALLATION PLAN

(TYPE 4 - FLARED-SKEWED CULVERT SHOWN)

REFERENCE:

CDOT M & S STANDARDS
M-603-12

TRAVERSABLE END SECTIONS AND SAFETY GRATES

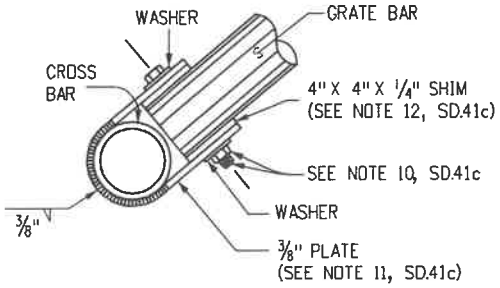
CITY OF CASTLE PINES

Issued: 6/15/2022

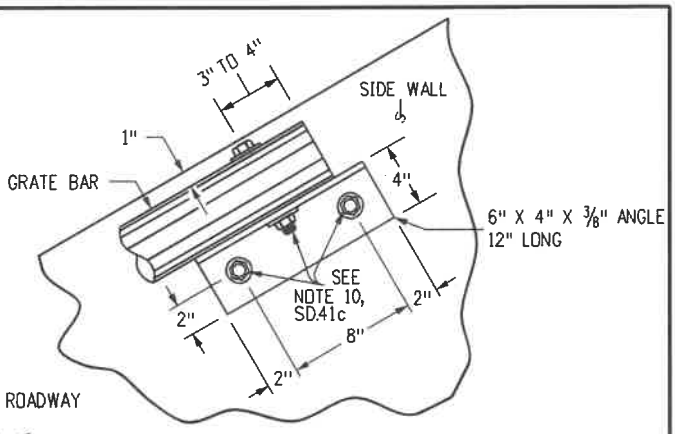
Revised: _____

Standard Drawing No.

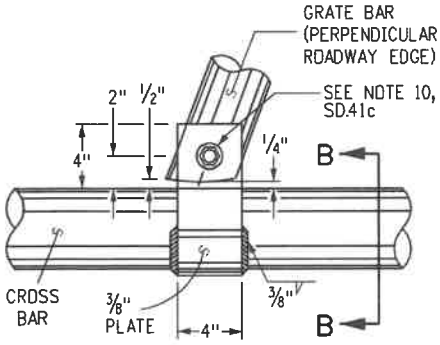
SD.41c



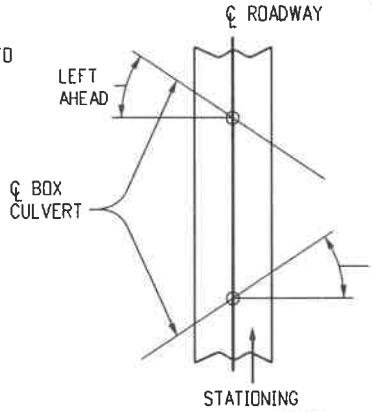
SECTION B-B



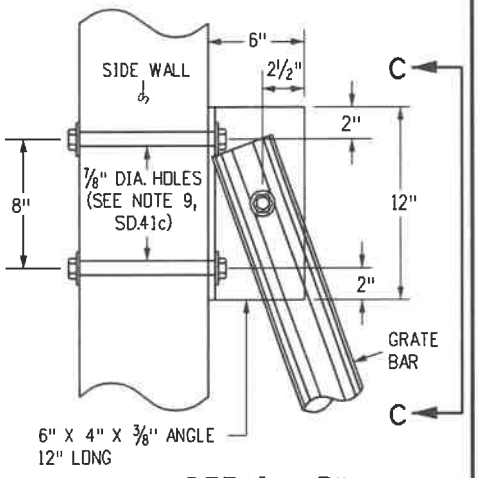
SECTION C-C



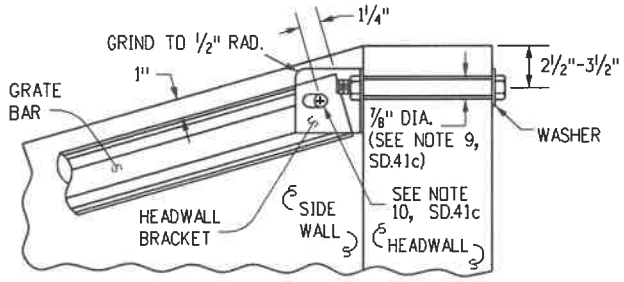
DETAIL "A"
TOP VIEW



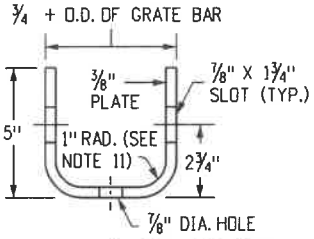
SKEW ANGLE DETERMINATION



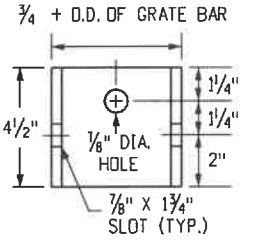
DETAIL "B"
TOP VIEW



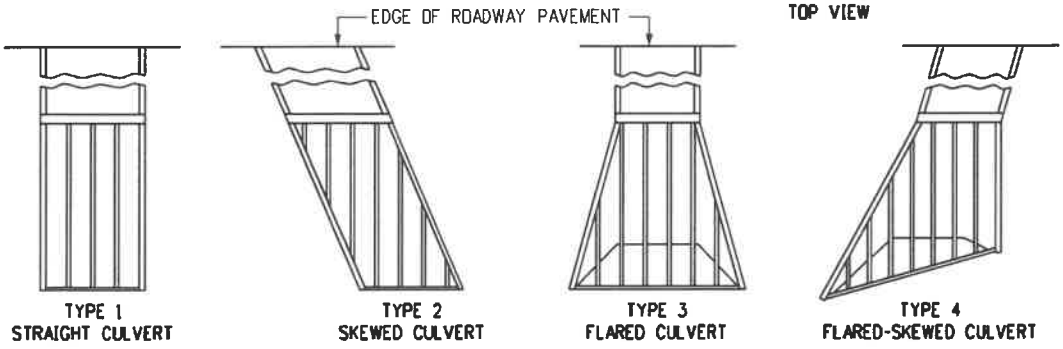
SECTION A-A



HEADWALL BRACKET
TOP VIEW



HEADWALL BRACKET
FRONT VIEW



TYPE 1
STRAIGHT CULVERT

TYPE 2
SKEWED CULVERT

TYPE 3
FLARED CULVERT

TYPE 4
FLARED-SKEWED CULVERT

INSTALLATION TYPES

GRATE BARS SHALL BE PERPENDICULAR TO DIRECTION OF TRAFFIC FLOW.

REFERENCE:

CDOT M & S STANDARDS
M-603-12

TRAVERSABLE END SECTIONS AND SAFETY GRATES

CITY OF CASTLE PINES

Issued: 6/15/2022

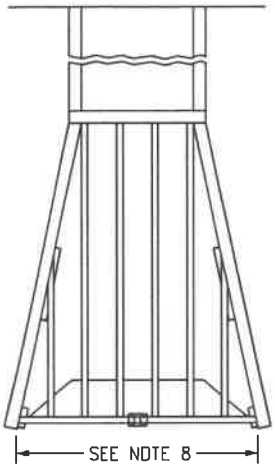
Revised:

Standard Drawing No.

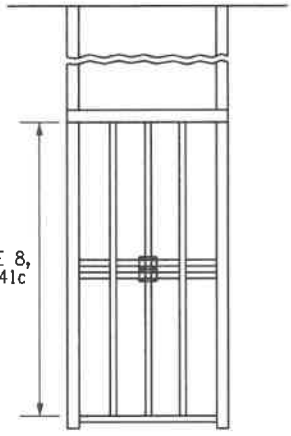
SD.41d

NOTES

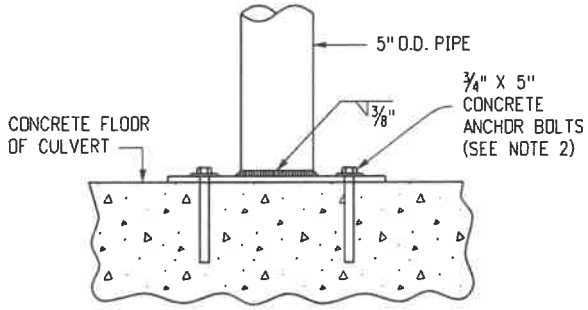
1. LENGTH OF SPAN (20 FEET MAXIMUM).
2. ALL ANCHOR BOLTS SHALL BE GROUTED IN PLACE WITH A NONSHRINK OR EPOXY GROUT WHICH SHALL COMPLETELY FILL THE HOLES.



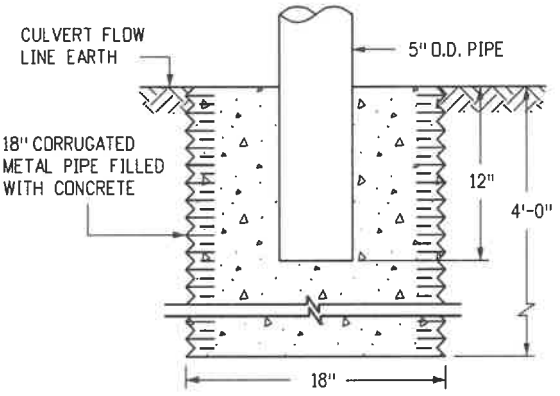
CASE 1



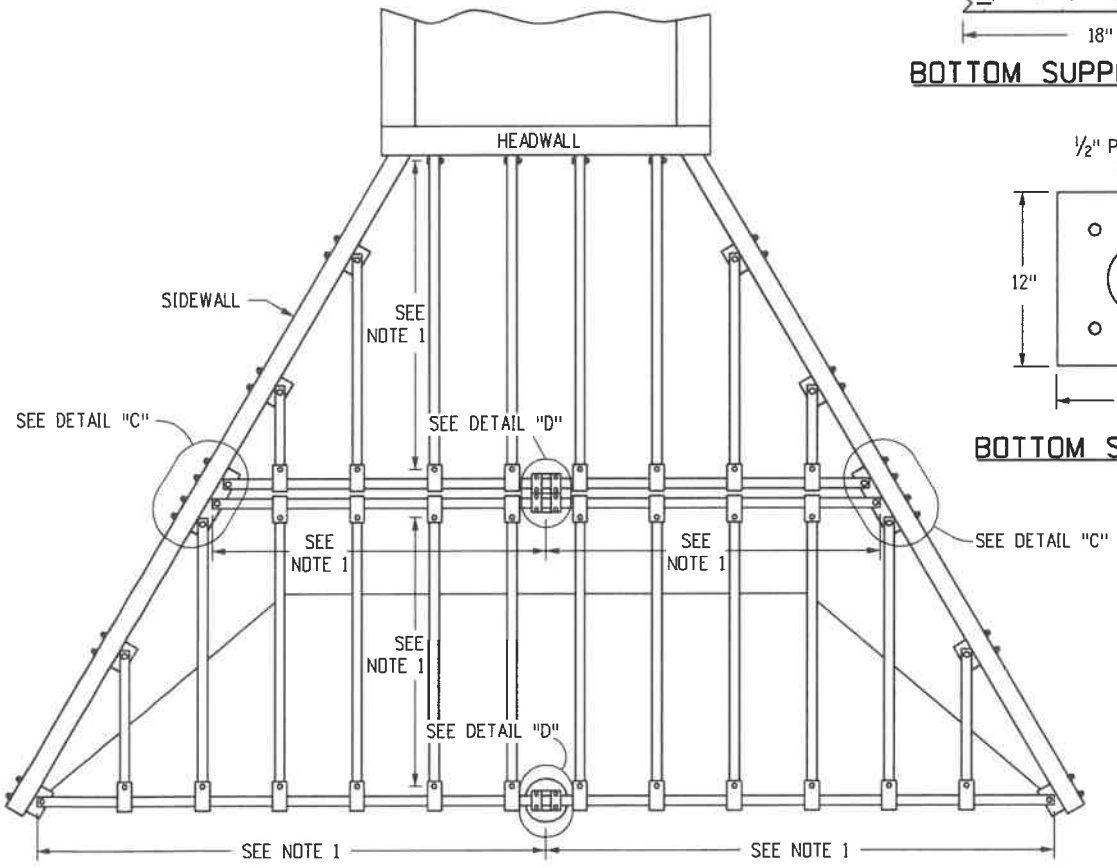
CASE 2



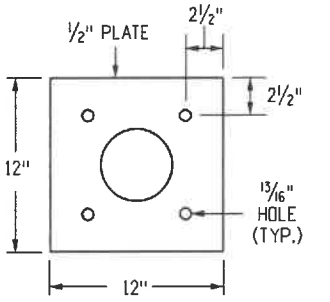
BOTTOM SUPPORT ON CULVERT FLOOR



BOTTOM SUPPORT ON EARTH

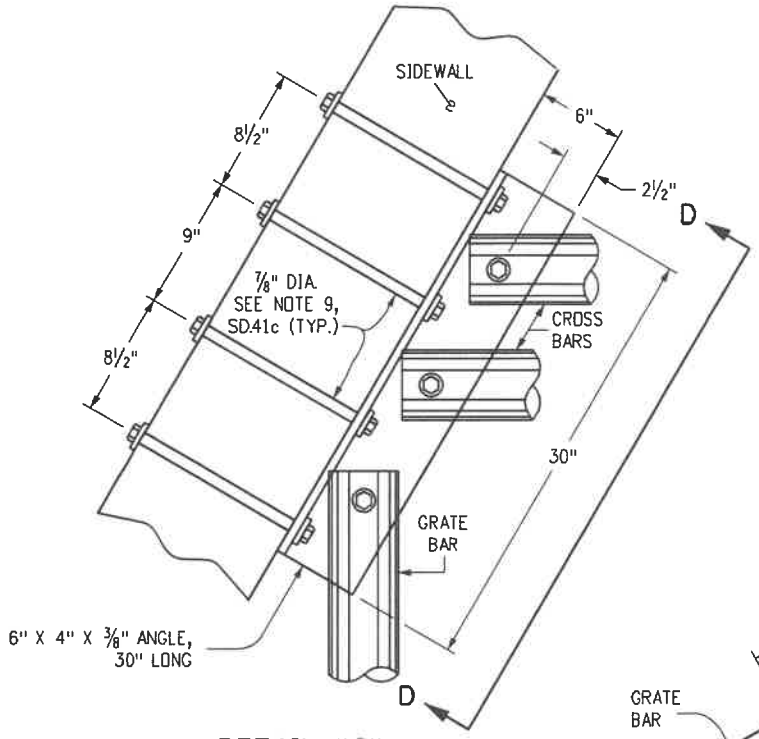


INSTALLATION PLAN WITH MIDSPAN SUPPORT

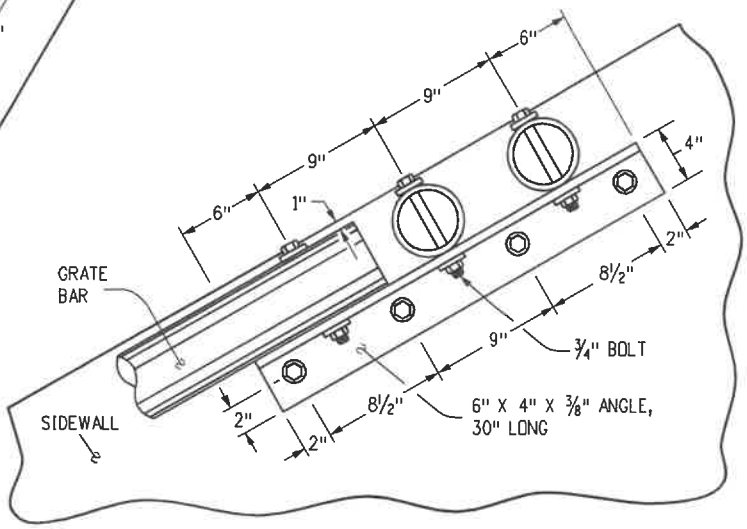


BOTTOM SUPPORT PLATE

REFERENCE:	TRAVERSABLE END SECTIONS AND SAFETY GRATES	Issued: 6/15/2022
CDOT M & S STANDARDS M-603-12	CITY OF CASTLE PINES	Revised:
		Standard Drawing No. SD.41e

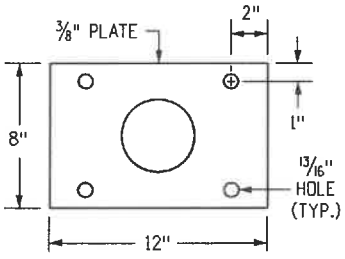


DETAIL "C"

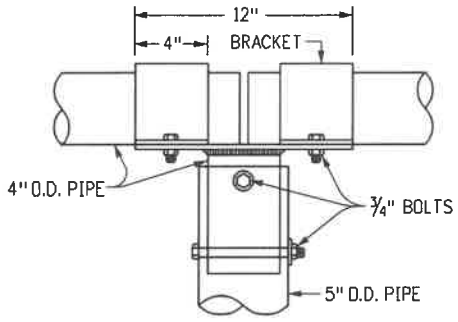


SECTION D-D

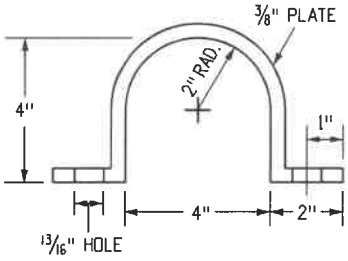
(SEE NOTE 11, SD.41e)



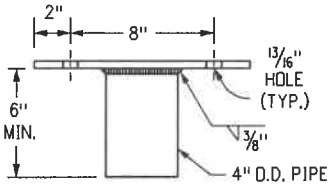
TOP VIEW



CROSS BAR SUPPORT ASSEMBLY
SIDE VIEW



BRACKET END VIEW
END VIEW



SUPPORT PLATE
SIDE VIEW

DETAIL "D"

REFERENCE:

CDOT M & S STANDARDS
M-603-12

TRAVERSABLE END SECTIONS AND SAFETY GRATES

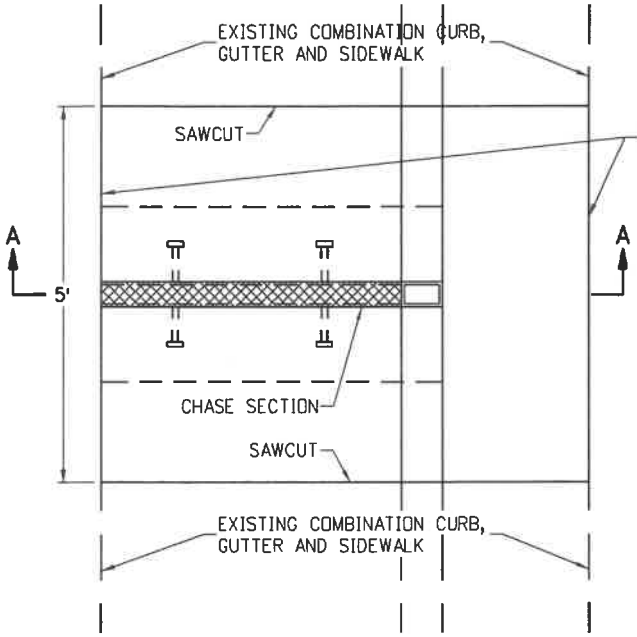
CITY OF
CASTLE PINES

Issued: 6/15/2022

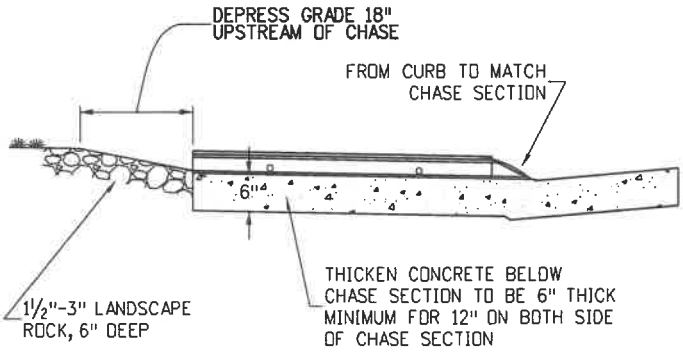
Revised: _____

Standard Drawing No.

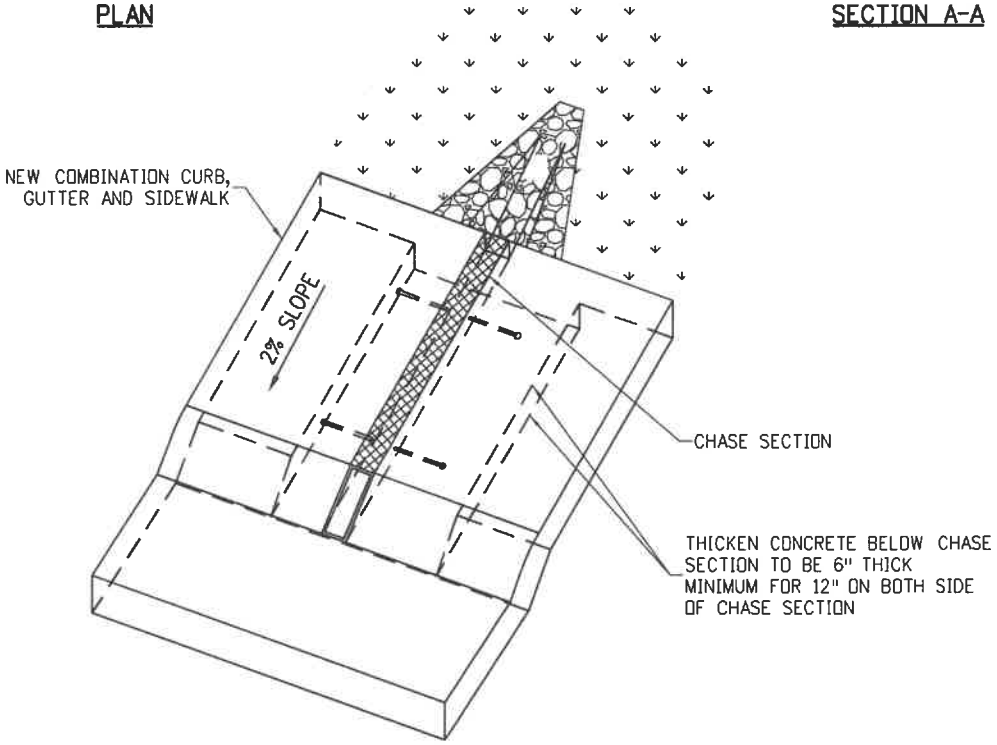
SD.41f



PLAN



SECTION A-A



ISOMETRIC VIEW

NOTES:

1. SAWCUT ALL AREAS TO RECEIVE CHASE SECTION.
2. THE USE OF THIS DETAIL MUST BE PREAPPROVED BY CASTLE PINES PUBLIC WORKS DEPARTMENT PRIOR TO CONSTRUCTION IN R.O.W.
3. DIRECT CONNECTION TO YARD PIPES WILL NOT BE ALLOWED.
4. CHASE DRAIN SHALL BE LOCATED 2.5' MIN. FROM PROPERTY LINE.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

RESIDENTIAL SIDEWALK CURB CHASE PLAN

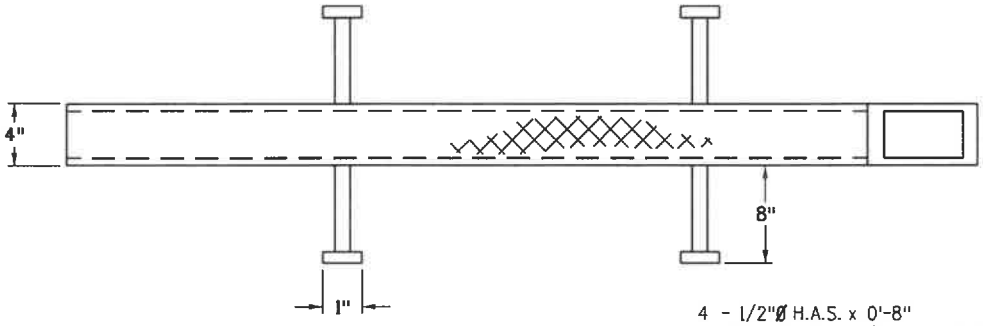
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

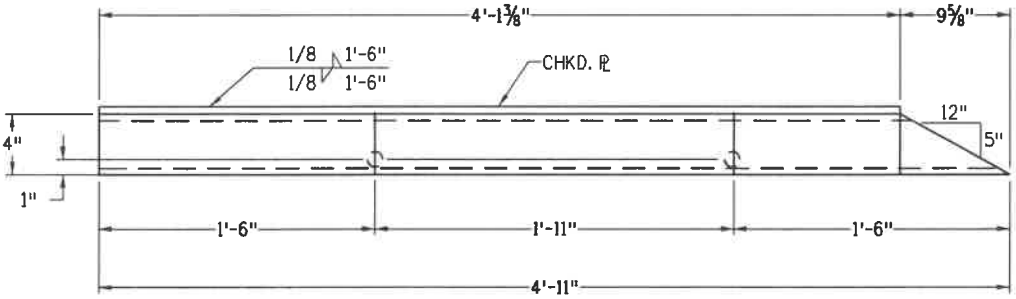
Standard Drawing No.

SD.42a



4 - 1/2"Ø H.A.S. x 0'-8"
1 - TS 4" x 3" x 1/4" x 4'-11" PIPE
1 - CHKD. PL 3/16" x 4" x 4'-3 7/8"

PLAN



SECTION

GALV. AFTER FAB.
M 111-68 / A 123-68

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 6/14/22

RESIDENTIAL SIDEWALK CURB CHASE DETAIL

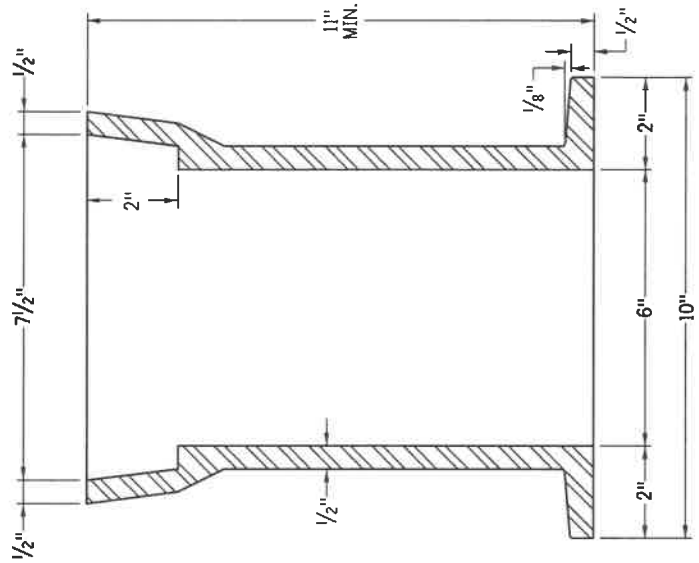
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

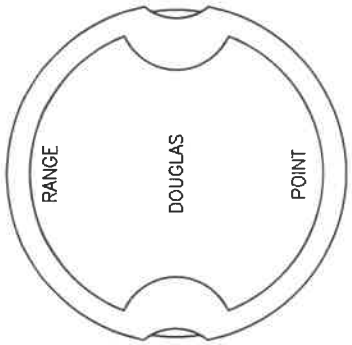
SD.42b



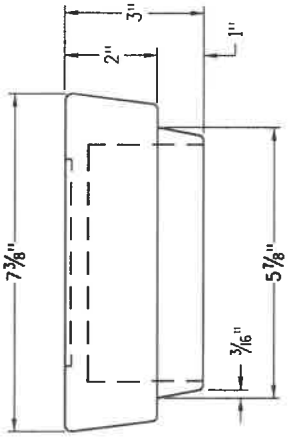
NOTES:

LETTERS SHALL BE NOT LESS THAN 5/8" HIGH & RAISED 1/8" ABOVE SURFACE.

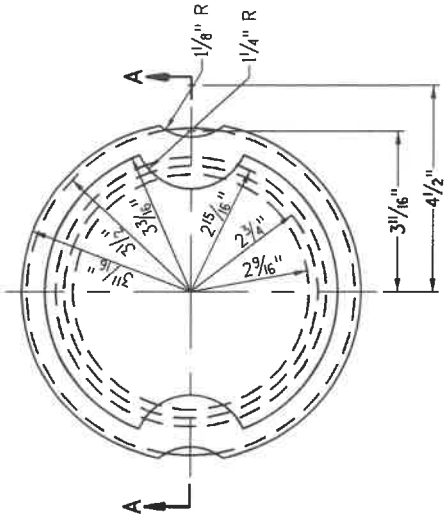
ALL FILLETS & ROUNDS RADII = 1/8"



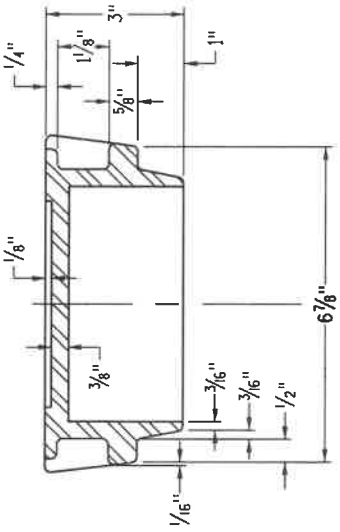
REQUIRED LETTERING FOR BOX COVER



SIDE



TOP



SECTION A-A

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

RANGE BOX

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

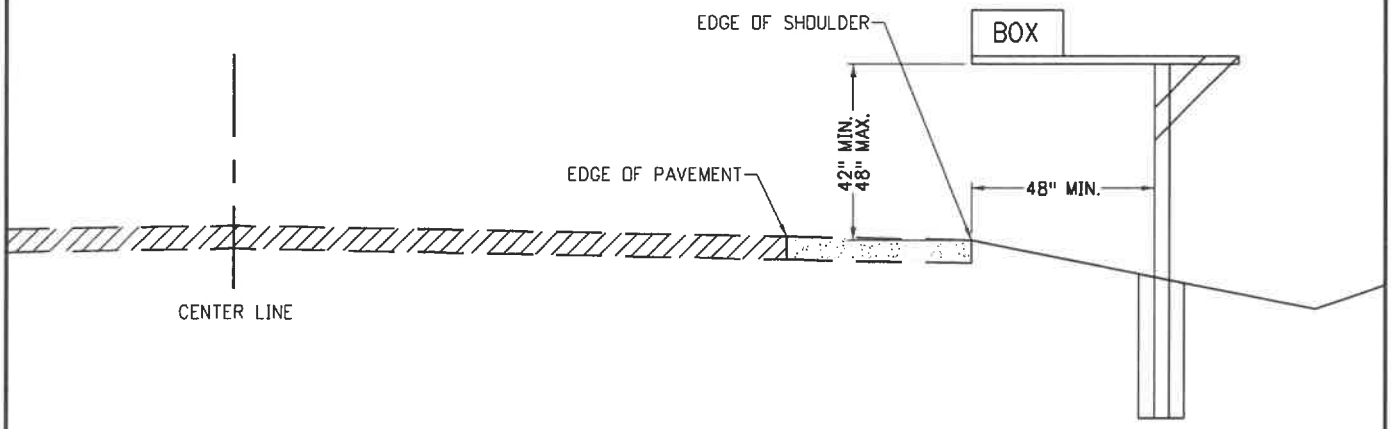
Standard Drawing No.

SD.43

NOTICE

RECOMMENDED MAILBOX INSTALLATIONS

TO AVOID DAMAGE TO YOUR MAILBOX AND ALSO ALLOW THE SNOWPLOWS TO REMOVE THE SNOW FROM UNDER YOUR MAILBOX, THE FOLLOWING DIMENSIONS ARE RECOMMENDED.



PLACING MAILBOX A SHORT DISTANCE AWAY FROM DRIVEWAYS AND INTERSECTIONS HELPS TO AVOID VISION-RESTRICTING SNOWBANKS AND ALSO DAMAGE TO YOUR MAILBOX. THE BOX AND BASE SHOULD BE STRONG ENOUGH TO WITHSTAND FLYING SNOW AND SLUSH TRAFFIC AND SNOWPLOWS.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 2/14/22	MAILBOX SUPPORT CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.44a**

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 6/14/22

CITY OF CASTLE PINES

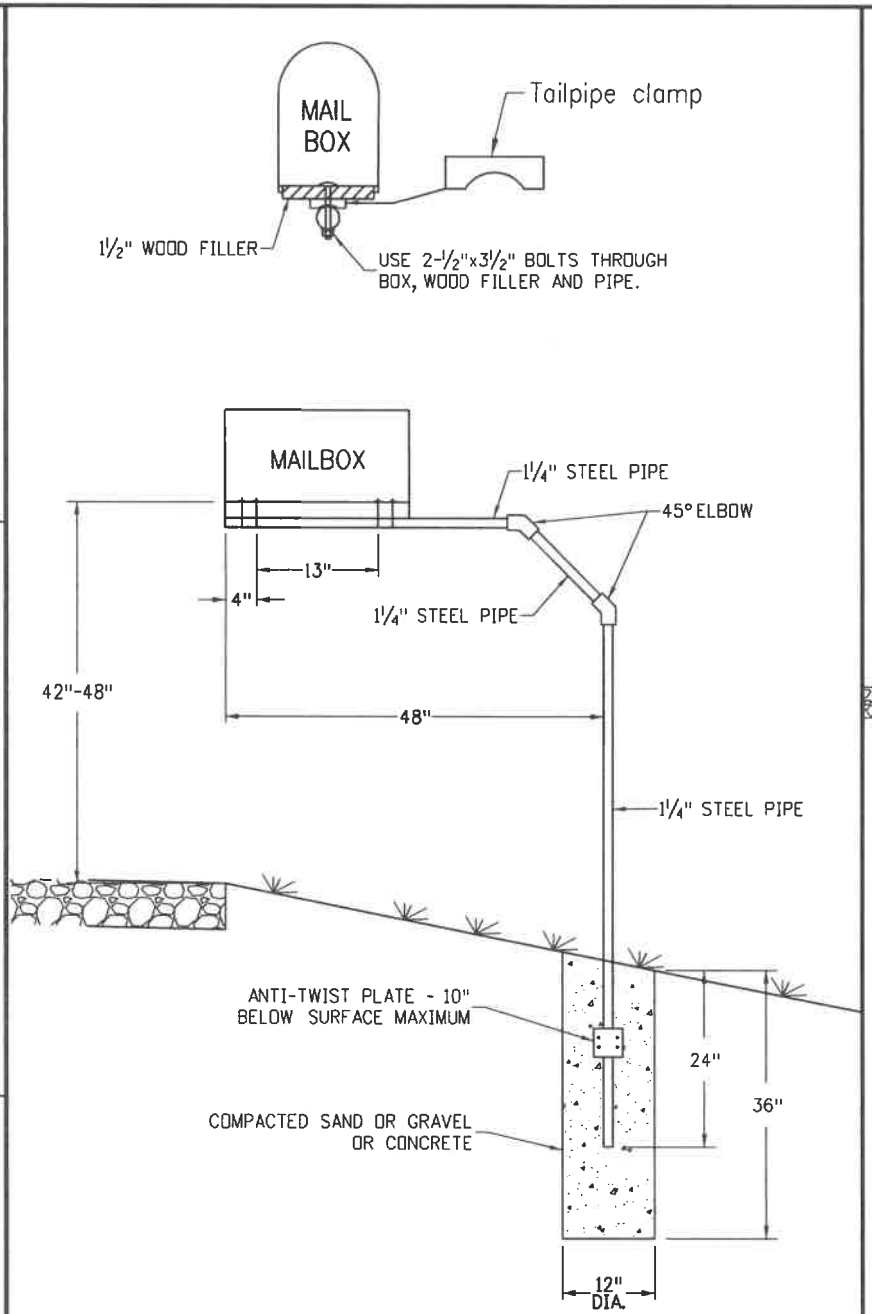
MAILBOX SUPPORT

Issued: 6/15/2022

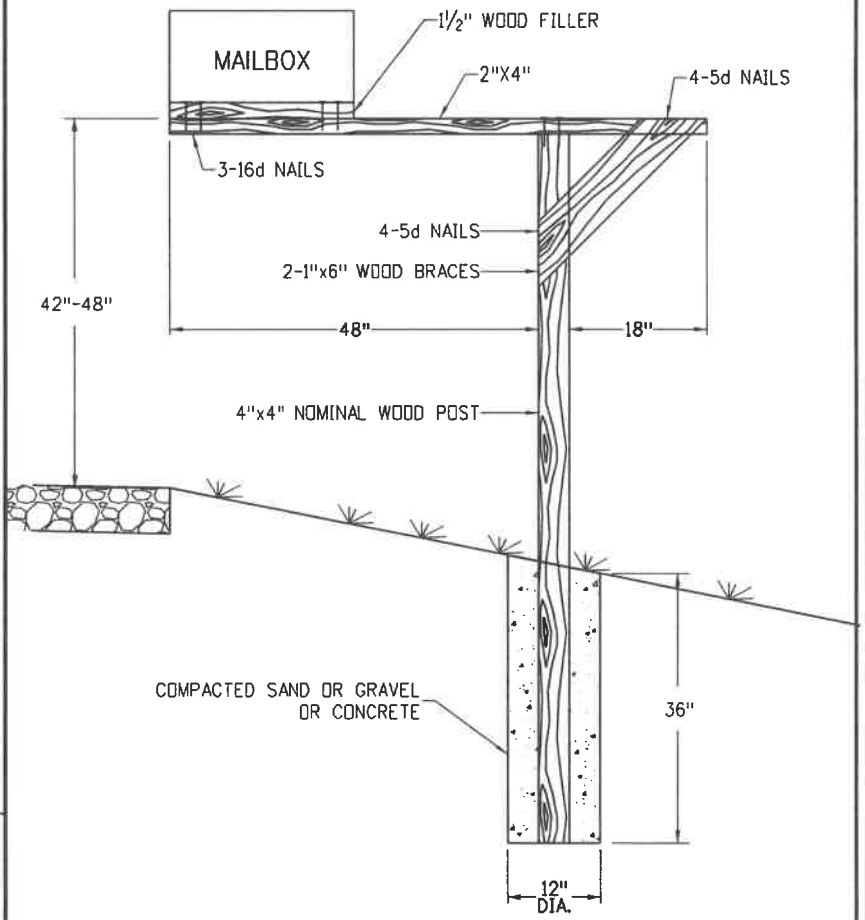
Revised: _____

Standard Drawing No.

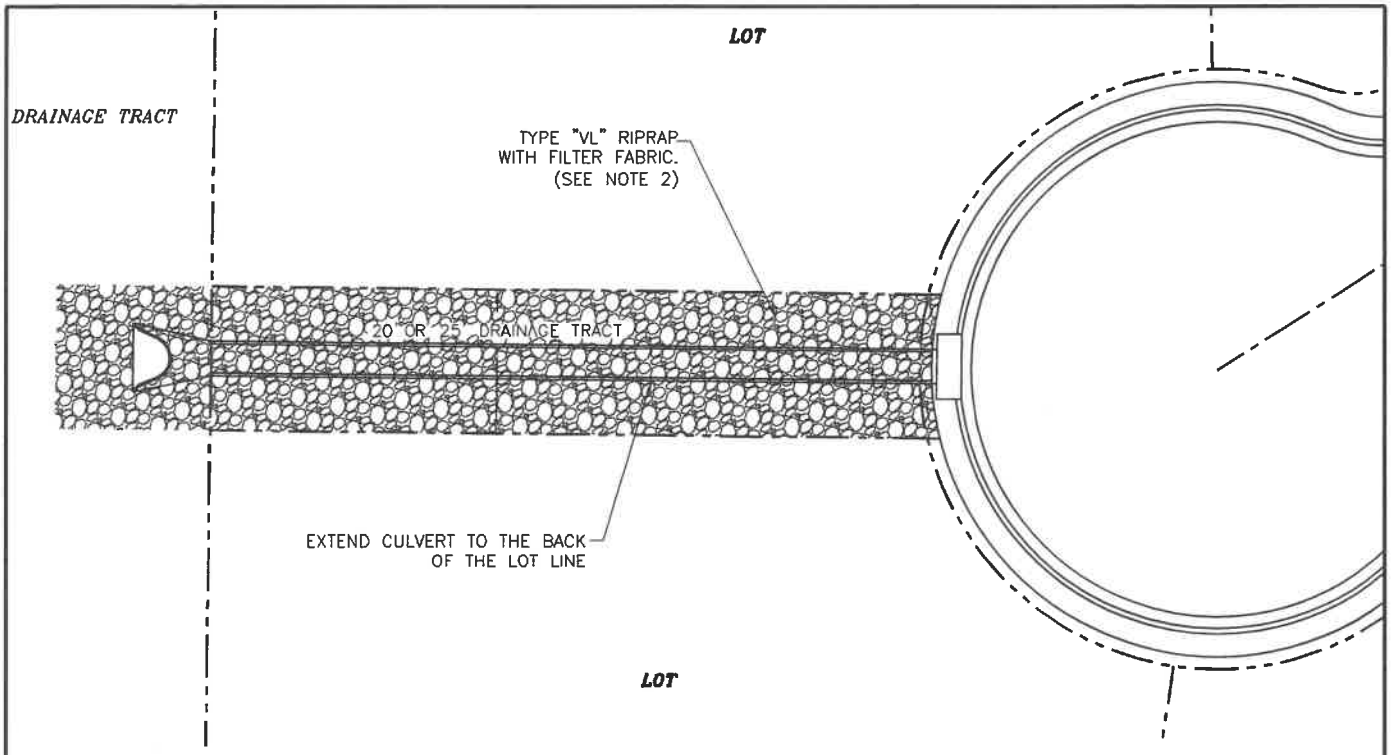
SD.44b

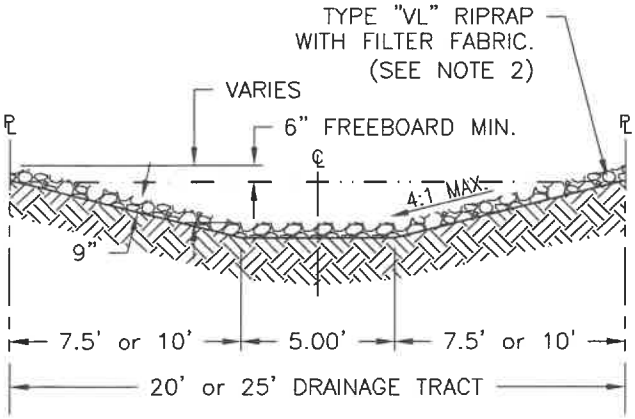


STEEL PIPE CANTILEVER MAILBOX SUPPORT

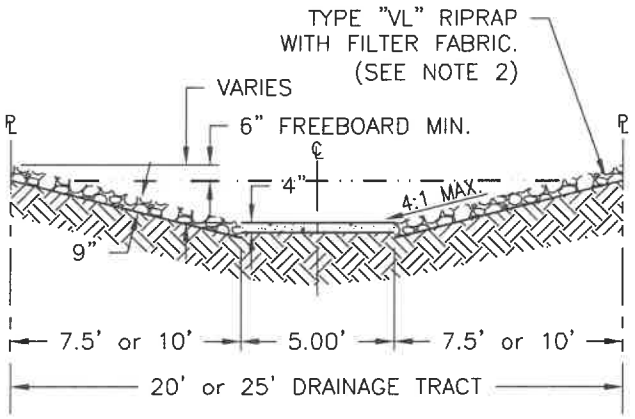


WOOD CANTILEVER MAILBOX SUPPORT





TYPICAL CROSS SECTION



CROSS SECTION WITH OPTIONAL SIDEWALK
(SEE NOTE 1)

NOTES:

1. OPTIONAL 4" CONCRETE SIDEWALK MAY BE USED ONLY WITH THE CITY'S APPROVAL.
2. FILTER FABRIC IS TARABOND #1112-12-4 OR EQUIVALENT.
3. LONGITUDINAL SLOPE SPECIFICATION, MIN. 2% MAX. 25%.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

EMERGENCY OVERFLOW CHANNEL (IN DRAINAGE TRACT)

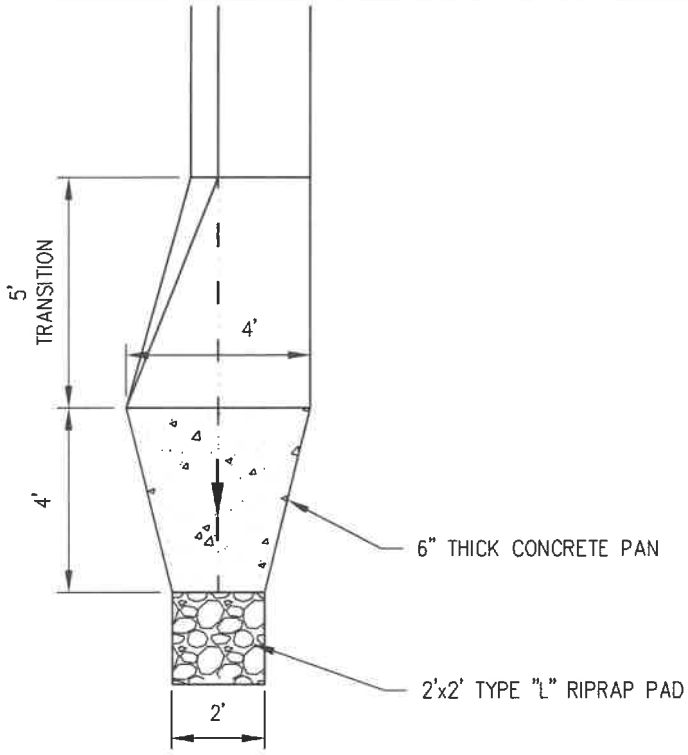
CITY OF CASTLE PINES

Issued: 6/15/2022

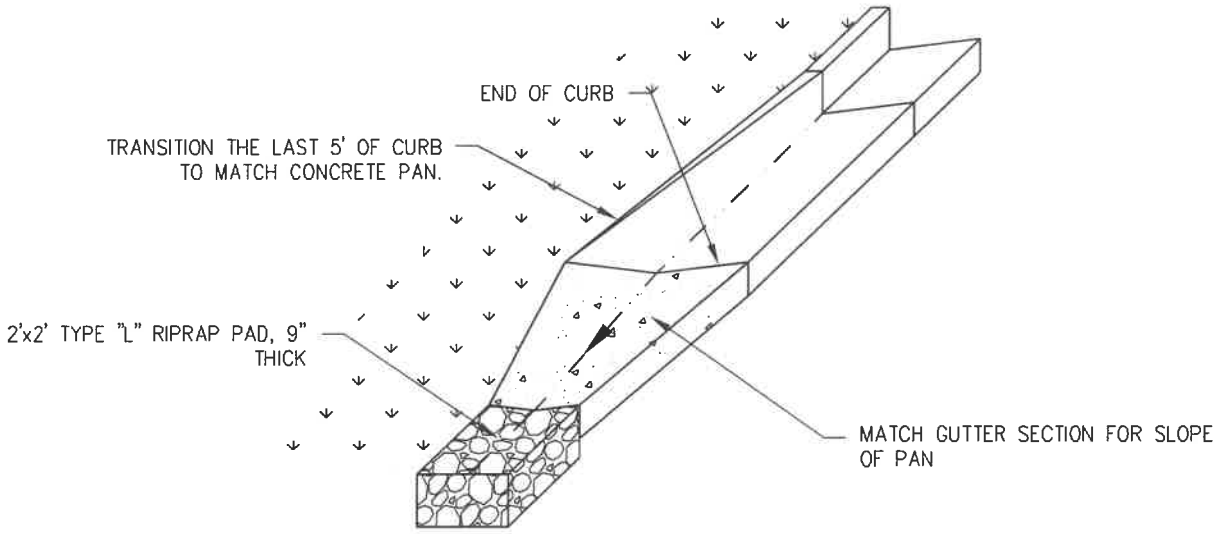
Revised: _____

Standard Drawing No.

SD.45



PLAN



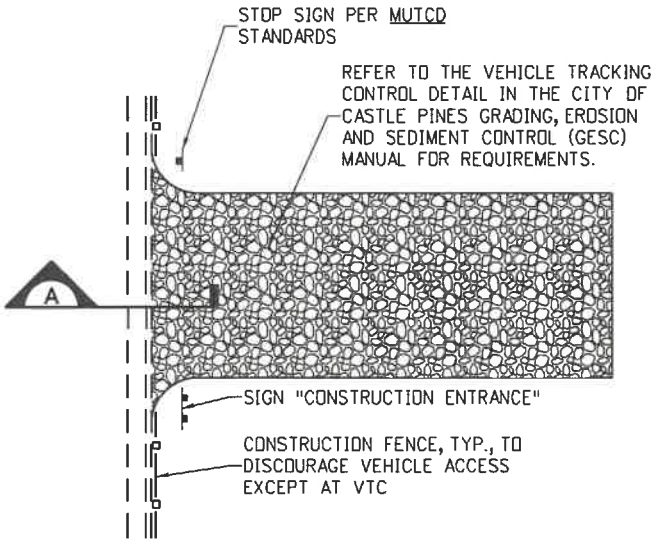
ISOMETRIC VIEW

NOTES:

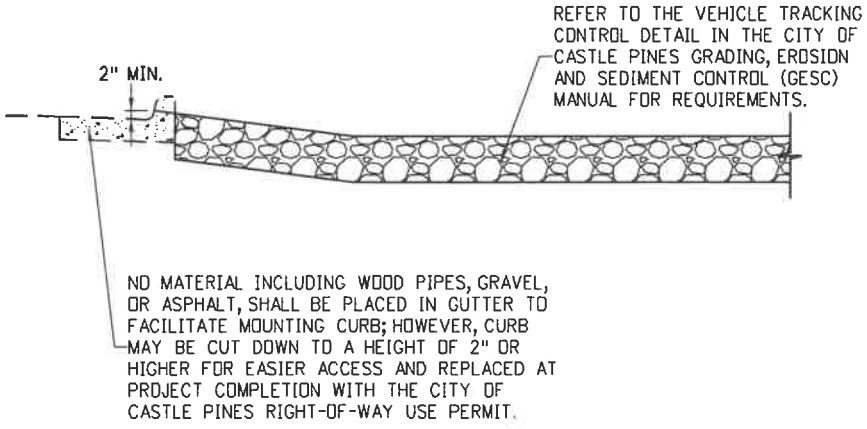
ADDITIONAL EROSION CONTROL PROTECTION SHALL BE SUBMITTED FOR COMMENTS.

EROSION CONTROL PROTECTION MUST BE PROVIDED TO TOP OF SLOPE OR NATURAL DRAINAGE.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	CURB TRANSITION TO DITCH CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. SD.46



PLAN
SCALE: 1"=1'-20"



SECTION A
SCALE: 1/4"=1'-0"

VEHICLE TRACKING CONTROL INSTALLATION NOTES

1. VEHICLE TRACKING CONTROL PADS SHALL BE INSTALLED AT EVERY ACCESS POINT TO SITE.
2. ANY CRACKED OR DAMAGED CURB AND GUTTER AND SIDEWALK SHALL BE REPLACED BY PERMITTEE.
3. A STOP SIGN INSTALLED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), AS AMENDED, SHALL BE INSTALLED FOR EXISTING TRAFFIC AT THE VTC.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 2/14/22

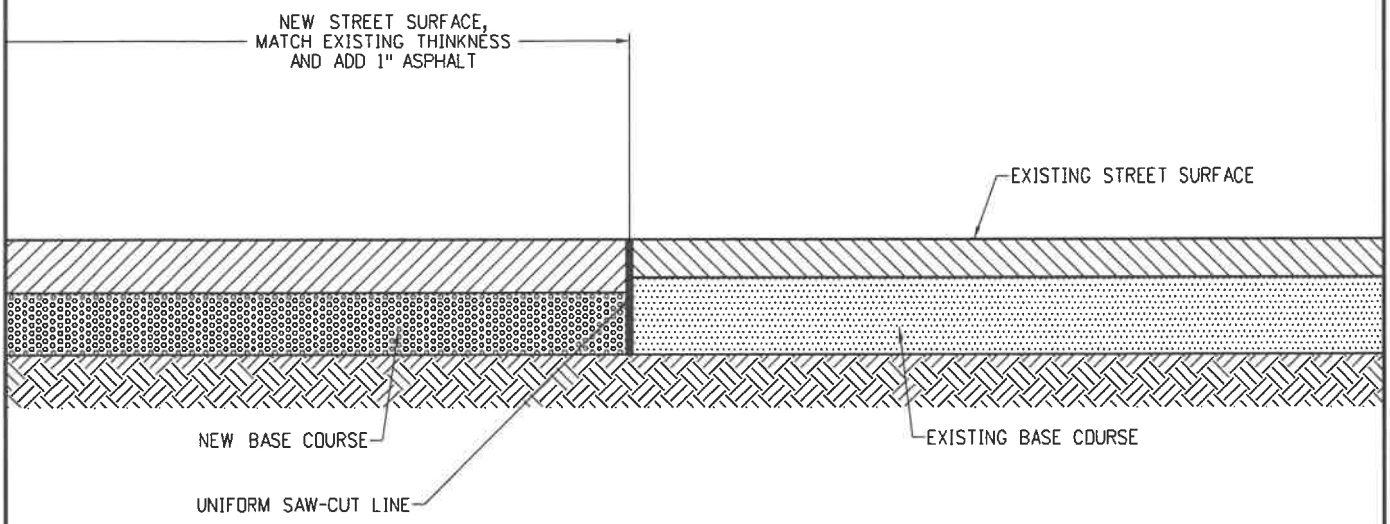
CURB CUT

CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

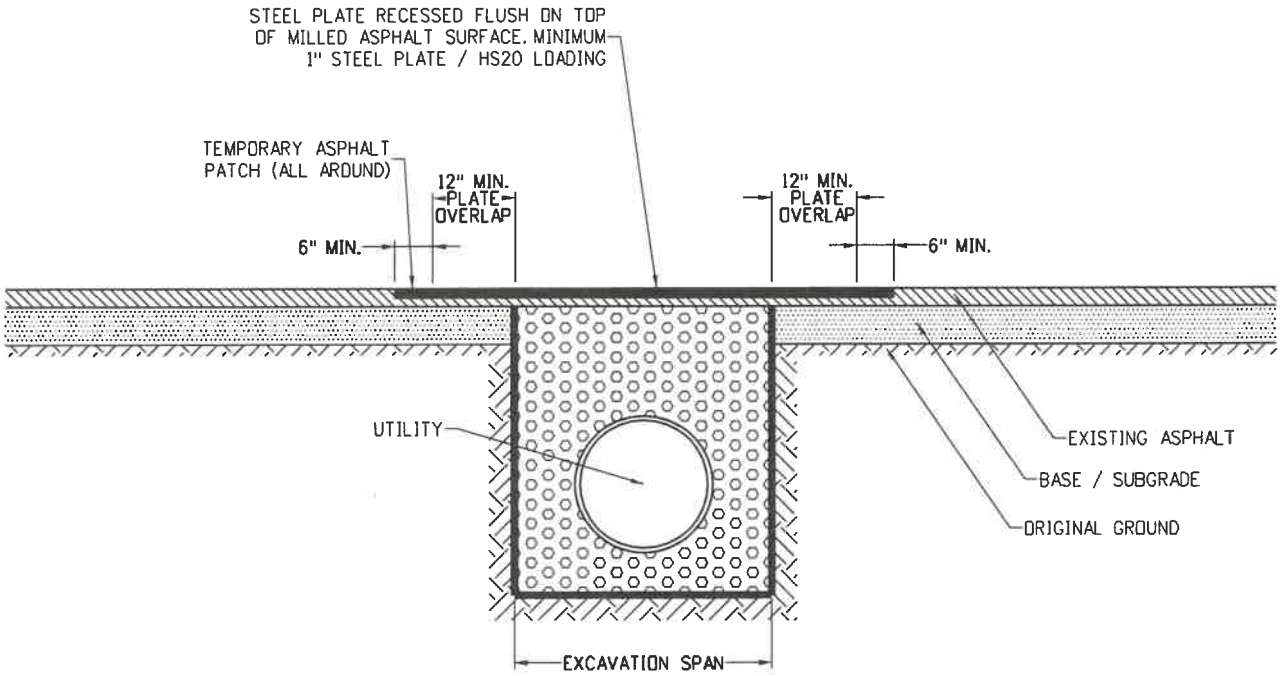
Standard Drawing No.
SD.47



NOTES:

1. THIS STREET CUT/PATCHING DETAIL SPECIFIERS REQUIREMENTS IN ADDITION TO THOSE SPECIFIED IN THE LATEST EDITION OF THE COLORADO DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. A CONSTRUCTION TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO AND APPROVED BY THE CITY OF CASTLE PINES PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS IN THE CITY RIGHT-OF-WAY.
3. PAVEMENT EDGES SHALL BE SAW-CUT AND KEPT TO A NEAT VERTICAL EDGE PRIOR TO PAVING.
4. EDGES SHALL BE TACK COATED PRIOR TO PATCHING.

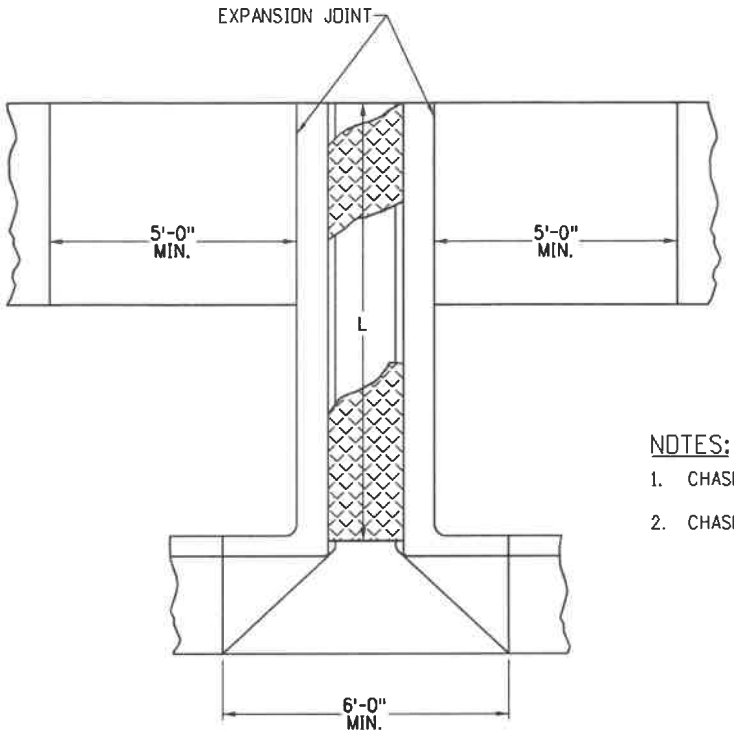
APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	ASPHALT STREET CUT/PATCHING CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.48**



NOTES:

1. MAY ONLY BE USED FROM MAY 15 TO OCTOBER 15.
2. MUST HAVE PRIOR APPROVAL BY THE CITY OF CASTLE PINES.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	TEMPORARY STEEL PLATE CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.49**

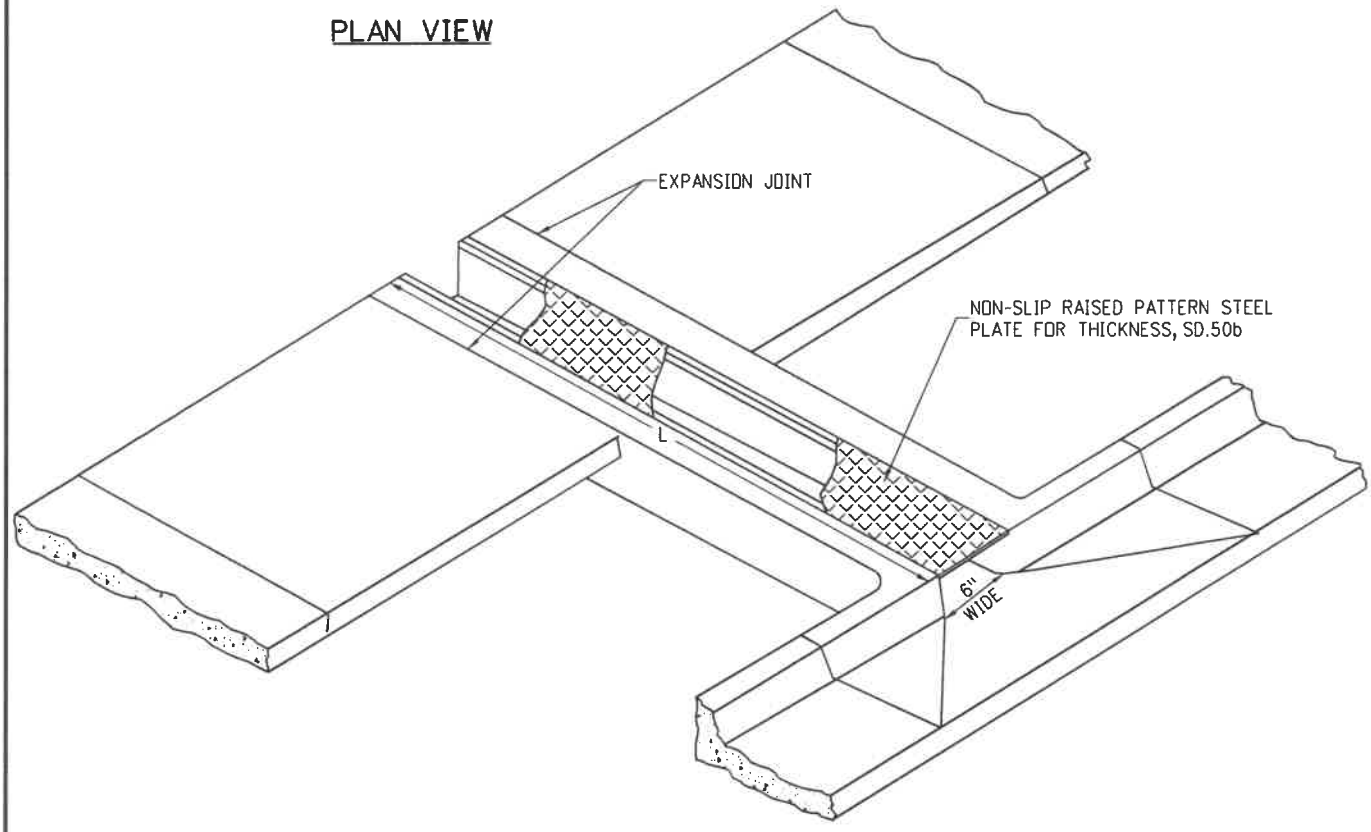


PLAN VIEW

TYPE OF WALK	LENGTH OF PLATE
L ATTACHED	L + 3"
L DETACHED	VARIES

NOTES:

1. CHASE IS NOT PERMITTED IN 4" CURB SECTION.
2. CHASE SHALL ONLY BE USED WITH APPROVAL OF CITY.



ISOMETRIC VIEW
N.T.S.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

SIDEWALK CHASE DRAIN

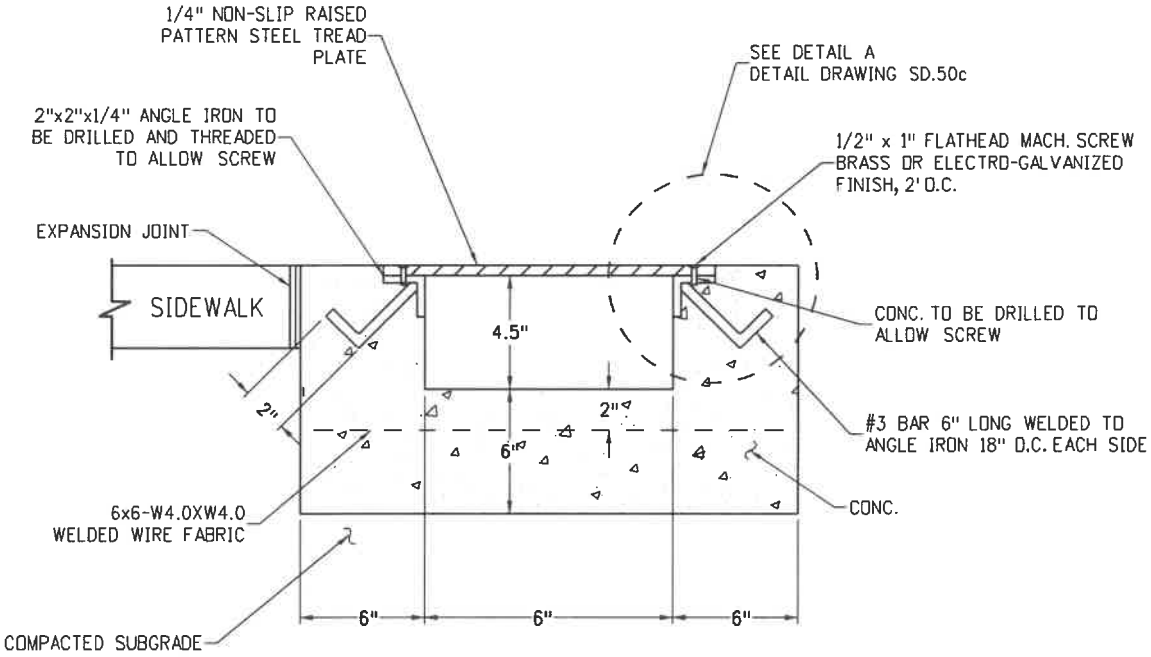
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

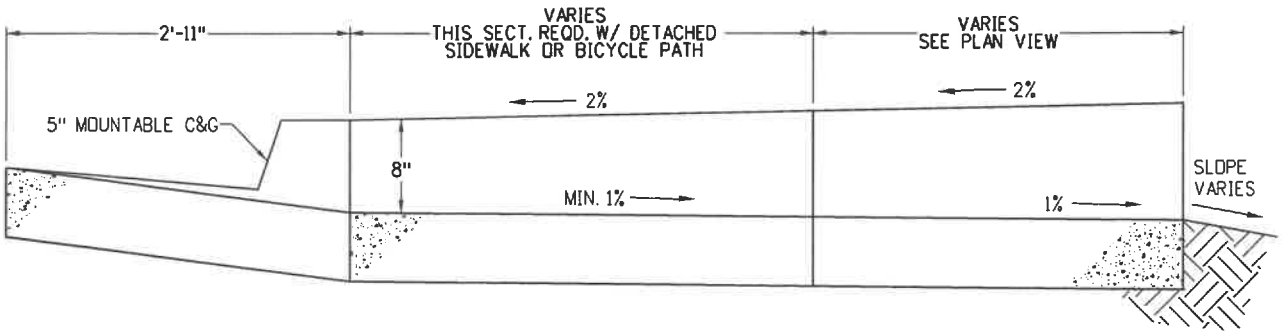
Standard Drawing No.

SD.50a

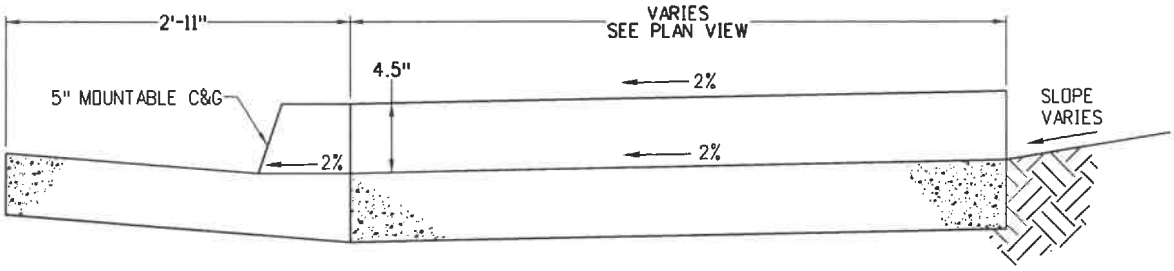


SIDEWALK CHASE DETAIL

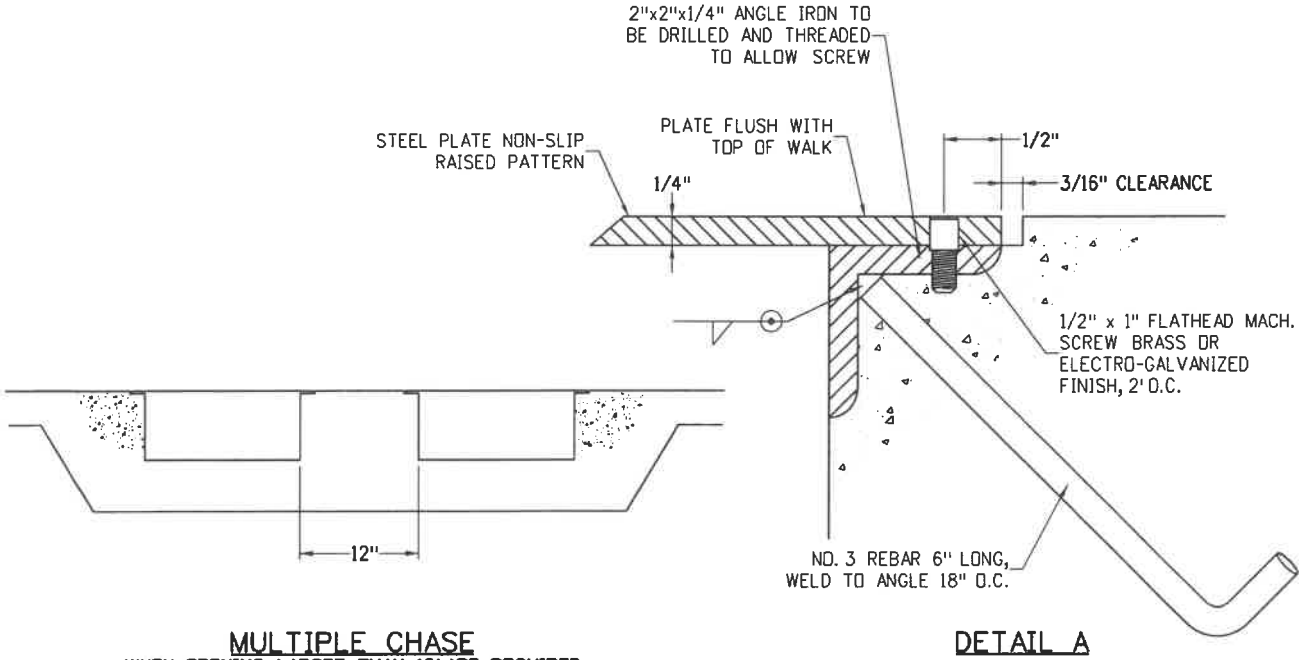
APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	SIDEWALK CHASE DRAIN CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SD.50b**



FLOW FROM GUTTER



FLOW TO GUTTER



MULTIPLE CHASE

WHEN OPENING LARGER THAN 12' ARE REQUIRED

DETAIL A

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

SIDEWALK CHASE DRAIN

CITY OF
CASTLE PINES

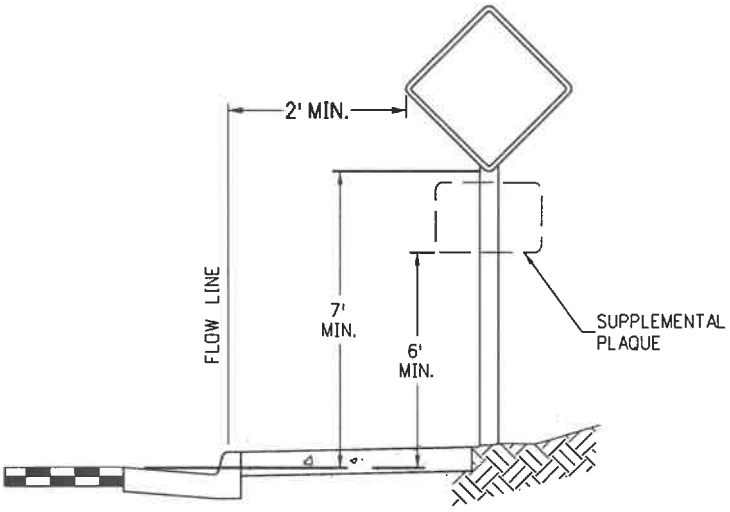
Issued: 6/15/2022

Revised: _____

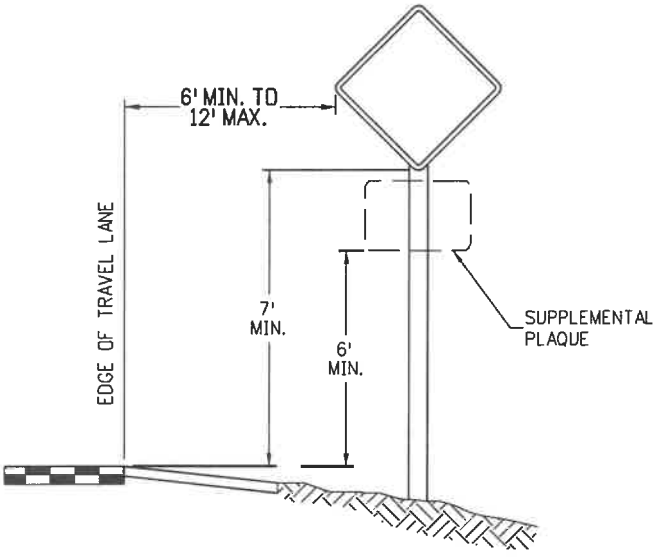
Standard Drawing No.

SD.50c

URBAN



RURAL



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

TYPICAL SIGN PLACEMENT DETAIL

CITY OF
CASTLE PINES

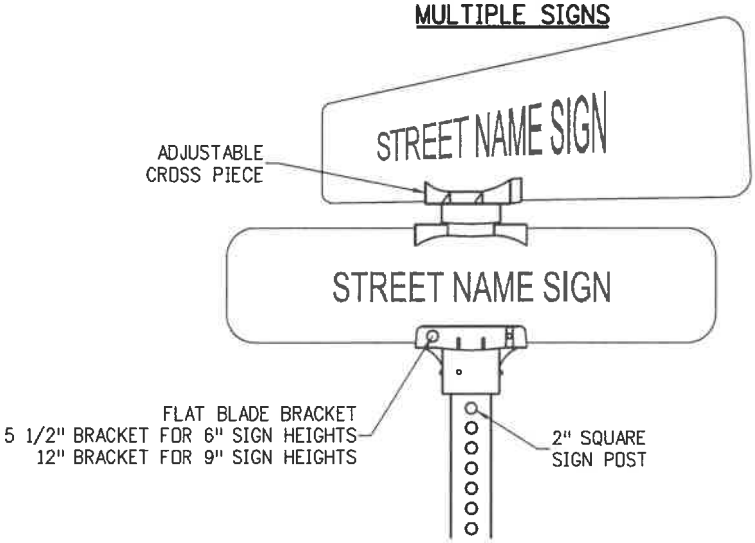
Issued: 6/15/2022

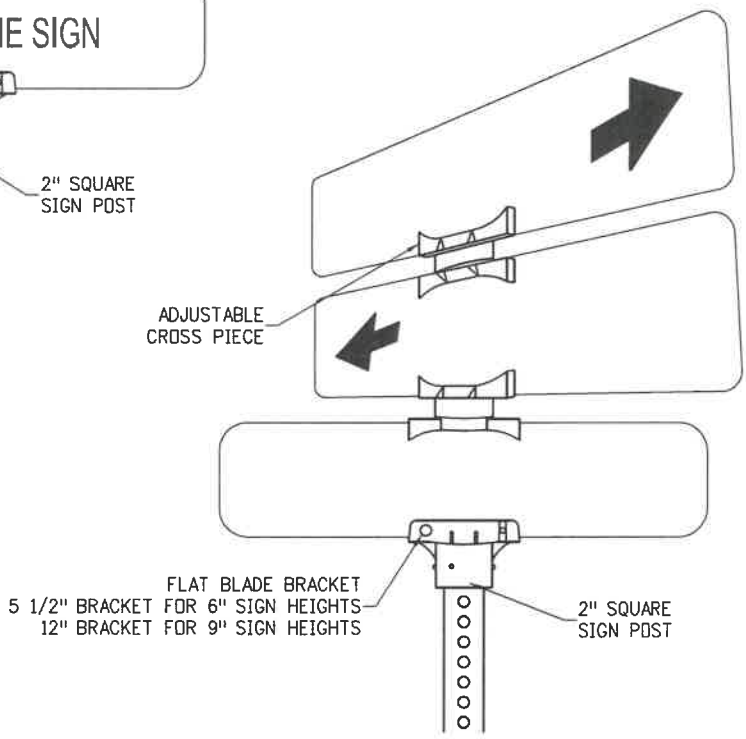
Revised: _____

Standard Drawing No.

SS.1

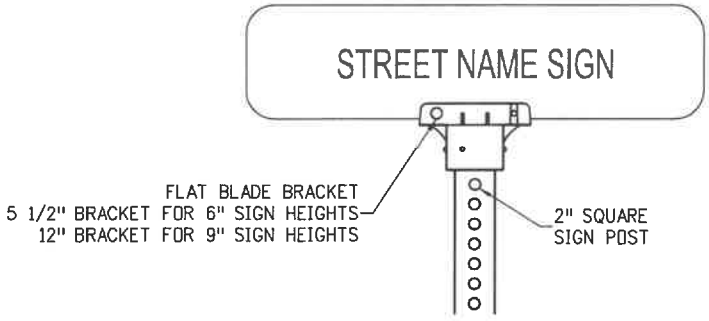
MULTIPLE SIGNS





STREET NAME SIGN ASSEMBLY
WHERE STREET NAMES CHANGE
(WHEN ARROWS ARE REQUIRED, OMIT CASTLE PINES LOGO)

SINGLE SIGN



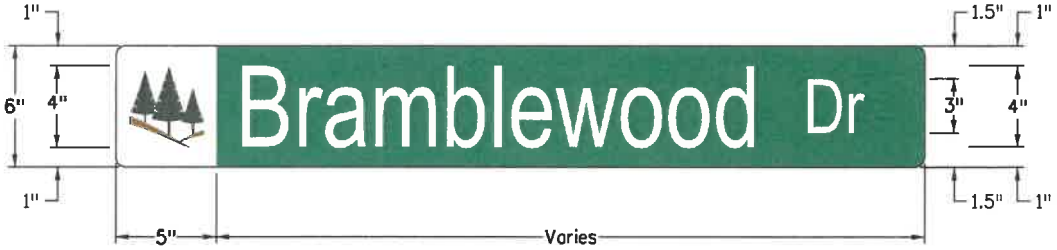
NOTE: DO NOT PUNCH HOLES IN SIGN IF NOT REQUIRED BY BRACKET MANUFACTURER.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	STREET NAME SIGN ASSEMBLY CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. SS.2

9"h fitted to lengths 36", 42", 48", 54", 60"
.080 Aluminum
3/4" Radius
High Intensity Prismatic
No Border

6"h Logo
Pantone 132 + Pantone 554

6"h Highway Gothic Series C fonts name
4"h Highway Gothic Series C fonts suffix

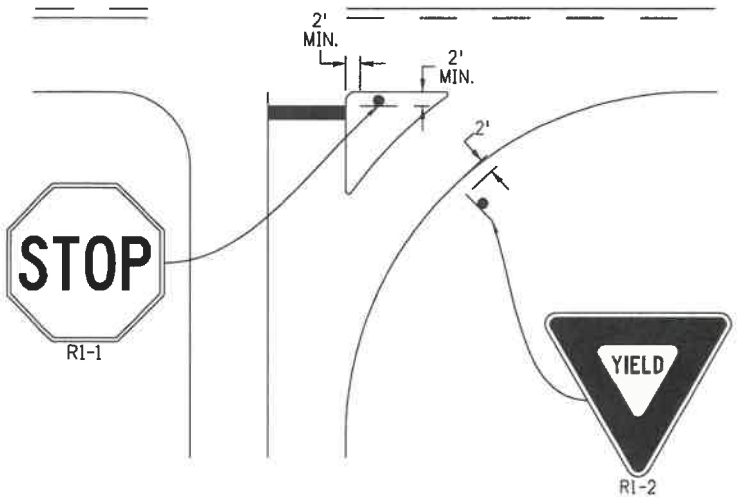


6"h fitted to lengths 24", 30", 36", 42"
.080 Aluminum
3/4" Radius
High Intensity Prismatic
No Border

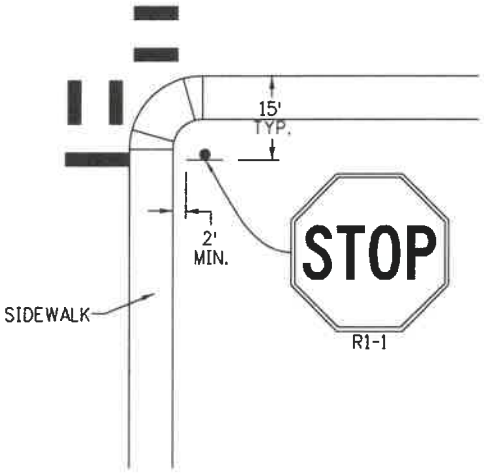
4"h Logo
Pantone 132 + Pantone 554

4"h Highway Gothic Series C fonts name
3"h Highway Gothic Series C fonts suffix

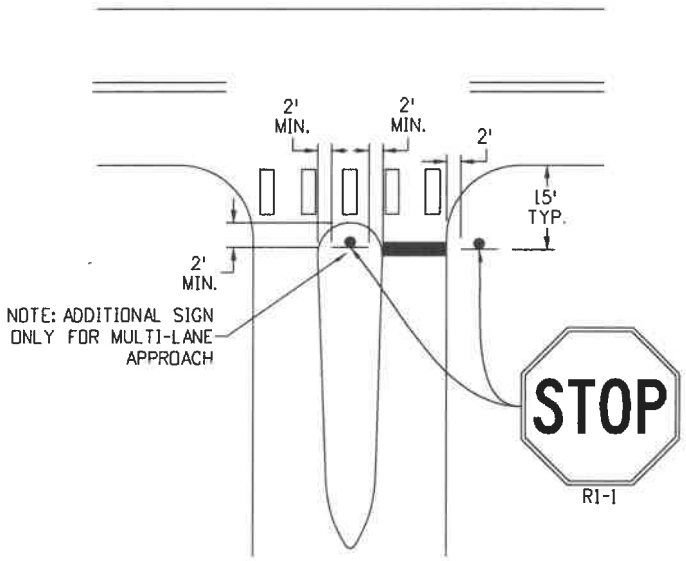
APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	GROUND MOUNTED STREET NAME SIGN DETAIL CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SS.3**



CHANNELIZED INTERSECTION



URBAN INTERSECTION



RAISED MEDIAN ISLAND

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

TYPICAL LOCATIONS FOR STOP SIGNS AND YIELD SIGNS

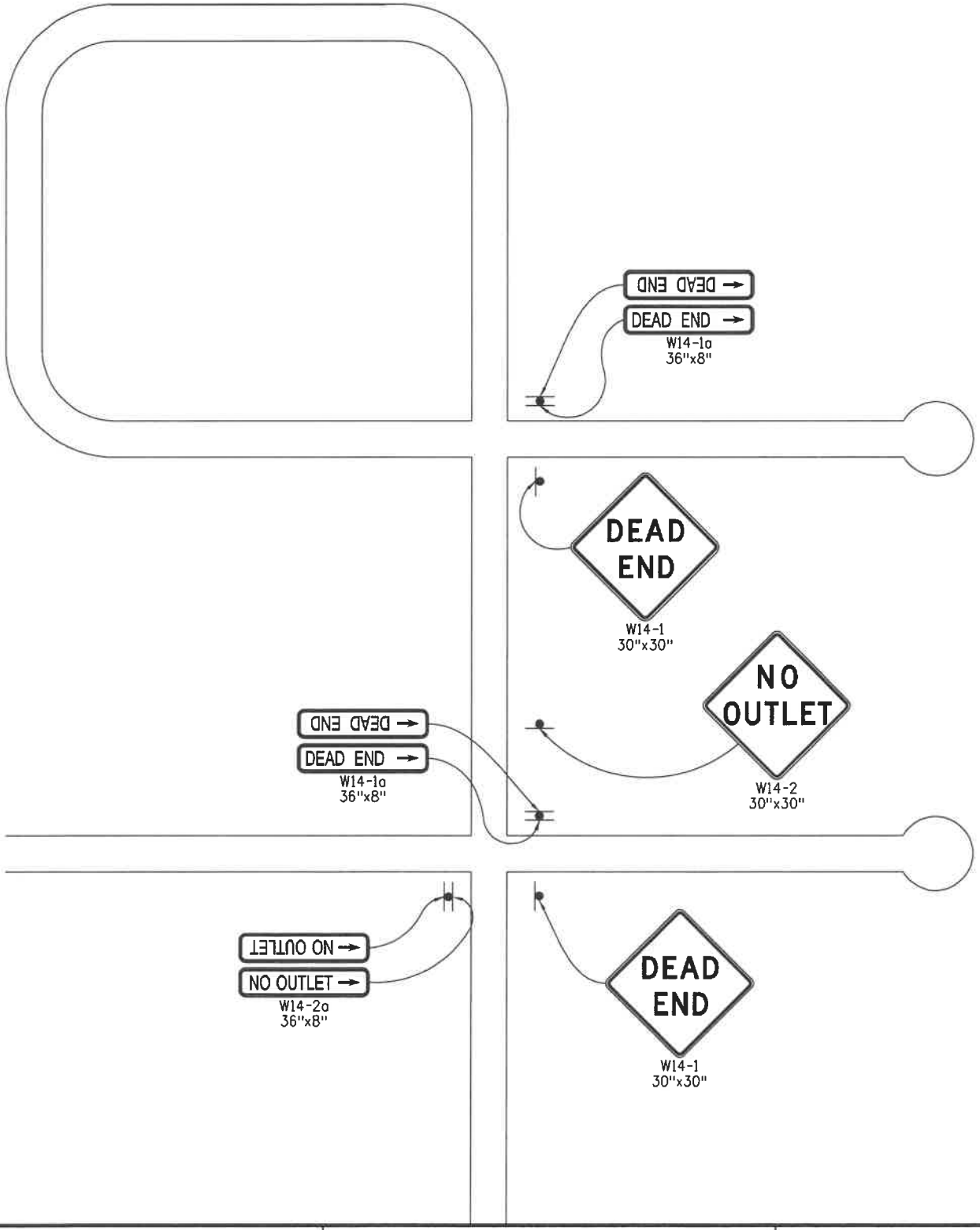
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.
SS.4

NOTE: W14-1a (DEAD END) AND W14-2a (NO OUTLET) SIGNS MOUNTED ON STREET NAME SIGN ASSEMBLY.



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

TYPICAL 'NO OUTLET' AND 'DEAD END' SIGN PLACEMENT

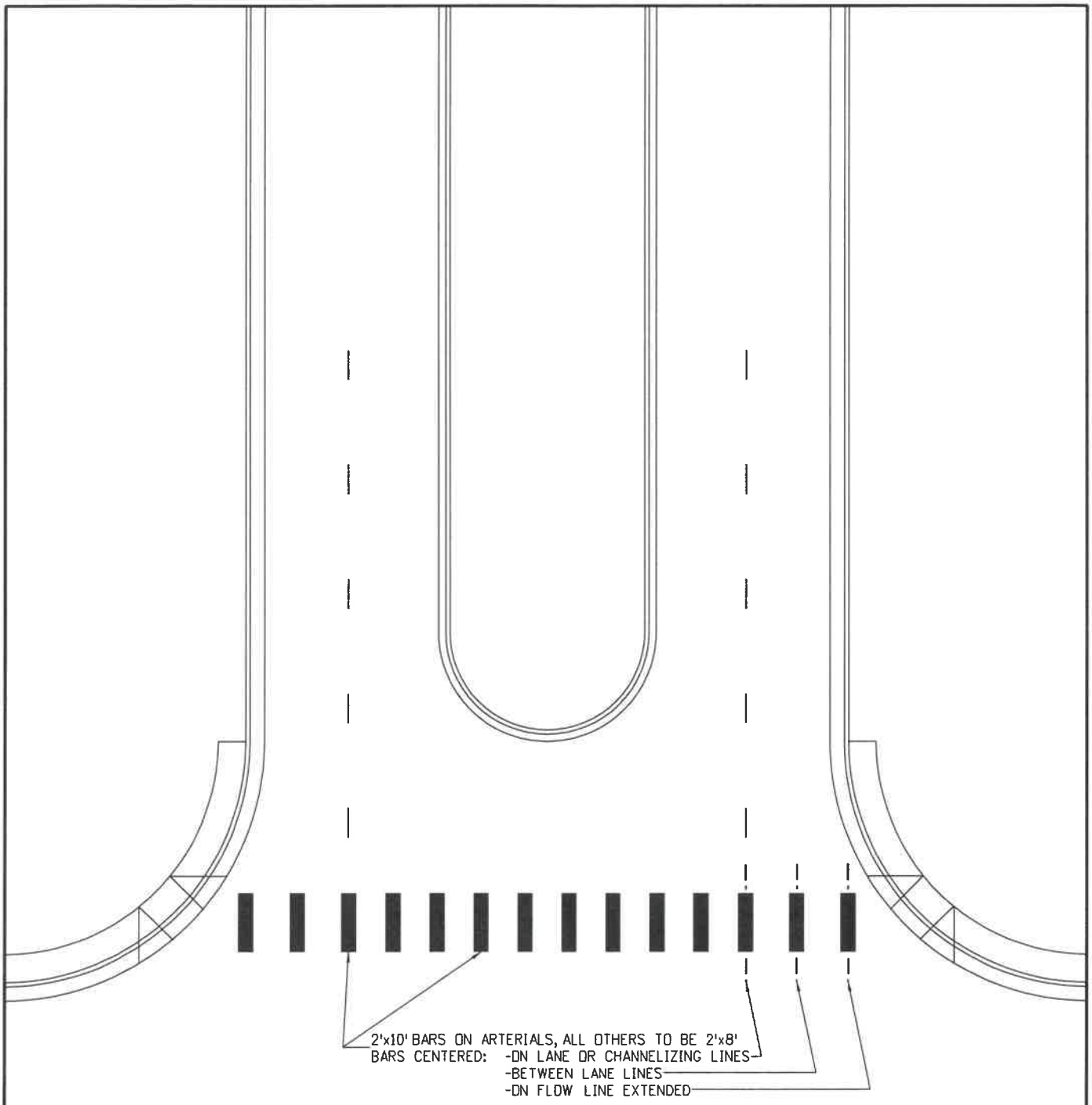
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SS.5



NOTES:

CROSSWALK BARS TO BE SPACED 12" TO 60" APART. CENTER CROSSWALKS ON CURB RAMPS. IF CURB RAMPS ARE NOT PRESENT, CENTER ON SIGNAL POLES WHEREVER PRACTICAL.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

TYPICAL CROSSWALK MARKING

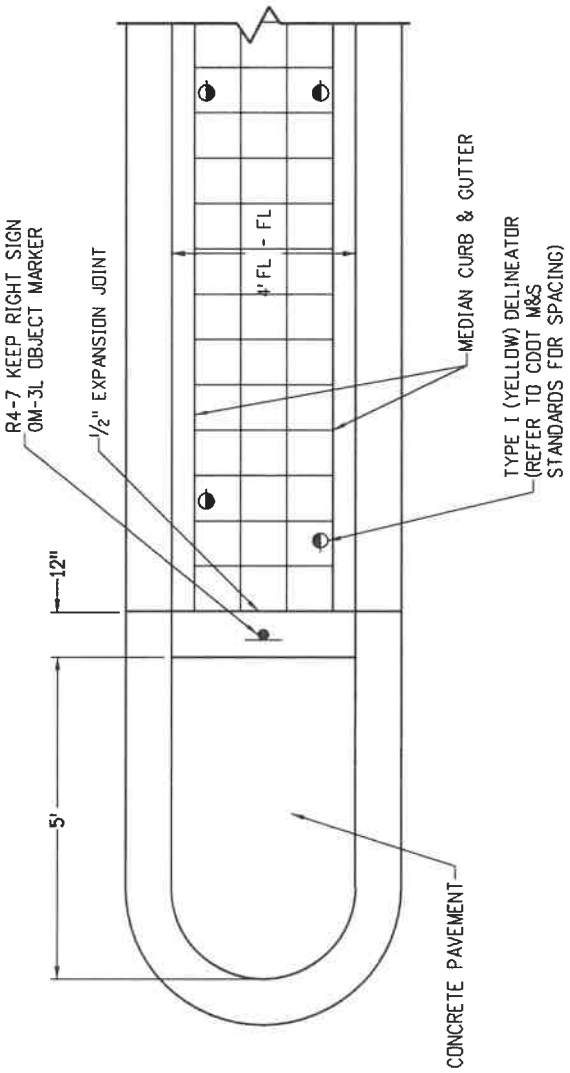
CITY OF CASTLE PINES

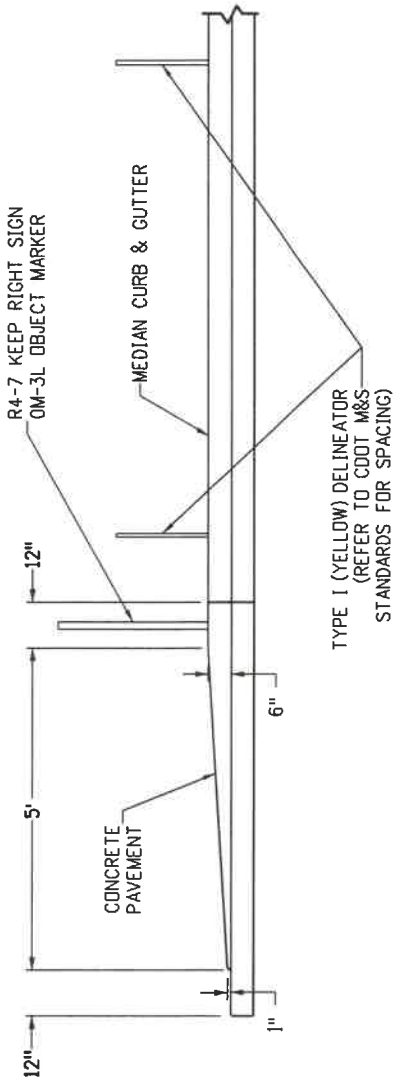
Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SS.6





APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

MEDIAN NOSE & SIGN DETAIL

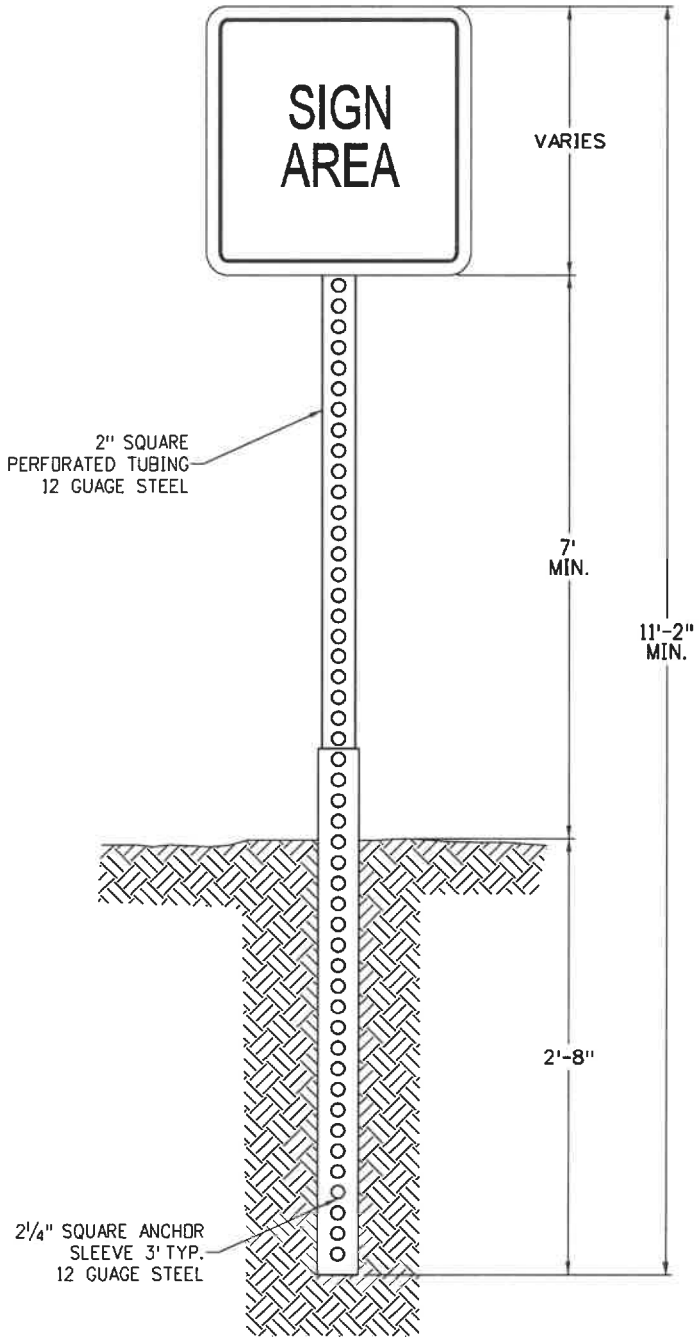
CITY OF
CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SS.7



APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

POST ANCHOR DETAIL

CITY OF CASTLE PINES

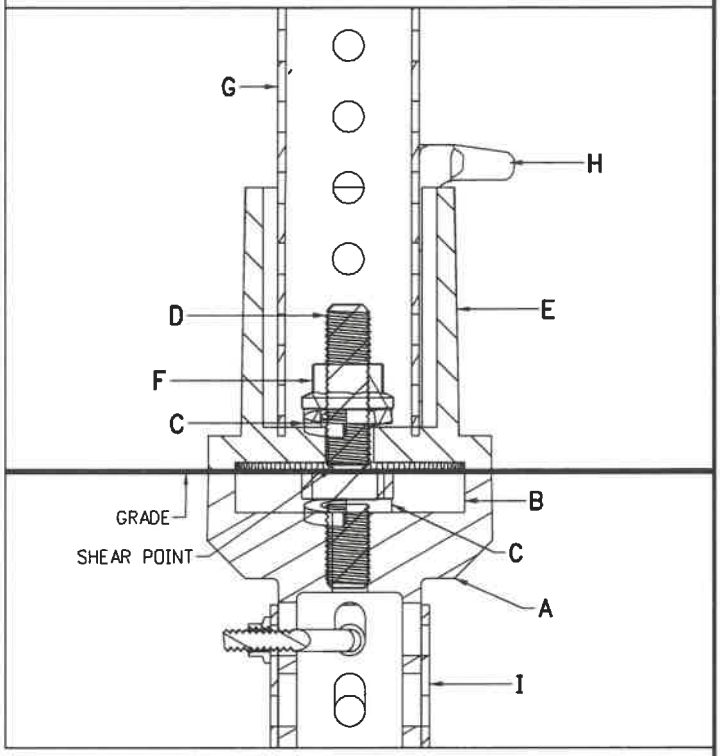
Issued: 6/15/2022

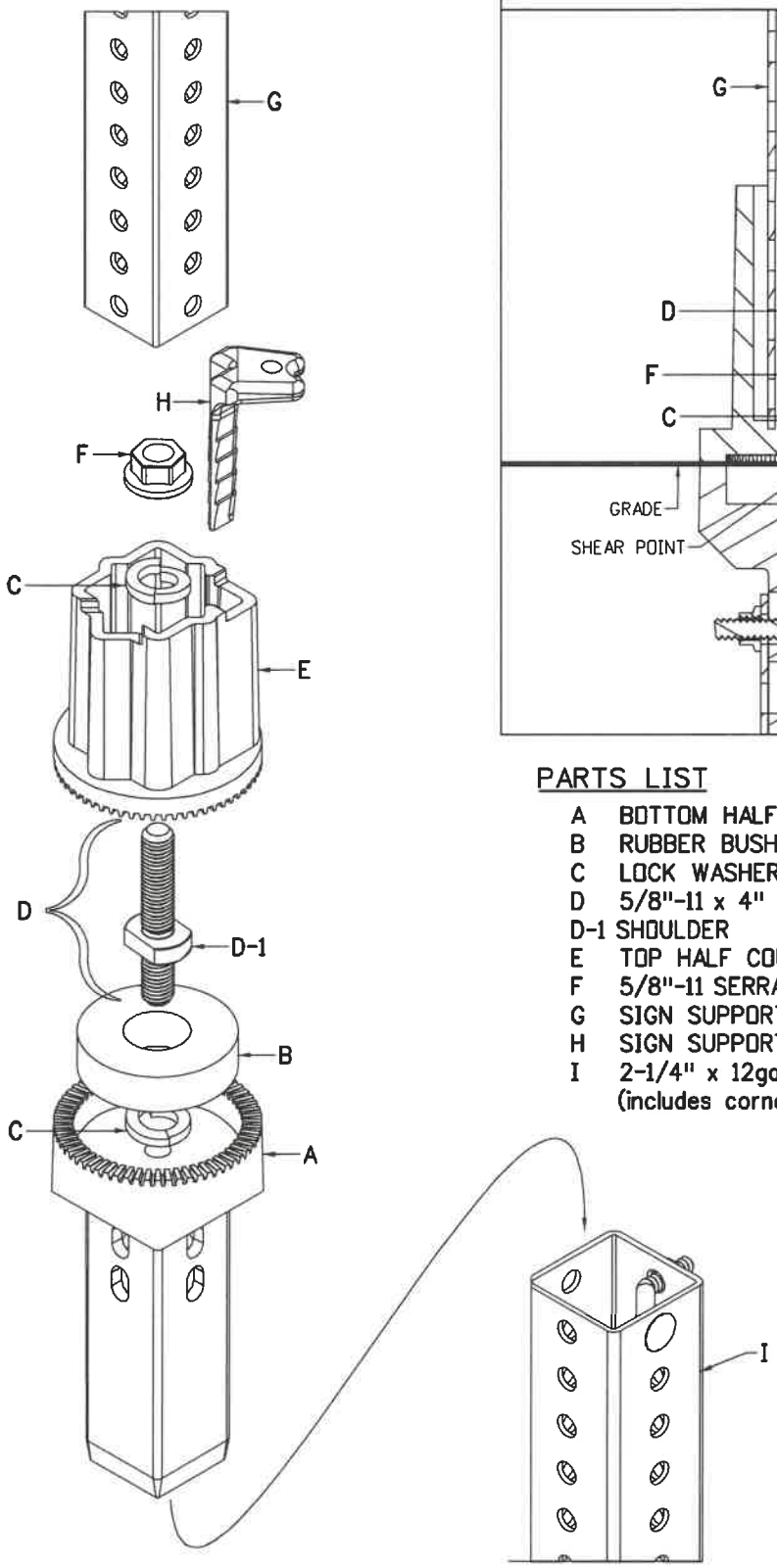
Revised: _____

Standard Drawing No.

SS.8

INSTALLED CROSS SECTION VIEW





PARTS LIST

A	BOTTOM HALF COUPLER
B	RUBBER BUSHING
C	LOCK WASHER
D	5/8"-11 x 4" SHEAR BOLT
D-1	SHOULDER
E	TOP HALF COUPLER
F	5/8"-11 SERRATED FLANGE NUT
G	SIGN SUPPORT
H	SIGN SUPPORT LOCKING WEDGE
I	2-1/4" x 12ga. ANCHOR EXTENSION (optional) (includes corner bolt & nut)

Source: Kleen Break Drawing Number XKB425-20-CI, dated August 12, 2021.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/19/22

KLEEN BREAK MODEL 425 FOR CONCRETE INSTALLATIONS

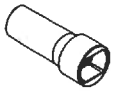
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

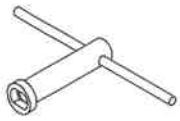
Standard Drawing No.

SS.9a



INSTALLATION PROCEDURE

TOOLS NEEDED: XKBW-SOCKET Kleen Break Socket or XKBW-1516 KLEEN BREAK WRENCH, and HAMMER



WHEN INSTALLING INTO FRESH CONCRETE, IT IS HELPFUL TO PREASSEMBLE KLEEN BREAK COUPLER (STEPS 1-3). THIS PREVENTS CONCRETE FROM INTERFERING WITH THE MESHING OF SERRATED TEETH WHEN POURING THE FOOTING. IT HELPS TO DRIVE OPTIONAL ANCHOR EXTENSION (I) PLUMB INTO SOIL IN BOTTOM OF HOLE A COUPLE OF INCHES PRIOR TO POURING, TO PREVENT MOVEMENT OF ASSEMBLY.

NOTE: IF INSTALLING BOTTOM HALF COUPLER (A) INTO EXISTING CONCRETE, A Ø4" HOLE NEEDS TO BE CORED. ANCHOR EXTENSION (I) IS OPTIONAL IF ADDITIONAL LENGTH BEYOND THE 8" BOTTOM HALF COUPLER STEM (A) IS DESIRED. IN THE EVENT AN EXISTING 2-1/4" PSST ANCHOR IS TO BE USED, BOTTOM HALF OF COUPLER (A) MAY REST ON TOP OF EXISTING CONCRETE TO MEET FHWA/NCHRP 350 REQUIREMENTS. WHEN A TRIPPING HAZARD IS A CONCERN, BOTTOM HALF (A) SHOULD BE INSTALLED FLUSH WITH GRADE.

STEP 1 THREAD SHORT END OF SHEAR BOLT (D), WITH LOCK WASHER (C) UNDER SHOULDER (D-1), INTO THREADED HOLE IN BOTTOM HALF COUPLER (A). TIGHTEN WITH (XKBW-SOCKET) KLEEN BREAK SOCKET OR A KLEEN BREAK WRENCH (XKBW-1516) UNTIL SPLIT RING LOCK WASHER (C) IS FULLY COMPRESSED.

NOTE: BE SURE THAT THE SHEAR POINT OF SHEAR BOLT (D) IS NOW ABOVE SHOULDER (D-1).

STEP 2 SLIDE RUBBER BUSHING (B) OVER SHEAR BOLT (D) UNTIL SEATED FIRMLY INTO ROUND CAVITY IN BOTTOM HALF COUPLER (A).

STEP 3 SLIDE TOP HALF OF COUPLER (E) OVER SHEAR BOLT (D) UNTIL IT RESTS ON THE RUBBER BUSHING (B). USING LOCK WASHER (C), THREAD 5/8" FLANGE NUT (F) ONTO TOP OF SHEAR BOLT (D) WITH A KLEEN BREAK SOCKET OR A 15/16" DEEP WELL SOCKET. ROTATE TOP RECEIVING HALF OF COUPLER (E) TO PROPER ORIENTATION OF SIGN BEFORE TIGHTENING FLANGE NUT (F), NOT TO EXCEED 110 FT.-LBS. BE SURE COUPLER TEETH ARE FULLY MESHED. TOTAL KLEEN BREAK COUPLER ASSEMBLY SHOULD BE COMPLETELY TIGHT BEFORE PROCEEDING TO THE NEXT STEP.

STEP 4 INSERT SIGN SUPORT (G) INTO TOP HALF OF COUPLER (E). LOCKING WEDGE (H) SHOULD BE POSITIONED AT A CORNER OF THE SIGN SUPPORT (G). WITH A HAMMER, DRIVE THE SIGN SUPPORT LOCKING WEDGE (H) BETWEEN SIGN SUPPORT (G) AND TOP HALF COUPLER (E) AT PRE-DETERMINED LOCATION UNTIL SEATED IN CORRESPONDING DEPRESSION OF TOP HALF COUPLER (E).

NOTE: IT IS NOT NECCESSARY TO DRIVE THE LOCKING WEDGE (H) UNTIL IT HAS BOTTOMED OUT IN THE POST RECEIVING COUPLER (E). DUE TO THE TOLERANCE WHEN HOT DIP GALVANIZING (THICKNESS, RUNS, OR DRIPS) THE LOCKING WEDGE (H) CAN BE FULLY ENGAGED AT DIFFERENT DEPTHS.

NOTE: THE SIGN SUPPORT LOCKING WEDGE (H) WILL KEEP THE SIGN SUPPORT (G) SECURE WITHOUT NEED OF ADDITIONAL FASTENERS OR HARDWARE.

NOTE: LOCKING WEDGE (H) CAN BE REMOVED BY USING A LIGHT DUTY WEDGE PULLER.

REINSTALLATION AFTER IMPACT

REMOVE SIGN SUPPORT LOCKING WEDGE (H) FROM TOP HALF COUPLER (E) WITH HAMMER. REMOVE BOTH ENDS OF BROKEN SHEAR BOLT (D) FROM BOTH COUPLER HALVES (A) & (E). REASSEMBLE FOLLOWING STEPS 1 THROUGH 4 FROM THE INSTALLATION PROCEDURE.

Source: Kleen Break Drawing Number XKB425-20-CI, dated August 12, 2021.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	KLEEN BREAK MODEL 425 FOR CONCRETE INSTALLATIONS CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SS.9b**

R1-1

R3-17

R3-17aP

R3-17b

R4-4

R7-9

R9-7 Special

R4-11


W11-1*


W11-15*

*FLUORESCENT YELLOW-GREEN COLOR

W16-1P*

W11-15P*

D11-1


M6-1


M6-3


M6-3Dir


M6-4


M6-6

M4-5

M4-6

M4-14

M4-TRL

NOTE: DISCUSS NEED FOR AND LOCATION OF BIKE ROUTE SIGNS WITH THE CITY PUBLIC WORKS DEPARTMENT.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

BIKE LANE / ROUTE SIGNS

CITY OF
CASTLE PINES

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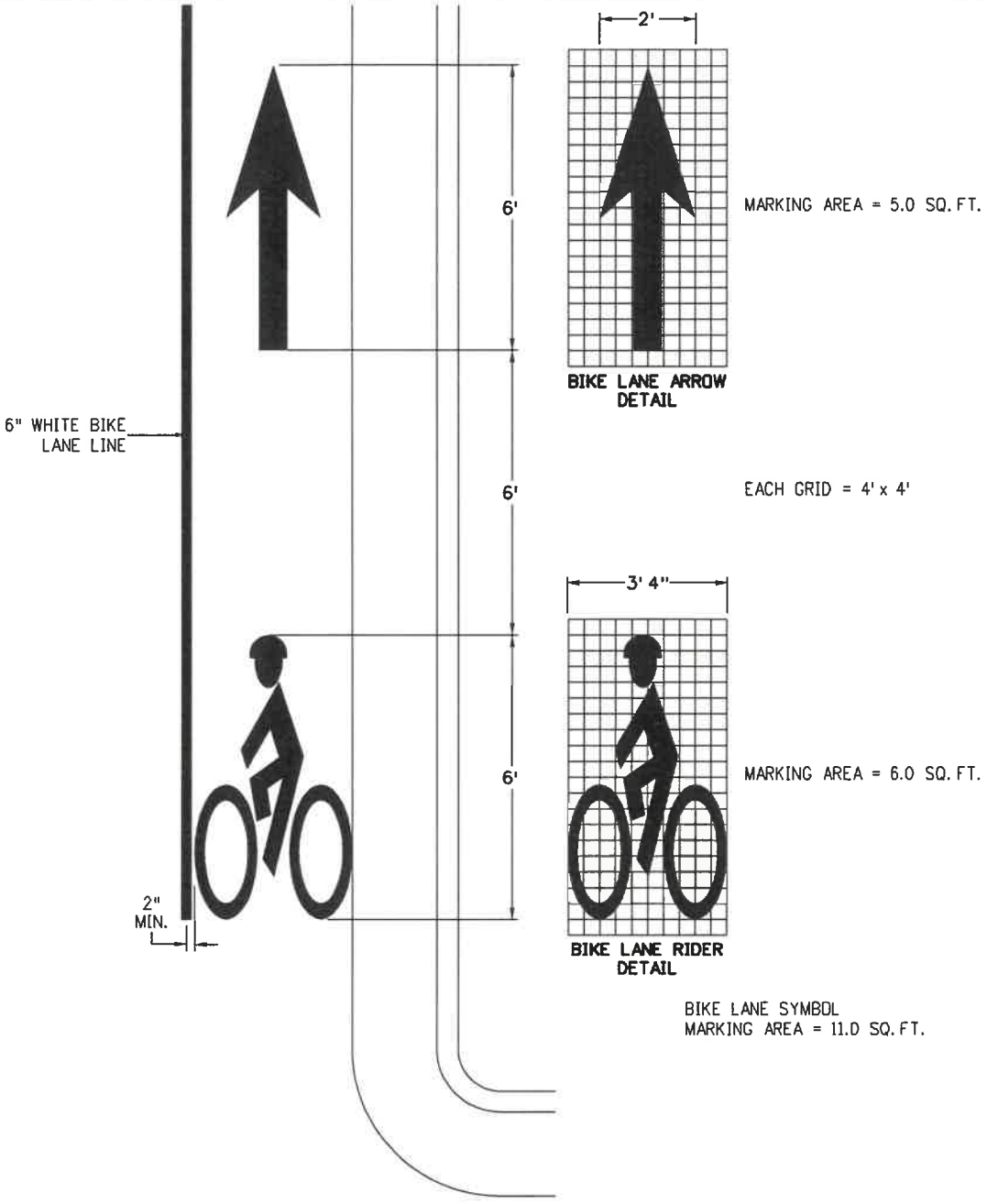
Revised: _____

Standard Drawing No.
SS.10



NOTES:

1. BIKE LANE SYMBOL INCLUDES BIKE LANE ARROW AND BIKE LANE RIDER SYMBOLS.
2. BIKE LANE SYMBOL SHALL BE CENTERED IN BIKE LANE IF POSSIBLE AND PLACED WITH A MINIMUM 2" SEPARATION FROM THE BIKE LANE LINE.
3. DO NOT PLACE BIKE LANE SYMBOL IN GUTTER PAN.
4. BIKE LANE SYMBOLS SHALL BE PLACED IMMEDIATELY BEYOND INTERSECTIONS AND MAJOR DRIVEWAYS, LOCATED ADJACENT TO THE BEGINNING OF THE BIKE LANE LINE.
5. AT INTERSECTION APPROACHES WHERE THE BIKE LANE IS BETWEEN A RIGHT-TURN LANE AND A THROUGH LANE, PLACE THE BIKE LANE SYMBOL A DISTANCE OF 30 FEET IN ADVANCE OF THE STOP BAR. AT SIGNALIZED INTERSECTIONS, PLACE THE BIKE LANE SYMBOL IN THE DETECTION ZONE.
6. IN RURAL AREAS, PLACE BIKE LANE SYMBOLS AT MAXIMUM INTERVALS OF 1500 FEET OR AS DETERMINED BY THE CITY PUBLIC WORKS DEPARTMENT. IN URBAN AREAS, PLACE BIKE LANE SYMBOLS AT MAXIMUM INTERVALS OF 700 FEET OR AS DETERMINED BY THE CITY PUBLIC WORKS DEPARTMENT.

APPROVED BY THE CITY OF CASTLE PINES

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Director of Public Works

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BIKE LANE STRIPING DETAIL
BIKE LANE SYMBOL

CITY OF
CASTLE PINES

Issued: 6/15/2022

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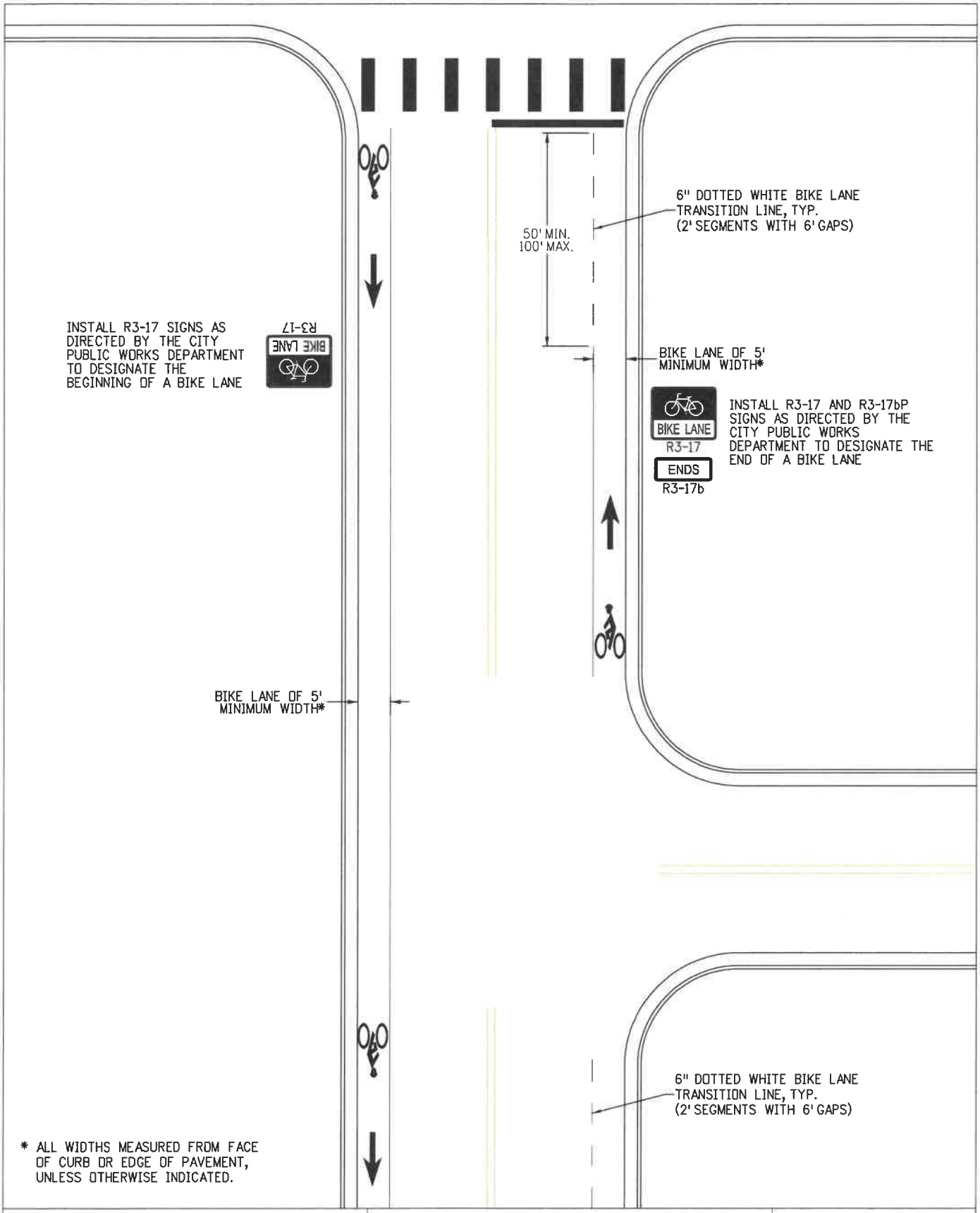
Standard Drawing No.
SS.11



* ALL WIDTHS MEASURED FROM FACE OF CURB OR EDGE OF PAVEMENT, UNLESS OTHERWISE INDICATED.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

BIKE LANE STRIPING DETAIL
TYPICAL BIKE LANE

CITY OF
CASTLE PINES

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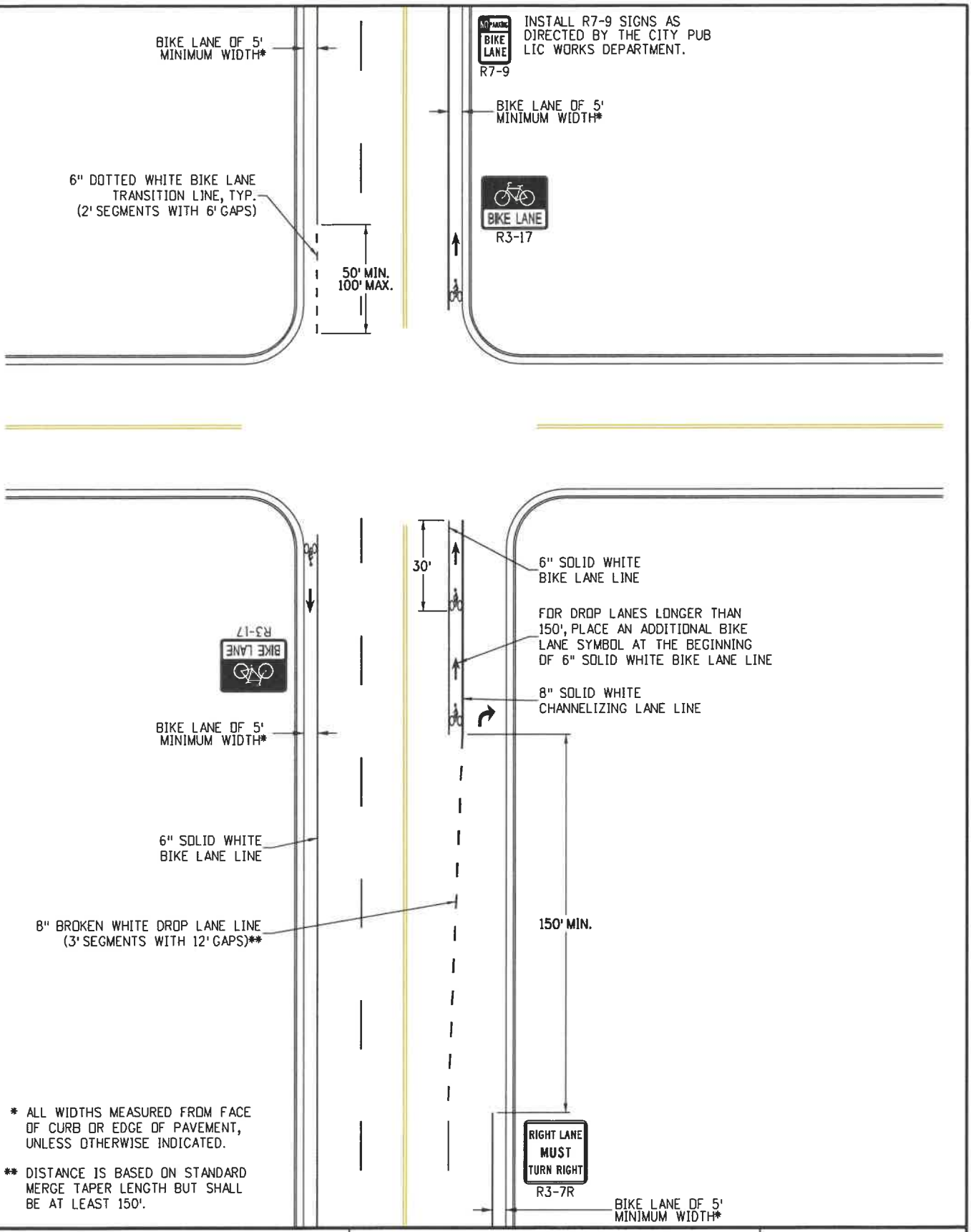
Standard Drawing No.

SS.12



* ALL WIDTHS MEASURED FROM FACE OF CURB OR EDGE OF PAVEMENT, UNLESS OTHERWISE INDICATED.

** DISTANCE IS BASED ON STANDARD MERGE TAPER LENGTH BUT SHALL BE AT LEAST 150'.

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BIKE LANE STRIPING DETAIL RIGHT TURN DROP LANE

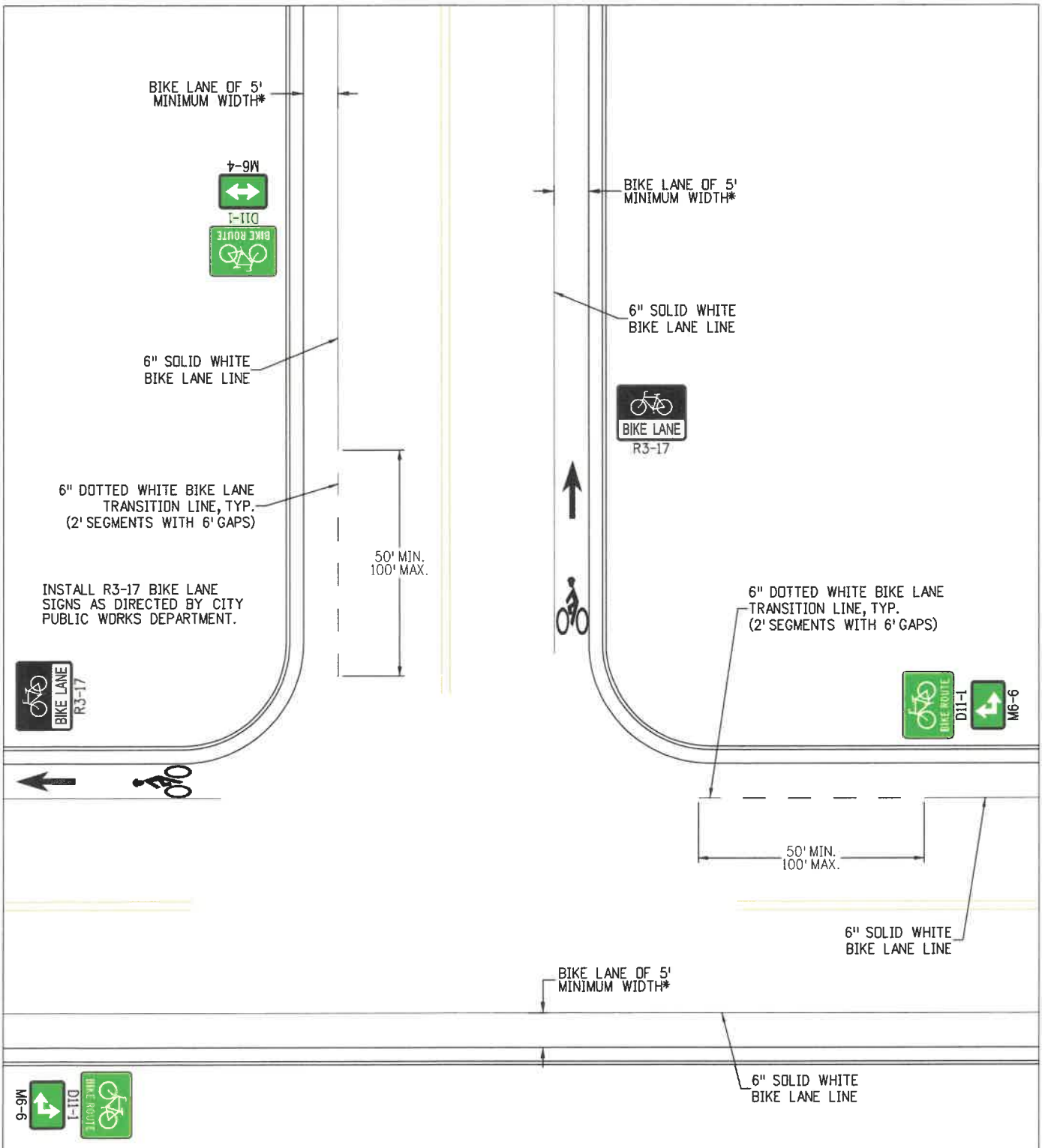
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SS.13



D11-1 BIKE ROUTE SIGNS TO BE LOCATED 50' MINIMUM FROM INTERSECTION, LOCATION MAY VARY.

* ALL WIDTHS MEASURED FROM FACE OF CURB OR EDGE OF PAVEMENT, UNLESS OTHERWISE INDICATED.

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Larry Nimmo
Director of Public Works

DATE 9/19/22

BIKE LANE STRIPING DETAIL T-INTERSECTION

CITY OF CASTLE PINES

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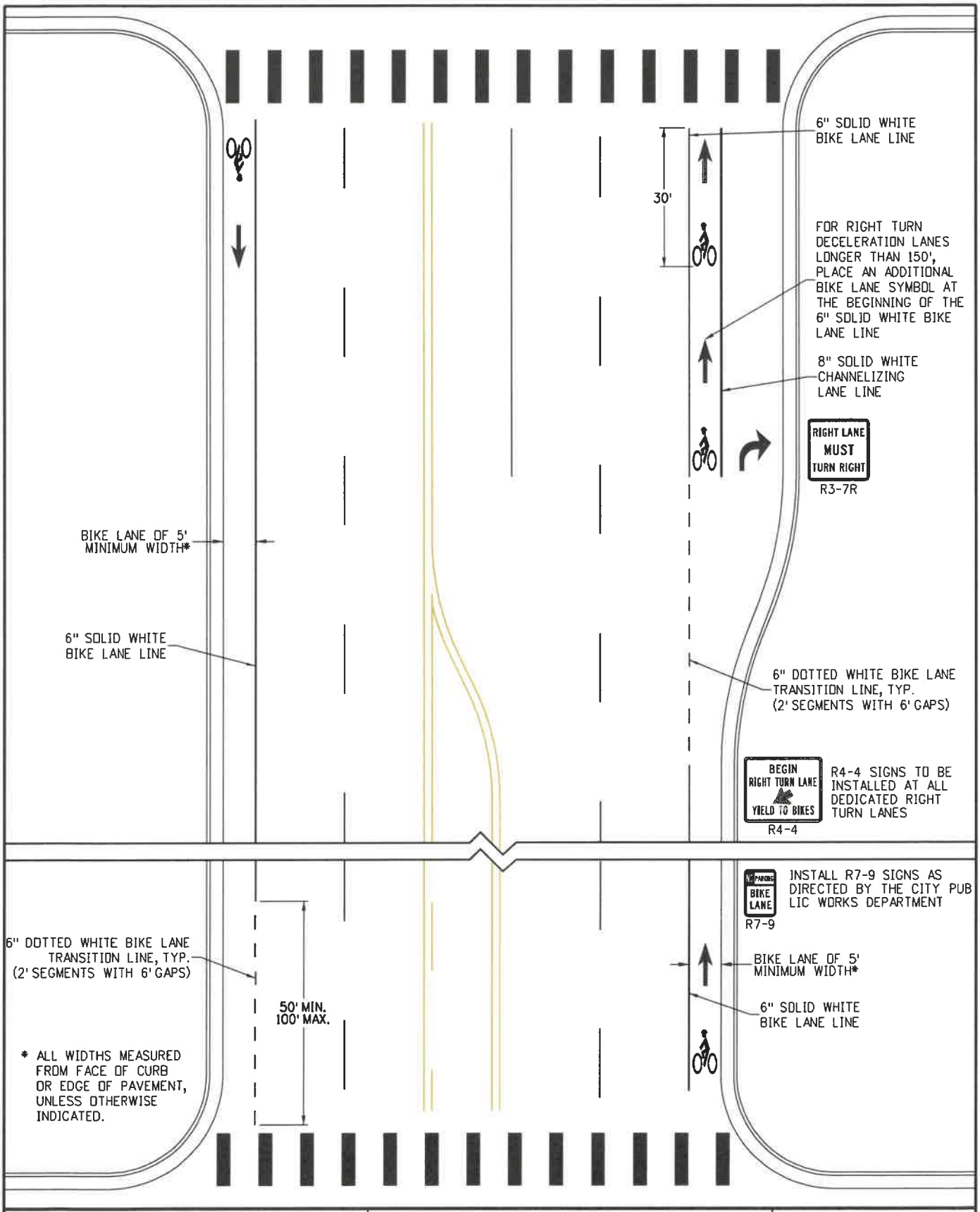
Revised:

Standard Drawing No.

SS.14



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Director of Public Works

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BIKE LANE STRIPING DETAIL INTERSECTION APPROACHES

CITY OF CASTLE PINES

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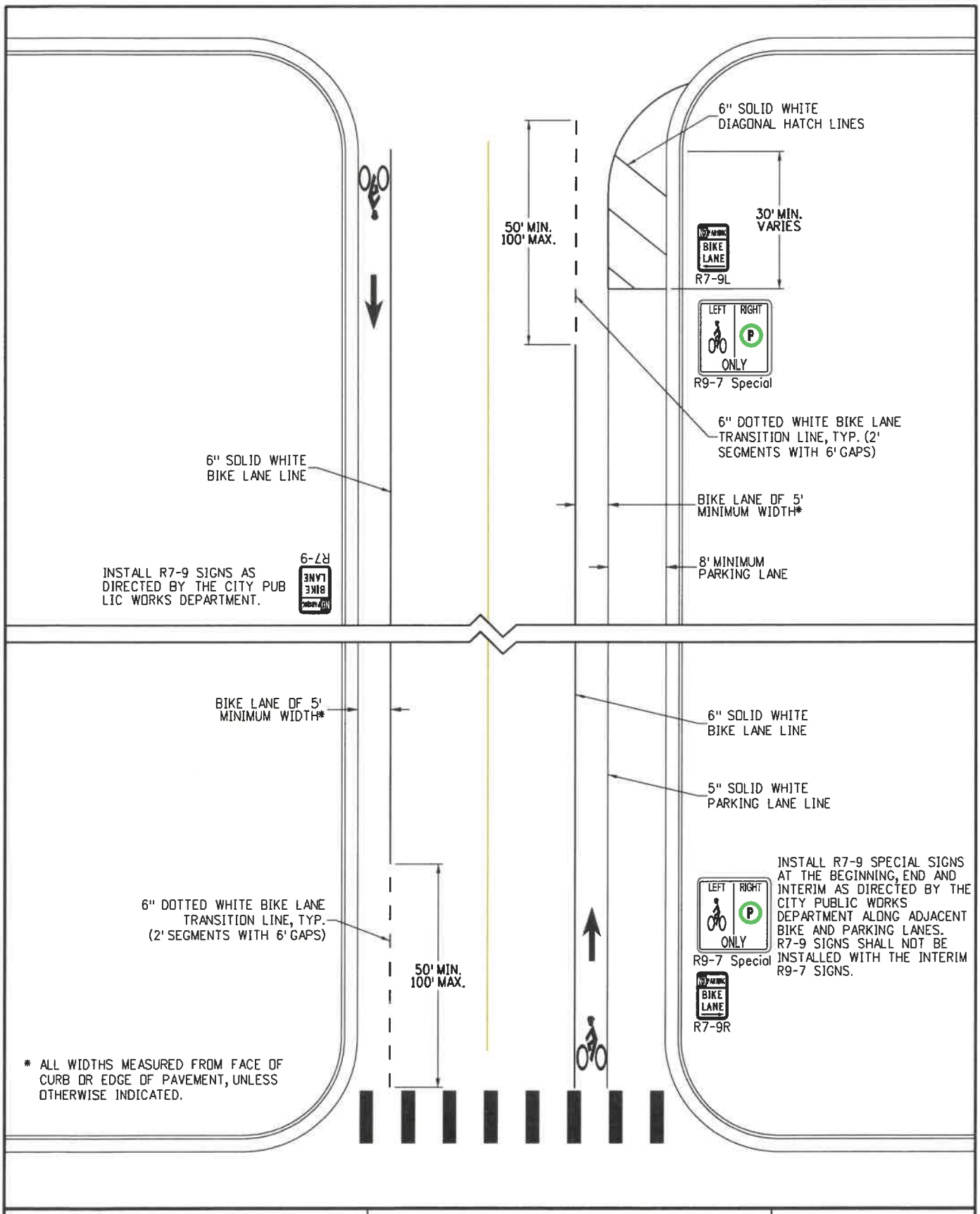
Standard Drawing No.

SS.15



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BIKE LANE STRIPING DETAIL
BIKE LANE AND PARKING

CITY OF
CASTLE PINES

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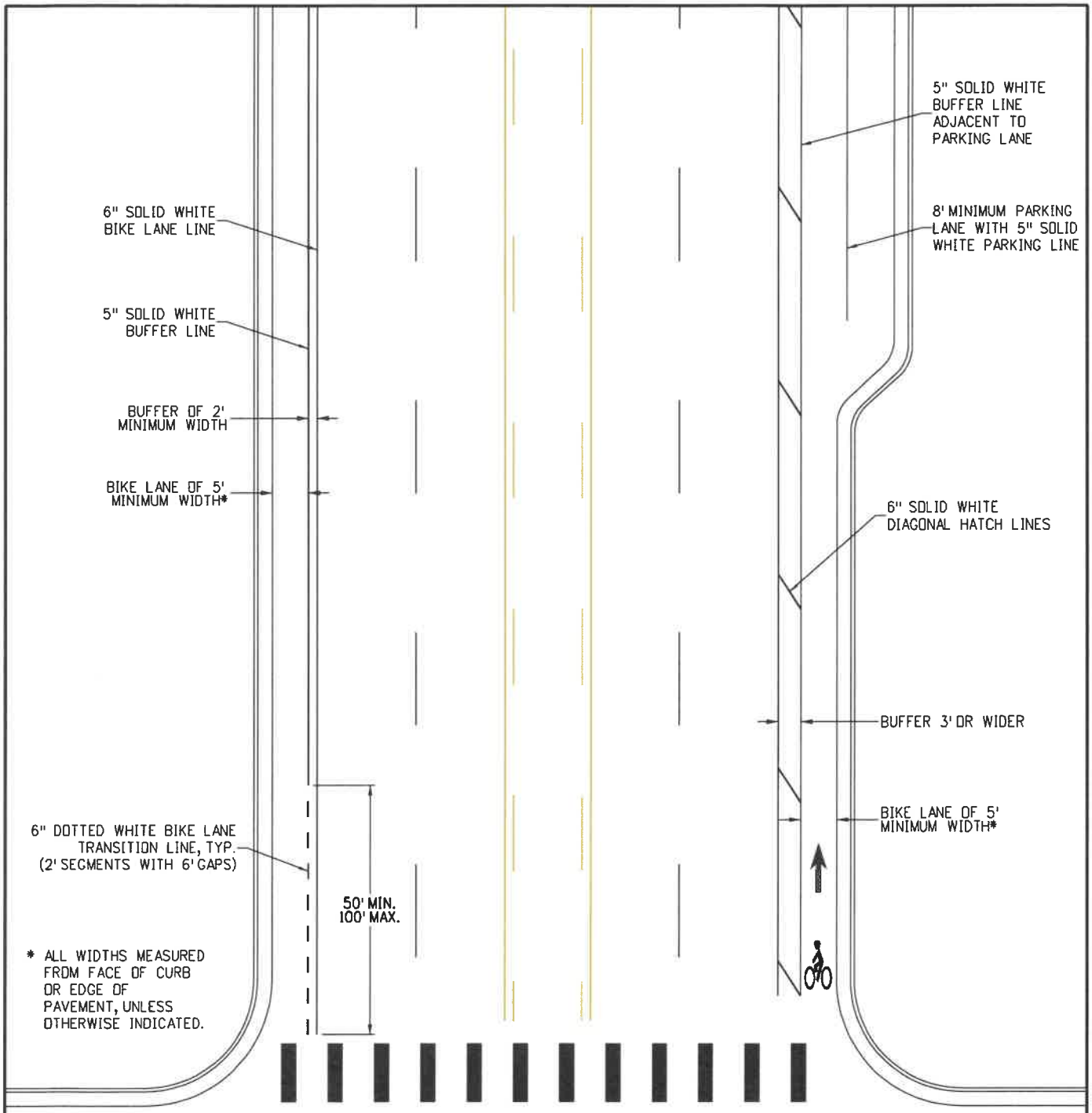
Standard Drawing No.

SS.16



NOTES:

1. WHERE THERE IS 7 FEET OF ROADWAY WIDTH AVAILABLE FOR A BIKE LANE, INSTALL A BUFFERED BIKE LANE INSTEAD OF A CONVENTIONAL BIKE LANE.
2. BUFFERED BIKE LANE CONFIGURATIONS PREFERABLY CONSIST OF A 5 FEET OR WIDER BIKE LANE AND A 2 FEET OR WIDER BUFFER.
3. FOR BUFFERS THAT ARE 3 FEET OR WIDER, INSTALL DIAGONAL HATCHED STRIPING INSIDE THE BUFFER.

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Director of Public Works

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BUFFERED BIKE LANE STRIPING DETAIL

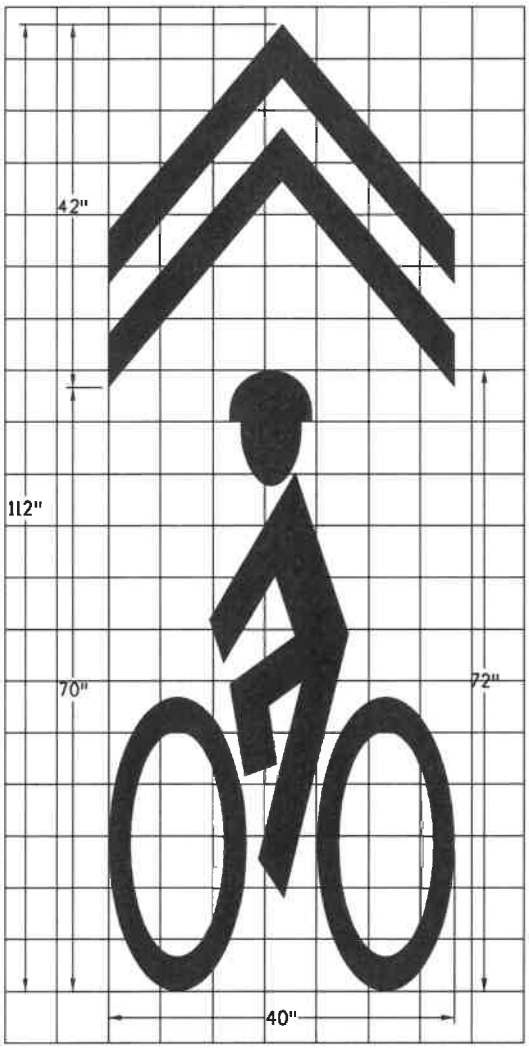
CITY OF CASTLE PINES

Issued: 6/15/2022

Revised: _____

Standard Drawing No.

SS.17



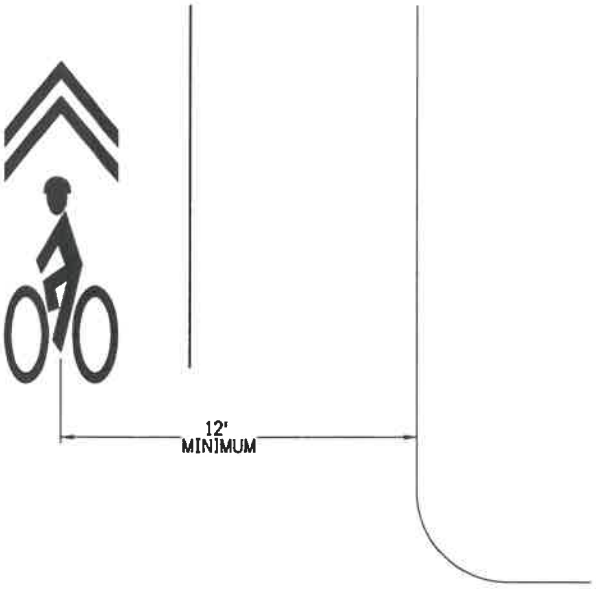
GRID 6" x 6"

MARKING AREA = 10.0 SQ. FT.

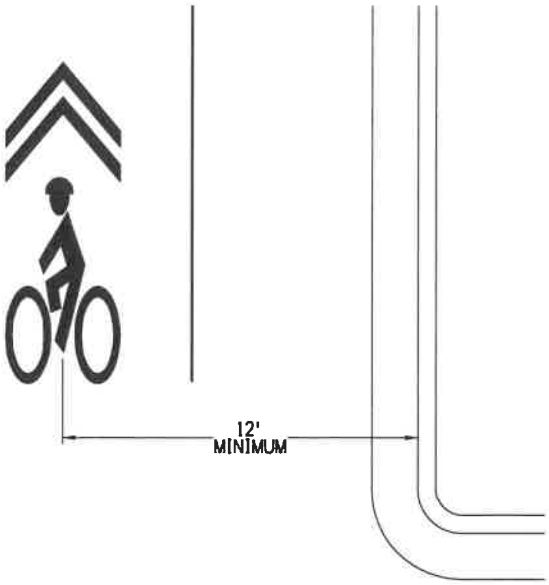
NOTES:

1. SHARED LANES ARE INTENDED FOR USE ON STREETS WITH A MAXIMUM POSTED SPEED OF 35 MPH, BUT PREFERABLY ON STREETS WITH A POSTED SPEED LIMIT OF 25 MPH, AND FOR LANES UP TO 15 FEET WIDE. FOR LANES 15 FEET AND WIDER, STRIPE A 5 FOOT BIKE LANE INSTEAD OF TREATING THE LANE AS A SHARED LANE.
2. SHARED LANE MARKINGS SHALL BE INSTALLED OUTSIDE WHEEL TRACKS OR WHERE INDICATED BY CITY OF CASTLE PINES PUBLIC WORKS. SHARED LANE MARKINGS SHALL NOT BE PLACED IN GUTTERS, SHOULDERS OR IN DESIGNATED BIKE LANES.
3. WHERE A PARKING LANE IS ADJACENT TO A SHARED LANE, PLACE SHARED LANE MARKINGS SUCH THAT THE CENTER OF THE MARKING IS AT LEAST 12 FEET FROM THE FACE OF CURB OR FROM THE EDGE OF PAVEMENT IF CURB AND GUTTER IS NOT PRESENT.
4. WHERE THERE IS NO ON-STREET PARKING AND THE TRAVEL LANE IS 13 FEET OR WIDER, PLACE SHARED LANE MARKINGS SUCH THAT THE CENTER OF THE MARKING IS AT LEAST 4 FEET FROM THE FACE OF CURB OR FROM THE EDGE OF PAVEMENT IF CURB AND GUTTER IS NOT PRESENT.
5. SHARED LANE MARKINGS SHALL BE PLACED IMMEDIATELY BEYOND AN INTERSECTION AND SPACED AT INTERVALS NO GREATER THAN 250 FEET THEREAFTER OR AS DETERMINED BASED ON CITY PUBLIC WORKS DEPARTMENTING JUDGMENT.
6. SHARED LANE MARKINGS MAY BE SUPPLEMENTED WITH SIGNS, ESPECIALLY BICYCLES MAY USE FULL LANE (R4-11) SIGN.

APPROVED BY THE CITY OF CASTLE PINES Larry Nimmo Director of Public Works DATE 9/14/22	SHARED LANE MARKING NOTES AND DETAIL CITY OF CASTLE PINES	Issued: 6/15/2022 Revised: _____ Standard Drawing No. **SS.18**

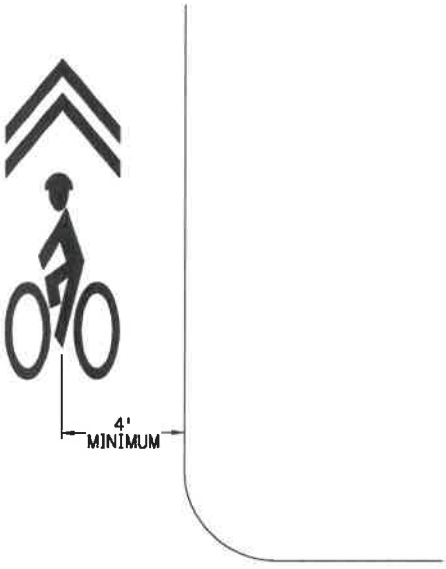


EDGE OF PAVEMENT
NO CURB & GUTTER DETAILS

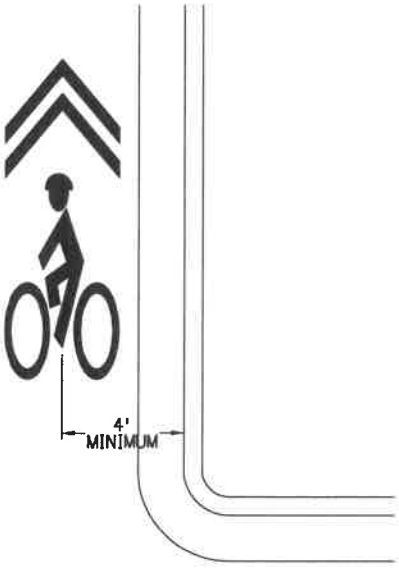


EDGE OF PAVEMENT
WITH CURB & GUTTER DETAILS

SHARED LANE ADJACENT
TO PARKING LANE



EDGE OF PAVEMENT
NO CURB & GUTTER DETAILS



EDGE OF PAVEMENT
WITH CURB & GUTTER DETAILS

SHARED LANE WITHOUT
PARKING LANE

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimmo
Director of Public Works

DATE 9/14/22

SHARED LANE MARKING
DETAILS

CITY OF
CASTLE PINES

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Revised: _____

Standard Drawing No.
SS.19

PAVER INSTALLATION NOTES:

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY OF CASTLE PINES (CP) STANDARDS AND SPECIFICATIONS, THE LATEST EDITION OF THE MUTCD, AND THE PROJECT CONSTRUCTION DRAWINGS AND SPECIFICATIONS INCLUDED HEREIN. IN CASES OF OMISSION FROM CP STANDARDS AND SPECIFICATIONS, THE MOST CURRENT EDITION OF THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AND THE LATEST EDITION OF THE CDOT STANDARDS PLANS, M&S STANDARDS SHALL APPLY.
2. THE BID QUANTITIES OF THE PROJECT ARE THE RESULT OF A CAREFUL QUANTITY TAKEOFF BY THE PROJECT ENGINEER. THE CONTRACTOR SHALL, HOWEVER, SATISFY HIMSELF AS TO THE ACCURACY OF ALL QUANTITIES AND BRING ANY DISCREPANCIES TO THE ATTENTION OF THE PROJECT ENGINEER, IN WRITING, AT HIS EARLIEST OPPORTUNITY.
3. ALL LABOR, EQUIPMENT, INCIDENTAL MATERIAL AND WIRING NECESSARY FOR THE INSTALLATION OF TRAFFIC SIGNAL POLE, SIGNAL HEADS, CABINET MODIFICATIONS (INCLUDING SIGNAL PHASE CHANGES AND VEHICLE DETECTION MODIFICATIONS) AND OTHER DEVICES SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL NOT BE PAID FOR SEPARATELY, BUT INCLUDED IN THE COST OF THE WORK.
4. THE CONTRACTOR SHALL PROVIDE MATERIAL SUBMITTALS TO CP PUBLIC WORKS FOR APPROVAL ON ALL EQUIPMENT PRIOR TO INSTALLATION. THE CITY SHALL REVIEW THE REQUIRED MATERIAL SUBMITTALS AND RETURN COMMENTS WITHIN 5 BUSINESS DAYS.
5. ALL TRAFFIC SIGNAL EQUIPMENT WILL BE MEASURED BY THE VARIOUS TYPES INSTALLED AND SHALL INCLUDE ALL INCIDENTAL MATERIALS AND WIRING NECESSARY FOR THE INSTALLATION AND OPERATION OF EACH ITEM.
6. THE UTILITY INFORMATION SHOWN ON THE SIGNAL PLANS IS APPROXIMATE ONLY AND IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. TO AVOID ANY DAMAGE TO A UTILITY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING THE EXACT LOCATION OF UTILITIES BEFORE COMMENCING ANY DRILLING, BORING, TRENCHING OR OTHER EXCAVATION TYPE OF WORK. THE CONTRACTOR SHALL CONTACT COLORADO 811 AT 811 OR 1-800-922-1987.
7. CONTRACTOR SHALL COORDINATE WITH XCEL ENERGY OR INTERMOUNTAIN RURAL ELECTRIC ASSOCIATION (IREA) TO INITIATE ELECTRICAL POWER APPLICATION PROCESS AND DETERMINE POWER SOURCE LOCATION.
8. THE POWER SOURCE SHALL BE 120/240 VOLT 60 AMP METERED SERVICE. IT SHALL INCLUDE A WEATHERPROOF METERED CIRCUIT DISCONNECTED BOX AND TYPE III PULL BOX. LOCATION OF METERED CIRCUIT DISCONNECT BOX TO BE DETERMINED BY CP PUBLIC WORKS AND SHALL NOT BE PLACED FURTHER THAN 75 FEET FROM THE SIGNAL CABINET.
9. UPON COMPLETION OF WORK, CONTRACTOR SHALL PROVIDE RECORD AS-BUILT DRAWING, CORRECTED PLANS AND ANY OTHER ADDITIONAL DATA REQUIRED BY THE CITY.
10. TRAFFIC SIGNAL INSTALLATION AND ALL ASSOCIATED WORK SHALL BE 100% COMPLETE PRIOR TO FLASH TURN ON. THIS INCLUDES ALL PUNCH LIST ITEMS AND OPERATIONAL LUMINARIES.
11. ALL SIGNAL POLE AND CONTROLLER CABINET LOCATIONS SHOWN IN THE PLANS ARE APPROXIMATE ONLY. ACTUAL LOCATIONS SHALL BE APPROVED IN THE FIELD BY CP PUBLIC WORKS PRIOR TO ANY DRILLING OR EXCAVATION. LOCATION OF EACH SIGNAL POLE FOUNDATION SHALL BE POTHOLED, PRIOR TO DRILLING TO VERIFY WHETHER ANY UTILITY CONFLICTS EXIST.
12. ALL NON-FUNCTIONING TRAFFIC OR PEDESTRIAN SIGNAL HEADS AND PEDESTRIAN PUSH BUTTONS SHALL BE BAGGED WHILE UNDER CONSTRUCTION. BAGS SHALL BE ORANGE PLASTIC.
13. MAST ARMS SHALL BE OF SUFFICIENT LENGTH TO ALLOW A SIGNAL HEAD TO BE MOUNTED IN THE CENTER OF THE INSIDE LEFT TURN LANE. TO ENSURE PROPER MAST ARM LENGTHS, THE CONTRACTOR SHALL FIELD VERIFY THE EXACT LOCATION OF THE POLE FOUNDATIONS WITH PROJECT AND CP PUBLIC WORKS (PRIOR TO ORDERING THE SIGNAL POLES AND MAST ARMS).
14. THE CONTRACTOR IS RESPONSIBLE FOR STORAGE AND ULTIMATE DELIVERY OF NEW TRAFFIC POLES AND MAST ARMS TO THE PROJECT SITE UNLESS OTHERWISE APPROVED BY CP PUBLIC WORKS.
15. ALL ELECTRICAL SYSTEMS SHALL BE PROPERLY GROUNDED IN ACCORDANCE WITH LATEST CASTLE PINES DESIGN AND CONSTRUCTION STANDARDS, CHAPTER 9 AND THE CP SIGNAL DETAILS. A GROUND ROD SHALL BE INSTALLED FOR EACH POLE AND CONTROLLER CABINET FOUNDATIONS.
16. ALL SIGNAL CABLE IS CONTINUOUS FROM CONNECTIONS MADE IN THE HAND HOLE COMPARTMENT OF THE SIGNAL POLE BASE TO THE TERMINAL COMPARTMENT IN THE CONTROLLER CABINET. SPLICING SHALL NOT BE PERMITTED UNLESS SPECIFICALLY APPROVED BY THE CP PUBLIC WORKS.
17. ALL HAND HOLE SPLICES SHALL BE BUCHANAN TYPE USING THE PRES-SURE-TOOL PART #C-24 CRIMPING TOOL SHALL BE STORED IN THE "UP" ORIENTATION.
18. WHENEVER MULTIPLE CABLES FEED EQUIPMENT ON A SINGLE POLE, EACH CABLE SHALL CONTAIN A NEUTRAL WIRE.
19. THE CONTRACTOR SHALL PROVIDE THE LUMINAIRE WIRING AND FINAL HOOK UP. LUMINAIRE FIXTURE SHALL BE APPROVED LED TYPE. EXISTING STREET LIGHTS SHALL NOT BE REMOVED UNTIL LUMINARIES ARE OPERATIONAL.
20. SIGNAL HEADS SHALL BE WIRED SEPARATELY FROM THE SIGNAL HEAD TO THE ABOVE GROUND HAND HOLE AT THE BASE OF THE SIGNAL POLE (NO OVERHEAD SPLICES). A SEPARATE 25 CONDUCTOR CABLE SHALL RUN FROM THE CONTROLLER CABINET TO THE TRAFFIC POLE HAND HOLE WITH NO SPLICES. WIRING SHALL BE LANDED AND LABELED IN ACCORDANCE WITH THE LATEST CP DESIGN AND CONSTRUCTION STANDARDS, CHAPTER 9 AND THE CP SIGNAL DETAILS.
21. EACH VEHICLES SIGNAL HEAD ON MAST ARMS SHALL HAVE A LOUVERED ALUMINUM BACKPLATE, BLACK IN COLOR, WITH 2 INCH FLUORESCENT YELLOW, DIAMOND GRADE RETROREFLECTIVE BORDER.
22. SIGNAL HEAD HOUSINGS SHALL BE POLYCARBONATE AND BLACK IN COLOR. MAST ARM MOUNTED SIGNAL HEADS AND SIGNS SHALL PELCO ASTRO-BRAC OR SKY-BRAC TYPE MOUNTING BRACKETS.
23. ALL VEHICLES AND PEDESTRIAN INDICATIONS SHALL BE APPROVED SOLID STATE LED TYPE. ALL VEHICLE INDICATIONS SHALL BE 12-INCH. ALL PEDESTRIAN INDICATIONS SHALL BE 16-INCH WITH A COUNTDOWN TIMER.
24. EACH APPROACH SHALL INCLUDE OPTICOM DETECTION IN ACCORDANCE WITH LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9). ☐ CHECK IF NOTE 24 IS APPLICABLE TO THIS PROJECT.
25. THE CONTROLLER CABINET SHALL BE 332D CABINET PAINTED CDOT SILVER AN ANTI-GRAFFITI COATING AND A PAINTED WHITE INTERIOR IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9) AND DETAILS. THE CONTROLLER CABINET SHALL BE INSTALLED SUCH THAT, WITH THE FRONT DOOR OPEN, A TECHNICIAN CAN VIEW BOTH THE CONTROLLER AND THE SIGNAL OPERATIONS. CABINET BASE SHALL BE APPROVED POLYMER CONCRETE.
26. THE TRAFFIC SIGNAL CONTROLLER SHALL BE A TRAFFICWARE/NAZTEC 2070 LITE TYPE PER CALTRAN STANDARDS WITH FIREWARE COMPATIBLE WITH SIGNAL SYSTEM SOFTWARE. CONFLICT MONITOR PROVIDED SHALL BE THE RENO MODEL 2018E
27. AN UNINTERRUPTABLE POWER SOURCE (UPS) SHALL BE INSTALLED IN THE CONTROLLER CABINET. THE UPS SHALL BE IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9).
28. COMMUNICATION AND ALL INTERCONNECT EQUIPMENT INSTALLED INSIDE AND OUTSIDE THE CONTROLLER CABINET SHALL BE IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9).
29. THE TRAFFIC SIGNAL CABINET, CONTROLLER AND ANCILLARY CABINET EQUIPMENT NEEDED TO PROVIDE PLANNED SIGNAL OPERATIONS SHALL BE DELIVERED TO THE CITY OF CASTLE PINES PUBLIC WORKS FOR INSPECTION, PROGRAMMING AND TESTING. MAXIMUM OF 15 BUSINESS DAYS SHALL BE ALLOWED PRIOR TO SUBSEQUENT PICKUP BY CONTRACTOR. ANY CABINET, CONTROLLER OR OTHER EQUIPMENT ERRORS WILL RESULT INA RETURN OF THE CABINET ASSEMBLY TO CONTRACTOR AND A RESTART OF 15 BUSINESS DAYS FOR REINSPECTION, PROGRAMMING AND TESTING UPON SUBSEQUENT DELIVERY.
30. ALL PULL BOXES AND CONDUIT SHALL BE IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9). ALL MULTIPLE CONDUIT RUNS SHALL BE INSTALLED IN A COMMON BORE OR TRENCH.
31. ALL CONDUIT SHALL HAVE PULL TAPE IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9) LEFT INSIDE CONDUIT WHEN CONSTRUCTION IS COMPLETED.
32. ALL INTERCONNECT CONDUIT TO INCLUDE A #14 AWG SOLID COPPER WIRE, IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9), THROUGH ENTIRE RUN TO FACILITATE FUTURE LOCATING.
33. CONTRACTOR SHALL INSTALL CITY PROVIDED DELINEATORS ON ALL PULL BOXES. COST OF INSTALLATION SHALL BE INCLUDED IN THE COST OF THE PULL BOX.
34. WHEN FIBER INTERCONNECT IS BEING INSTALLED, A MINIMUM OF 100 FEET SHALL BE COILED IN EACH COMMUNICATION VAULT, A MINIMUM OF 50 FEET IN EACH PULL BOX AND A MINIMUM OF 10 FEET IN THE CONTROLLER CABINET.
    ☐ CHECK IF NOTE 34 IS APPLICABLE TO THIS PROJECT.
35. VEHICLE DETECTION AND ASSOCIATED HARDWARE SHALL BE IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9). STOP BAR DETECTION SHALL BE PROVIDED FOR ALL APPROACHES AND ADVANCE DETECTION AS SPECIFIED IN DESIGN PLANS.
36. CONTRACTOR SHALL COORDINATE WITH VEHICLE DETECTION MANUFACTURER REPRESENTATIVE TO DETERMINE FINAL PLACEMENT AND OPERATION OF DETECTION. VEHICLE DETECTION REPRESENTATIVE SHALL BE PRESENT FOR DETECTION SET UP AND INITIAL OPERATION.
37. THE CONTRACTOR SHALL INSTALL ACCESSIBLE PEDESTRIAN PUSH BUTTONS, PEDESTRIAN SIGNAGE AND ASSOCIATED RACK MOUNTED EQUIPMENT AND WIRING IN ACCORDANCE WITH THE LATEST CP ROADWAY DESIGN AND CONSTRUCTION STANDARDS (CHAPTER 9).
    ☐ CHECK IF NOTE 37 IS APPLICABLE TO THIS PROJECT.
38. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL STRIPING WITH THE CITY OF CASTLE PINES ENGINEER PRIOR TO REMOVAL AND INSTALLATION. CONTACT THE CITY OF CASTLE PINES ENGINEER TO COORDINATE.
39. APPROPRIATE REGULATORY SIGNS, WARNING SIGNS AND PAVEMENT MARKINGS (ARROWS, SYMBOLS, ETC.), APPROVED BY THE CITY OF CASTLE PINES. SHALL BE IN PLACE PRIOR TO SIGNAL OPERATION.
40. STRIPING AND MARKING LEGENDS MAY BE SUBJECT TO MATERIALS CHANGES DUE TO SEASON AND OR WEATHER. TEMPORARY STRIPING MAY BE REQUIRED. FINAL SPECIFIED MATERIALS SHALL BE INSTALLED WHEN WEATHER/SEASON ALLOWS AS APPROVED BY CP PUBLIC WORKS.
41. FOR ALL DESIGN OR CONSTRUCTION INQUIRIES CONTRACT THE CITY PUBLIC WORKS DEPARTMENT.

CASTLE PINES STANDARD NOTES:

1. THE CASTLE PINES DEVELOPMENT REVIEW ENGINEER SIGNATURE AFFIXED TO THIS DOCUMENT INDICATES THE CITY PUBLIC WORKS DEPARTMENT HAS REVIEWED THE DOCUMENT AND FOUND IT IN GENERAL CONFORMANCE WITH THE CITY OF CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARD APPLICABLE MUNICIPAL CODE, AND ANY ASSOCIATED AGREEMENT (SUCH AS A DEVELOPMENT AGREEMENT) OR ACCEPTED VARIANCES TO THOSE REGULATIONS. THROUGH ACCEPTANCE OF THIS DOCUMENT, THE CITY ASSUMES NO RESPONSIBILITY, OTHER THAN STATED ABOVE, FOR THE COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS. THE OWNER AND ENGINEER ADEQUACY OF THE FACILITIES DEPICTED IN THIS DOCUMENT LIES SOLELY WITH THE PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO WHOSE STAMP AND SIGNATURE IS AFFIXED TO THIS DOCUMENT.
2. ALL CONSTRUCTION SHALL CONFORM TO CITY STANDARDS. ANY CONSTRUCTION NOT SPECIFICALLY ADDRESSED BY THESE PLANS AND SPECIFICATIONS WILL BE BUILT IN COMPLIANCE WITH THE LATEST EDITION OF THE MOST STRINGENT OF THE FOLLOWING:
    -THE CITY OF CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS
    -THE COLORADO DEPARTMENT OF HIGHWAYS STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
    -THE COLORADO DEPARTMENT OF TRANSPORTATION M STANDARDS
3. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE CITY PUBLIC WORKS DEPARTMENT AS APPLICABLE. THE CITY RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO ITS STANDARDS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL NOTIFY THE CITY PUBLIC WORKS DEPARTMENT A MINIMUM OF 24 HOURS AND A MAXIMUM OF 72 HOURS PRIOR TO STARTING CONSTRUCTION OF ELEMENTS THAT REQUIRE REVIEW AND INSPECTION. NOTIFICATION SHALL CONSIST OF THE CONTRACTOR'S CONTACTING THE CITY PUBLIC WORKS DEPARTMENT AND RECEIPT OF ACKNOWLEDGEMENT BY THE CITY. THE CONTRACTOR SHALL NOTIFY THE CITY WHEN WORKING OUTSIDE OF THE PUBLIC RIGHT-OF-WAY ON ANY FACILITY THAT WILL BE CONVEYED TO THE CITY, MHFD, OR OTHER SPECIAL DISTRICTS FOR MAINTENANCE. FAILURE TO NOTIFY THE CITY TO ALLOW INSPECTION OF THE CONSTRUCTION MAY RESULT IN NON-ACCEPTANCE OF THE FACILITY OR INFRASTRUCTURE BY THE CITY, MHFD, OR BOTH.
5. CONSTRUCTION SHALL NOT BEGIN UNTIL ALL APPLICABLE PERMITS HAVE BEEN ISSUED. IF A CITY ENGINEERING INSPECTOR IS NOT AVAILABLE AFTER PROPER NOTICE OF CONSTRUCTION ACTIVITY HAS BEEN PROVIDED, THE PERMITTEE MAY COMMENCE WORK IN THE INSPECTOR'S ABSENCE. HOWEVER, THE CITY RESERVES THE RIGHT NOT TO ACCEPT THE IMPROVEMENT IF SUBSEQUENT TESTING REVEALS AN IMPROPER INSTALLATION.
6. THE LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO ACTUAL CONSTRUCTION. FOR INFORMATION CONTRACT COLORADO 811 AT 811 OR 1-800-922-1987
7. THE CONTRACTOR SHALL HAVE ONE (1) COPY OF THE PLANS SIGNED BY THE CITY, ONE (1) COPY OF THE ROADWAY DESIGN AND CONSTRUCTION STANDARDS, AS AMENDED AND ALL APPLICABLE PERMITS AT THE JOB SITE AT ALL TIMES.
8. A TRAFFIC CONTROL PLAN, IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, SHALL BE SUBMITTED TO THE CITY FOR ACCEPTANCE WITH THE RIGHT-OF-WAY PERMIT APPLICATION. A RIGHT-OF-WAY PERMIT WILL NOT BE ISSUED WITHOUT AN ACCEPTED TRAFFIC CONTROL PLAN FOR TRAFFIC CONTROL DURING CONSTRUCTION
9. THE CONSTRUCTION PLAN SHALL BE CONSIDERED VALID FOR THREE (3) YEARS FROM THE DATE OF CITY ACCEPTANCE. AFTER WHICH TIME THESE PLANS SHALL BE VOID AND WILL BE SUBJECT TO RE-REVIEW AND RE-ACCEPTANCE BY THE CITY.
10. THE CITY OF CASTLE PINES STANDARD DETAILS SHALL NOT BE MODIFIED. ANY NON-STANDARD DETAILS WILL BE CLEARLY IDENTIFIED AS SUCH.
11. STANDARD CITY OF CASTLE PINES HANDICAP RAMPS ARE TO BE CONSTRUCTED AT ALL CURB RETURNS AND AT MID-BLOCK LOCATIONS OPPOSITE OF ONE OF THE CURB RETURNS OF ALL "T" INTERSECTIONS AS IDENTIFIED ON THESE PLANS.
12. THE PROFESSIONAL ENGINEER, REGISTERED IN THE STATE OF COLORADO, SIGNING THESE PLANS IS RESPONSIBLE FOR ENSURING THAT THE DETAILS INCLUDED ARE COMPATIBLE WITH THE STANDARD THE CITY OF CASTLE PINES DETAILS CONTAINED IN THE LATEST VERSIONS OF THE CRITERIA MANUALS THIS INCLUDES, BUT IS NOT LIMITED TO :
    -THE CITY OF CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS
    -THE CITY OF CASTLE PINES STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA
    -THE CITY OF CASTLE PINES GRADING, EROSION AND SEDIMENT CONTROL CRITERIA
    -CDOT M & S STANDARDS
    -MUTCD
    -URBAN STORM DRAINAGE CRITERIA MANUAL VOLUMES 1,2 & 3
13. A TEMPORARY CONSTRUCTION ACCESS PERMIT FROM THE CITY OF CASTLE PINES MAY BE REQUIRED FOR ANY PROJECT.

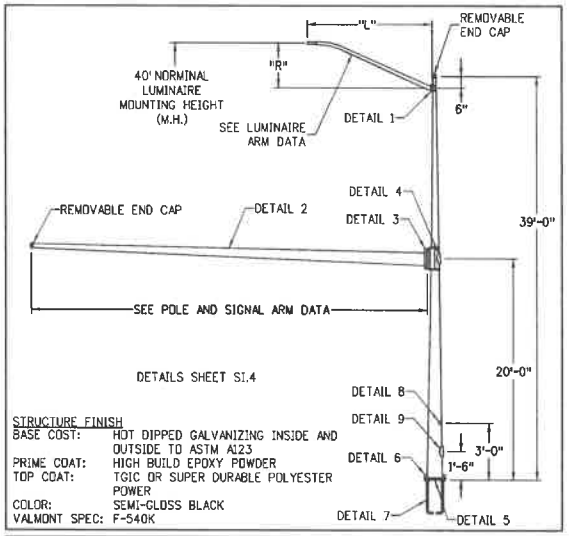
APPROVED BY THE CITY OF CASTLE PINES
Larry Nimmo
Director of Public Works
DATE 6/14/22

CITY OF CASTLE PINES

GENERAL NOTES

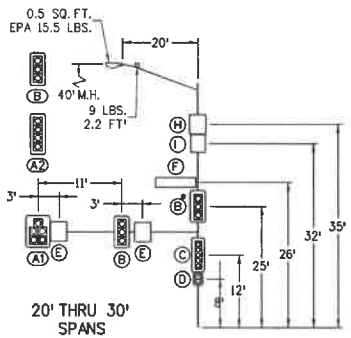
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.1

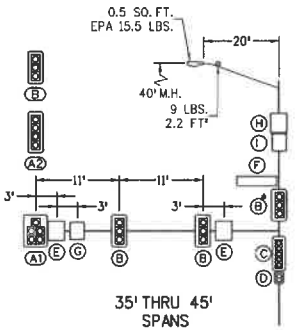


STRUCTURE FINISH

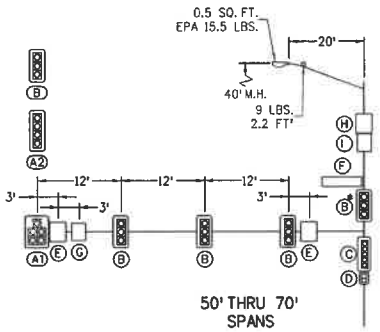
BASE COAT:	HOT DIPPED GALVANIZING INSIDE AND OUTSIDE TO ASTM A123
PRIME COAT:	HIGH BUILD EPOXY POWDER
TOP COAT:	TGIC OR SUPER DURABLE POLYESTER POWER
COLOR:	SEMI-GLOSS BLACK
VALMONT SPEC:	F-540K



20' THRU 30' SPANS



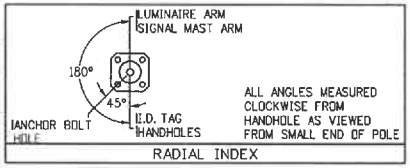
35' THRU 45' SPANS



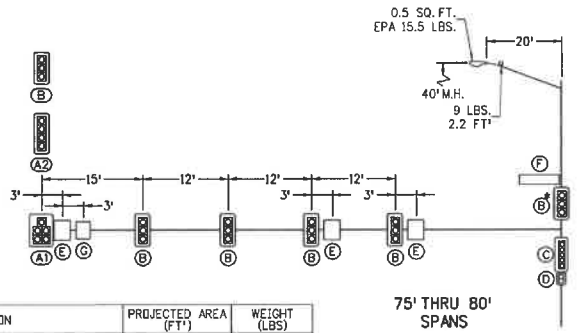
50' THRU 70' SPANS

CP – 101 – 30 – 20

- CASTLE PINES POLE SERIES
- POLE TYPE (01 DESIGNATES AASHTO YEAR)
- MAST ARM LENGTH
- LUMINAIRE ARM LENGTH



RADIAL INDEX



75' THRU 80' SPANS

MATERIAL DATA

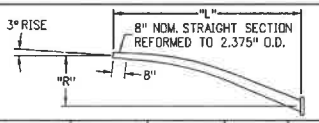
COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
ALL TAPERED SHAFTS	A595 GR.A OR A572	55
POLE BASE	A572 GR.50	50
SIGNAL ARM ATTACHMENT	A572 GR.50	50
SIGNAL ARM CONN. BOLTS	A325	--

COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
LUMINAIRE ATTACHMENT	A36	36
LUMINAIRE CONN. BOLTS	SAE GR.5	--
GALVANIZING-HARDWARE	A153	--
ANCHOR BOLTS	F1554 GR.55	55

POLE AND SIGNAL ARM DATA

POLE DESIGN AND SPANS	POLE TUBE				POLE BASE				ANCHOR BOLT				SIGNAL ARM TUBE			
	BASE DIA. (IN)	TOP DIA (IN)	LENGTH (FT)	GAUGE OR THK. (IN)	SQUARE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "H" (IN)	HOLE / SLOT "Z" (IN)	DIA. "K" (IN)	LENGTH "J" (IN)	HOOK "H" (IN)	THREAD LENGTH "U" (IN)	FIXED END DIA. (IN)	FREE END DIA. (IN)	GAUGE OR THICK (IN)	SPAN (FT)
CP-101 20'-40'	17.00	11.54	39.00	0.250	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	8.00	5.20	7	20.00
	17.00	11.54	39.00	0.250	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	10.00	6.50	7	25.00
	17.00	11.54	39.00	0.250	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	11.00	6.80	7	30.00
	17.00	11.54	39.00	0.250	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	12.50	7.60	5	35.00
	17.00	11.54	39.00	0.250	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	13.00	7.40	3	40.00
CP-201 45'-70'	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	12.50	6.56	DET. 2	45.00
	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	13.00	6.36	DET. 2	50.00
	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	14.00	6.65	DET. 2	55.00
	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	14.50	7.40	DET. 2	60.00
	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	15.00	6.26	DET. 2	65.00
	18.50	13.04	39.00	0.250	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	15.50	6.06	DET. 2	70.00
CP-301 75'-80'	20.00	14.54	39.00	0.313	27.00	26.00	2.00	2.50	2.25	89.00	7.00	12.00	16.50	6.36	DET. 2	75.00
	20.00	14.54	39.00	0.313	27.00	26.00	2.00	2.50	2.25	89.00	7.00	12.00	17.50	6.66	DET. 2	80.00

DEVICE	DESCRIPTION	PROJECTED AREA (FT²)	WEIGHT (LBS)
A1	12"-5 SEC. SIGNAL WITH BACKPLATE (STACKED)	13.72	96.00
A2	12"-4 SEC. SIGNAL WITH BACKPLATE (VERTICAL)	10.22	57.00
B	12"-3 SEC. SIGNAL WITH BACKPLATE (VERTICAL)	8.14	45.00
C	12"-5 SEC. SIGNAL WITH BACKPLATE (VERTICAL)	13.33	96.00
D	DUAL-2 SEC.-PEDESTRIAN *	8.00	80.00
E	30"x36" REGULATORY SIGN	7.50	25.00
F	21"x144" BACK TO BACK STREET NAME SIGNS	21.00	200.00
G	24"x30" REGULATORY SIGN	5.00	20.00
H	36"x36" REGULATORY SIGN	9.00	30.00
I	18"x30" REGULATORY SIGN	3.75	15.00



ARM SPAN "L"	FIXED END DIA.	FREE END DIA.	GA.	RISE HEIGHT "R"
20.00'	5.22"	2.38"	11	1'-8"

LUMINAIRE ARM DATA

NOTES:

BOTTOM OF ALL SIGNAL HEADS SHALL HJAVE A MINIMUM VERTICAL CLEARANCE FROM PAVEMENT OF 17 FEET AND A MAXIMUM VERTICAL CLEARANCE FROM PAVEMENT OF 19 FEET AND SHALL BE ON THE SAME HORIZONTAL PLANE.

(B)* THIS SIGNAL INDICATION OPTIONAL BASED ON INTERSPECTION GEOMETRICS. IF NOT REQUIRED, MOUNT STREET NAME SIGN AS SPECIFIED ON SHEET 17, ADJUST REGULATORY SIGNS DOWN ACCORDINGLY.

SEE LATEST EDITION OF CHAPTER 9, CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS

APPROVED BY THE CITY OF CASTLE PINES

Tom Nimmo
Director of Public Works

DATE

CITY OF CASTLE PINES

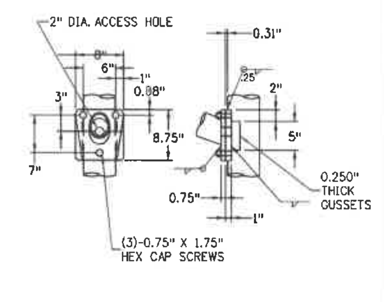
MAST ARM AND SIGNAL HEADS

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

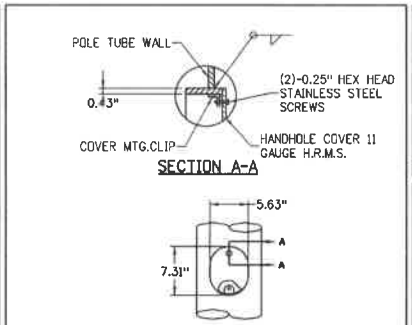
Issued: 6/15/2022

Revised:

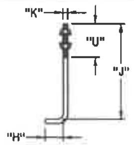
Standard Drawing No. SI.2



DETAIL 1 — LUMINAIRE ARM ATTACHMENT



DETAIL 4 — UPPER HANDHOLE



DETAIL 7 — ANCHOR BOLT

1.50" X 3.25 ALUMINUM IDENTIFICATION TAG SECURED TO POLE SHAFT WITH (2) 0.19" RIVETS AT 36" UP FROM BASE STAMPED AS SHOWN

DETAIL 8 — I.D. TAG

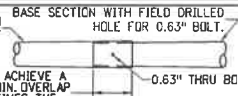
THESE TRAFFIC SIGNAL SUPPORT STRUCTURES ARE DESIGNED IN ACCORDANCE WITH LOADING AND ALLOWABLE STRESS REQUIREMENTS OF 2001 AASHTO "STANDARDS SPECIFICATION FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", FOURTH EDITION. WIND LOADS ARE BASED ON A BASIC WIND SPEED OF 100 MPH WIT A RECURRENCE INTERVAL OF 50 YEARS, AND A FATIGUE CATEGORY OF 2. FATIGUE LOADS ARE BASED ON THE REQUIREMENTS OF SECTION 11.7 AND THE FOLLOWING DESIGN LOADS:

VORTEX SHEDDING: NOT APPLICABLE FOR STRUCTURES WITH A TAPER OF AT LEAST 0.14 IN/FT. PER AASHTO.

NATURAL WIND GUSTS: THE YEARLY MEAN WIND SPEED FOR NATURAL WIND GUSTS WILL BE ASSUMED TO BE 11.2 MPH.

TRUCK- INDUCED GUST: STRUCTURES ARE DESIGNED TO INCLUDE TRUCK-INDUCED GUSTS. (THE SPECIFIED AVERAGE TRUCK SPEED IS 65 MPH)

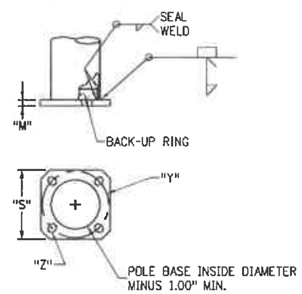
AASHTO 2001 SPECIFICATIONS



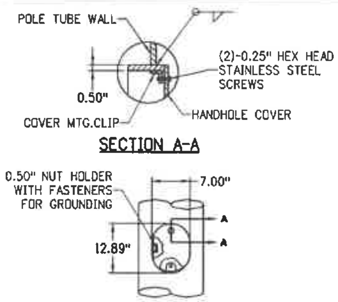
FIELD ASSEMBLED TO ACHIEVE A SNUG TIGHT JOINT (MIN. OVERLAP NOT LESS THAN 1.5 TIMES THE I.D. OF THE END SECTION)

SPAN	BASE SECTION LENGTH	BASE SECTION GAUGE	END SECTION BASE DIA.	END SECTION LENGTH	END SECTION GAUGE
45'	15.72'	0.313"	11.00"	31.72"	7
50'	19.29'	0.313"	11.00"	33.15"	7
55'	19.42'	0.313"	12.00"	38.15"	7
60'	15.97'	0.375"	13.00"	46.72"	7
65'	19.54'	0.375"	13.00"	48.15"	7
75'	23.11'	0.375"	13.00"	49.58"	7
75'	30.26"	0.375"	13.00"	47.44"	7
80'	37.40'	0.375"	13.00"	45.30"	7

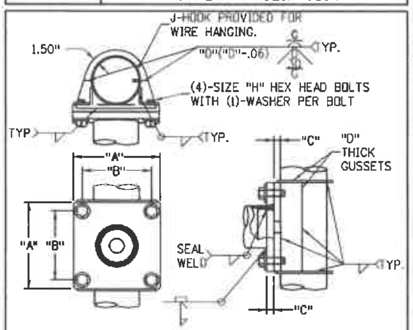
DETAIL 2 — SIGNAL ARM SLIP JOINT



DETAIL 5 — POLE BASE



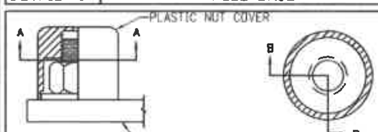
DETAIL 9 — LOWER HANDHOLE



SIGNAL ARM ATTACHMENT DATA

POLE TYPE	"A"	"B"	"C"	"D"	"H"
CP-101	21.75"	18.50"	1.750"	0.500"	1.25" X 3.75"
CP-201	24.25"	20.50"	2.000"	0.625"	1.50" X 4.25"
CP-301	26.75"	23.00"	2.000"	0.625"	1.50" X 4.25"

DETAIL 3 — SIGNAL ARM ATTACHMENT



ANCHOR BOLT PROJECTION ABOVE TOP OF BASE PLATE
0.75" DIA. ANCHOR BOLT - 1.25" MIN. / 1.75" MAX.
1.00" DIA. ANCHOR BOLT - 1.75" MIN. / 2.50" MAX.
1.25" DIA. ANCHOR BOLT - 2.00" MIN. / 2.75" MAX.
1.50" DIA. ANCHOR BOLT - 2.25" MIN. / 3.00" MAX.
1.75" DIA. ANCHOR BOLT - 2.50" MIN. / 3.25" MAX.
2.00" DIA. ANCHOR BOLT - 2.75" MIN. / 3.50" MAX.
2.25" DIA. ANCHOR BOLT - 3.00" MIN. / 3.75" MAX.

INSTALLATION INSTRUCTIONS

PLACE COVER OVER ANCHOR BOLT. ENGAGE EXPOSED THREADS OF ANCHOR BOLT AND ROTATE CLOCKWISE UNTIL BOTTOM OF COVER SITS FLUSH WITH TOP OF BASE PLATE. ONCE RIBS INSIDE ARE ENGAGED WITH ANCHOR BOLT NUT, LOCKING ACTION OCCURS AND COUNTER-CLOCKWISE ROTATION IS INHIBITED.

DETAIL 6 — NUT COVER

POLE AND SIGNAL ARM DATA

POLE DESIGN AND SPANS	POLE BASE: SQUARE "S" (IN)	POLE BASE: BOLT CIRCLE "Y" (IN)	POLE BASE: THK. "M" (IN)	POLE BASE: HOLE / SLOT "Z" (IN)	ANCHOR BOLT: DIA. "K" (IN)	ANCHOR BOLT: LENGTH "J" (IN)	ANCHOR BOLT: HOOK "M" (IN)	ANCHOR BOLT: THREAD LENGTH "U" (IN)	SIGNAL ARM TUBE: FIXED END DIA. (IN)	SIGNAL ARM TUBE: FREE END DIA. (IN)	SIGNAL ARM TUBE: GAUGE OR THICK (IN)	SIGNAL ARM TUBE: SPAN (FT)
CP-101 20'-40'	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	8.00	5.20	7	20.00
	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	10.00	6.50	7	25.00
	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	11.00	6.80	7	30.00
	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	12.50	7.60	5	35.00
	23.00	23.00	2.00	2.00	1.75	84.00	6.00	8.00	13.00	7.40	3	40.00
CP-201 45'-70'	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	12.50	6.56	DET.2	45.00
	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	13.00	6.36	DET.2	50.00
	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	14.00	6.66	DET.2	55.00
	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	14.50	6.46	DET.2	60.00
	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	15.00	6.28	DET.2	65.00
	25.00	24.00	2.00	2.25	2.00	84.00	6.00	10.00	15.50	6.06	DET.2	70.00
CP-301 75'-80'	27.00	26.00	2.00	2.50	2.25	89.00	7.00	12.00	16.50	6.36	DET.2	75.00
	27.00	26.00	2.00	2.50	2.25	89.00	7.00	12.00	17.50	6.66	DET.2	80.00

APPROVED BY THE CITY OF CASTLE PINES

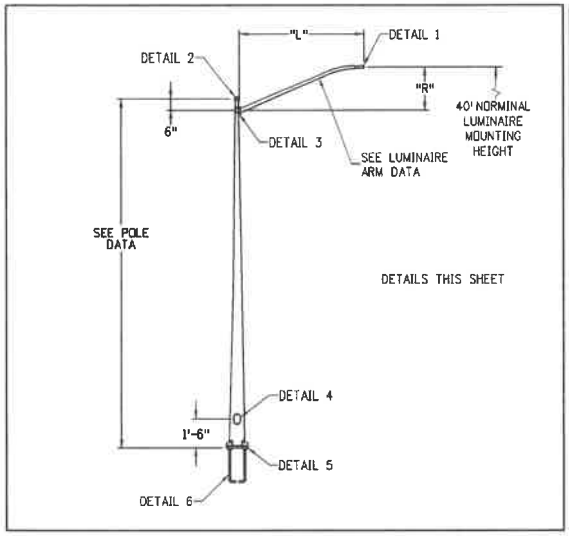
Larry Nimmo
Director of Public Works
DATE 9/14/22

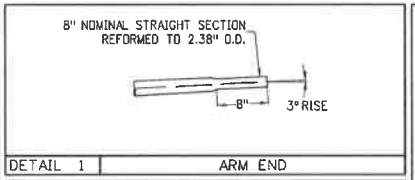
CITY OF CASTLE PINES

MAST ARM ATTACHMENT AND POLE BASE

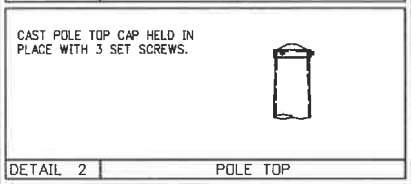
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No.
SI.3

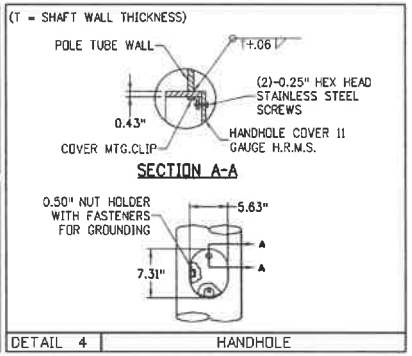




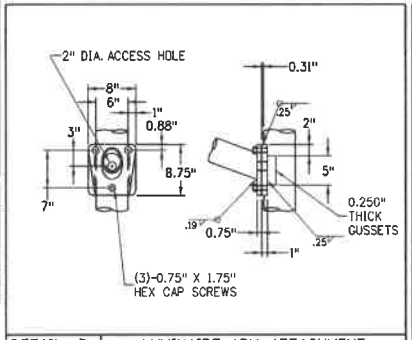
DETAIL 1 | ARM END



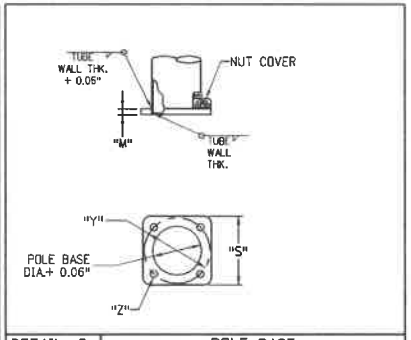
DETAIL 2 | POLE TOP



DETAIL 4 | HANDHOLE



DETAIL 3 | LUMINAIRE ARM ATTACHMENT



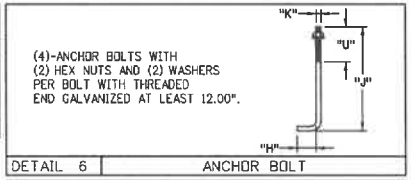
DETAIL 5 | POLE BASE

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)	COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
POLE SHAFT	A595 GR.A	55	GUSSET PLATES	A36	36
ARM SHAFT	A595 GR.A	55	LUMINAIRE CONN. BOLTS	SAE GR.5	--
POLE BASE	A572 GR.50	50	ANCHOR BOLTS	F1554 GR.55	--
SIMPLEX PLATE	A36	36	GALVANIZING-HARDWARE	A153	55

POLE AND LUMINAIRE ARM DATA

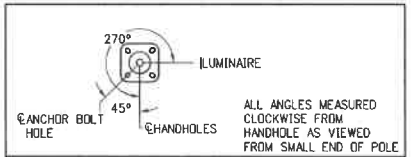
		POLE TUBE				POLE BASE				ANCHOR BOLT				LUMINAIRE ARM TUBE				
DESIGN	POLE TYPE	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	GAUGE OR THINK (IN)	SQUARE "S" (IN)	BOLT CIRCLE "YY" (IN)	THK. "N" (IN)	HOLE / SLOT "Z" (IN)	DIA. "K" (IN)	LENGTH "U" (IN)	HOOK "J" (IN)	THREAD LENGTH "H" (IN)	FIXED END DIA. (IN)	FREE END DIA. (IN)	GAUGE OR THICK (IN)	SPAN "L" (FT)	RISE "R" (FT)
CP-01	32	11.00	5.54	39.00	7	15.00	15.00	1.25	1.75	1.50	54.00	6.00	8.00	5.22	2.40	11	20.00	1.50



DETAIL 6 | ANCHOR BOLT

STRUCTURE FINISH
BASE COAT: HOT DIPPED GALVANIZING INSIDE AND OUTSIDE TO ASTM A123
PRIME COAT: HIGH BUILD EPOXY POWDER
TOP COAT: TGIC OR SUPER DURABLE POLYESTER POWER
COLOR: SEMI-GLOSS BLACK
VALMONT SPEC: F-540K

CP-0132-20
- CP: CASTLE PINES POLE SERIES
- 01: POLE TYPE (01 DESIGNATES AASHTO YEAR)
- 32: LUMINAIRE ARM LENGTH



RADIAL INDEX

APPROVED BY THE CITY OF CASTLE PINES
Jeffrey Nimmo, Director of Public Works
DATE 6/15/22

CITY OF CASTLE PINES

LUMINAIRE POLE

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.4

EXISTING MAST ARM DRILLED PIER SCHEDULE

DC DWG	POLE SERIES/TYPE	EXISTING MAST ARM LENGTH (FT)	SHAFT DIAMETER (IN)	SHAFT LENGTH		REINFORCING		DESIGN SERVICE LOADS			
				L (FT)	LBR (FT)	VERTICAL	HORIZONTAL TIES 'S'	AXIAL (LBS)	SHEAR (LBS)	TORSION (FT/LB)	MOMENT (FT/LB)
DB00349	CP 1, 2 & 3	0-60	42	14'-0	6'-0	(19) #8	#5 @ 6 1/4" OC	4,681	4,708	119,317	115,994
	CP 4 & 5	65-70	42	14'-6	6'-0	(19) #8	#5 @ 5 1/2" OC	5,109	4,564	144,316	126,674

NEW MAST ARM DRILLED PIER SCHEDULE

DC DWG	POLE SERIES/TYPE	EXISTING MAST ARM LENGTH (FT)	SHAFT DIAMETER (IN)	SHAFT LENGTH		REINFORCING		DESIGN SERVICE LOADS			
				L (FT)	LBR (FT)	VERTICAL	HORIZONTAL TIES 'S'	AXIAL (LBS)	SHEAR (LBS)	TORSION (FT/LB)	MOMENT (FT/LB)
DB00798	CP 101	20 - 40	36	14'-6	6'-0	(16) #8	#5 @ 8" OC	4,836	5,328	59,407	125,353
	CP 201	45 - 70	42	16'-0	7'-0	(19) #8	#5 @ 6" OC	6,555	5,585	128,708	162,241
	CP 301	75 - 80	42	17'-0	7'-6	(23) #8	#5 @ 4 3/4" OC	7,981	5,960	169,316	212,572

GENERAL NOTES

1. THE GEOTECHNICAL REPORT PREPARED BY YEH AND ASSOCIATES, INC. NUMBER 28-033, DATED MARCH 19 2008 PROVIDED CRITERIA FOR THE FOUNDATION DESIGN FOR THE PROJECT. RE: DRILLED PIER TABLE FOR SOIL INPUT DATA FOR L- PILE COMPUTER PROGRAM.

   A. DRILLED PIER TABLE:

MATERIAL	c (PSF)	Ø	γ_t	K_S	ε50	SOIL TYPE
SOIL	0	28	110	90	--	1
CLAY	750	0	100	--	0.01	2
BEDROCK	3000	0	120	--	0.005	3

   c - COHESION INTERCEPT (PSF)
   Ø - ANGLE OF INTERNAL FRICTION
   γ_T - TOTAL UNIT WEIGHT (PCF)
   K_S - INITIAL MODULES OF HORIZONTAL SUBGRADE REACTION (PCI) - STATIC

   SOIL TYPES:
   A. SAND (REESE)
      SOFT CLAY
      STIFF CLAY W/O FREE WATER

2. GEOTECHNICAL ENGINEER SHALL BE PRESENT FULL TIME AT SITE DURING PIER DRILLING FOR DRILLED PIER SHAFT OBSERVATION AND INSPECTION.
3. TESTING AGENCY SHALL BE USED TO SAMPLE AND TEST CONCRETE BEING PLACED ON SITE TO VERIFY CORRECT MIX, SLUMP AND DESIGN STRENGTH.
4. PIER HOLES SHALL BE PROPERLY CLEANED PRIOR TO PLACEMENT OF CONCRETE.
5. CONCRETE SHALL BE PLACED IN HOLE FULL HEIGHT SAME DAY AFTER DRILLING WITH NO CONSTRUCTION JOINTS.
6. TREMIE METHOD OF CONCRETE PLACEMENT SHALL BE USED IF MORE THAN 3" OF WATER IS PRESENT AT BOTTOM OF PIER.
7. DRILLED PIER LENGTH 'L' IS THE MINIMUM REQUIRED LENGTH AND INCLUDES 2'-0 OF MATERIAL DISCOUNTED FOR DESIGN. IF SOIL MATERIAL IS LOOSE FILL DEEPER THAN 2'-0, DRILLED PIER LENGTH SHALL BE EXTENDED SAME AMOUNT OVER THE 2'-0, LENGTH IF BEDROCK IS ENCOUNTERED MINIMUM LENGTH IN BEDROCK 'LDR' SHALL BE PROVIDED.
8. REINFORCING STEEL SHALL CONFORM TO ASTM A615/A615M, GRADE 60 DEFORMED.
9. NO SPLICING OF VERTICAL REINFORCEMENT IS PERMITTED.
10. CONCRETE MIX REQUIREMENTS:

TYPE	INTENDED USE	28 DAY STRENGTH f'c (KSI)	CONC. TYPE LIGHTWEIGHT (LW) NORMAL WT. (NW)	MAX. W/C FLY (INCLUDING ASH)	MIN. CEM. MTRL (#/CY) (INC. FLY ASH)	MAX AGGR. SIZ (1)	SLUMP LIMITS (IN) (0"-2")	TOTAL AIR LIMITS (%) (2)	CEMENT TYPE	REQ'D ADMIXTURES	OTHER REQUIREMENTS (3)
1	DRILLED PIERS	3	NW	--	470	1	7	6	II	(4)	HRNP

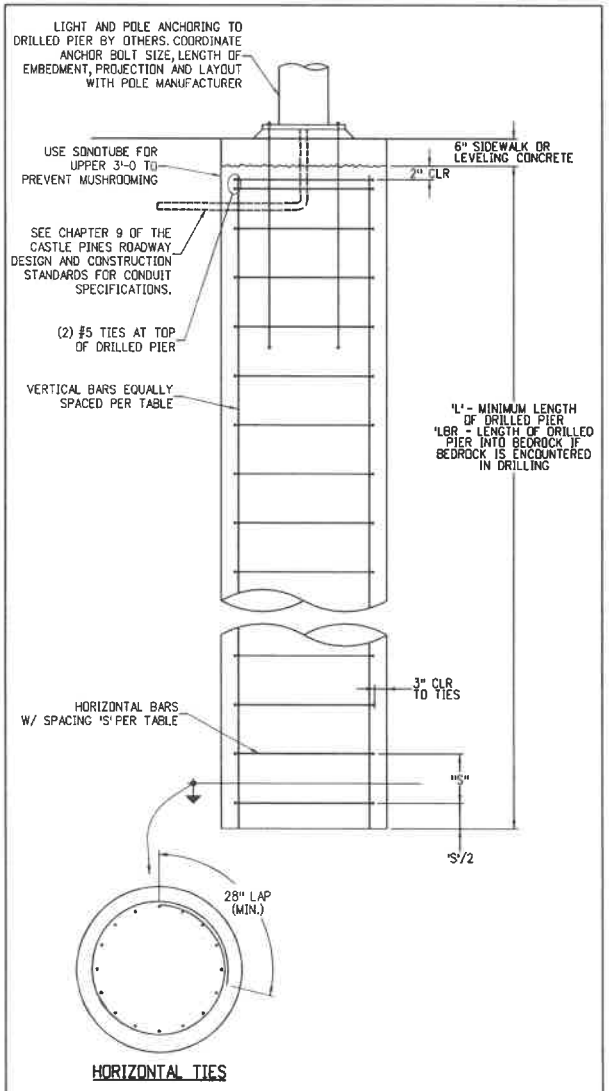
NOTES:

(1) FOR THE MAXIMUM COARSE AGGREGATE SIZE INDICATED, USE THE FOLLOWING AGGREGATE SIZE NUMBERS PER ASTM C33:
3/4" #67 AGGREGATE
1" #57 AGGREGATE

(2) TOTAL AIR CONTENT LIMITS INCLUDE BOTH ENTRAINED AND ENTRAPPED AIR +/- 1 1/2% 'N' IN COLUMN INDICATES ADDITION OF ENTRAINED AIR IS NOT PERMITTED.

(3) ABBREVIATIONS FOR OTHER REQUIREMENTS AS FOLLOWS:
HRNP = HIGH RANGE WATER REDUCING ADMIXTURE SHALL NOT BE USED TO OBTAIN HIGH SLUMP UNLESS DATA ARE SUBMITTED DEMONSTRATION SLUMP IS NOT LOST UNTIL CONCRETE IS OVER 90 MINUTES OLD.

(4) FOR DRILLED PIERS REQUIRED TO BE CASED PROVIDE CONCRETE MIX WITH FLOWABILITY TO PREVENT ARCHING WHEN CASING IS PULLED.



LIGHT POLE FOUNDATION (NO SCALE) | 1

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimtz
Director of Public Works

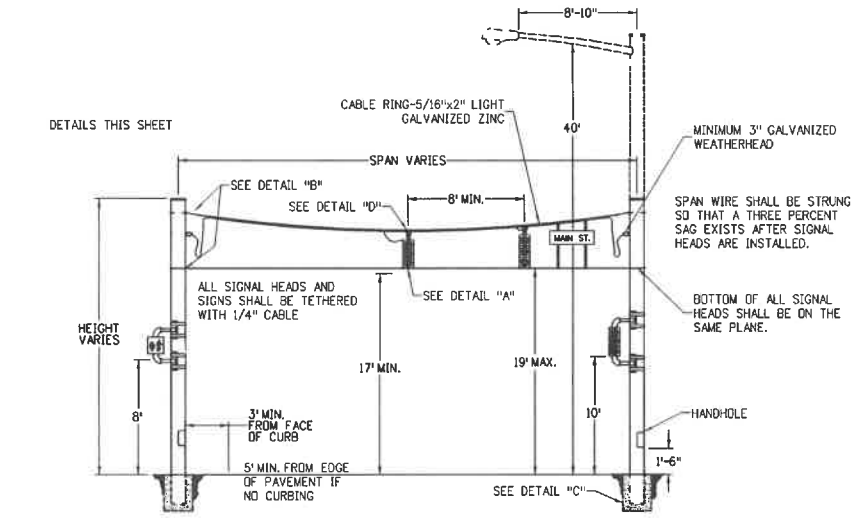
DATE 6/15/22

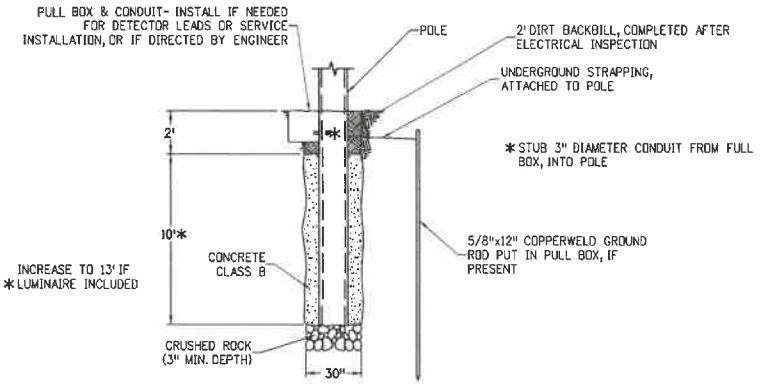
CITY OF CASTLE PINES

MAST ARM POLE FOOTINGS
(20' THROUGH 80')

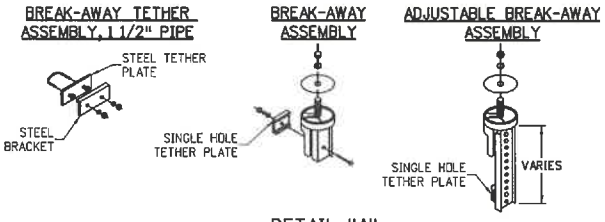
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.5

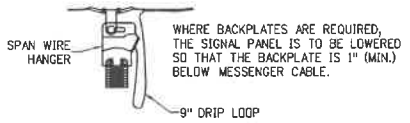




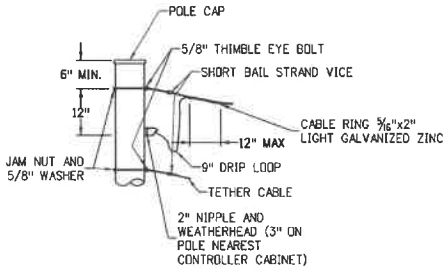
DETAIL "C"
TYPICAL TRAFFIC SIGNAL SPAN WIRE POLE FOOTING (CAST IN PLACE)



DETAIL "A"
TETHERING OPTIONS



DETAIL "D"
TYPICAL SPAN WIRE MOUNTING



DETAIL "B"
TYPICAL CABLE AND TETHER INSTALLATION

GENERAL NOTES

1. SPAN WIRE POLE SHALL BE FINISHED PER THE CITY OF CASTLE PINES' PAINT SPECIFICATION OR APPROVED EQUAL.
2. DESIGN CRITERIA SHALL MEET LATEST AASHTO EDITION OF "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS," FOR A WIND VELOCITY OF 90 MPH.
3. SPAN WIRE POLES SHALL BE FABRICATED OF STEEL WITH A MINIMUM YIELD STRENGTH OF 35 KSI. AND A MINIMUM WEIGHT PER LINEAR FOOT AS FOLLOWS: 40.4 POUNDS FOR 10 INCH DIAMETER POLES AND 49.5 POUNDS FOR 12 INCH DIAMETER POLES. POLES SHALL BE INSTALLED SO THAT THEY WILL BE PLUMB WHEN DEFLECTED BY THE INSTALLED LOAD. SPAN WIRE CABLE SHALL BE A MINIMUM OF 3/8 INCH DIAMETER, RATED AT A MINIMUM OF 13,000 POUNDS.
4. SPAN WIRE SIGNAL HEADS SHALL HAVE ONE POWER FEED WIRE IN AND OUT PER HEAD. CONNECTIONS SHALL BE MADE ONLY ON THE SIGNAL HEAD TERMINALS, WITH NO EXTERNAL SPLICES.
5. ALL SIGNAL INDICATIONS SHALL BE WIRED INDEPENDENTLY AND TERMINATED IN THE HANDHOLE WITH NO EXTERNAL SPLICES.

TEMPORARY SPAN WIRE POLE DETAIL
(FOR SPECIAL USE, WITH PRIOR APPROVAL OF THE CITY ONLY)

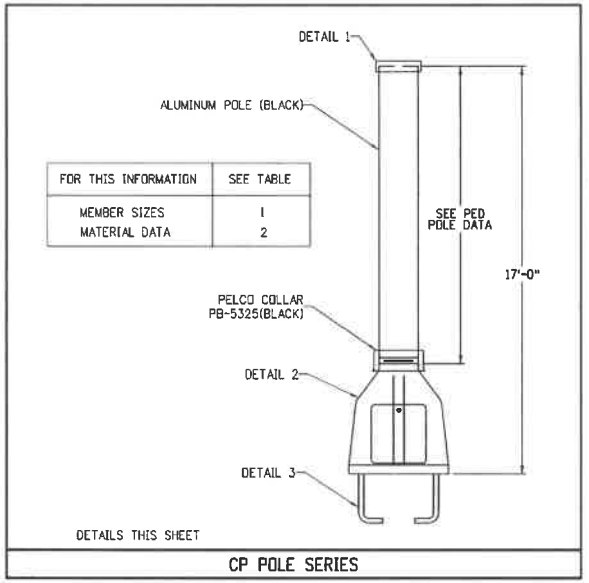
APPROVED BY THE CITY OF CASTLE PINES
Larry Hottis, Director of Public Works
DATE 6/14/22

CITY OF CASTLE PINES

TEMPORARY SPAN WIRE POLE

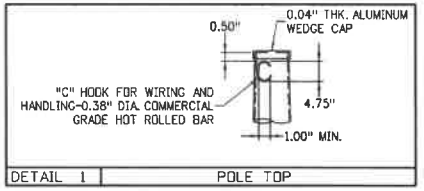
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.6

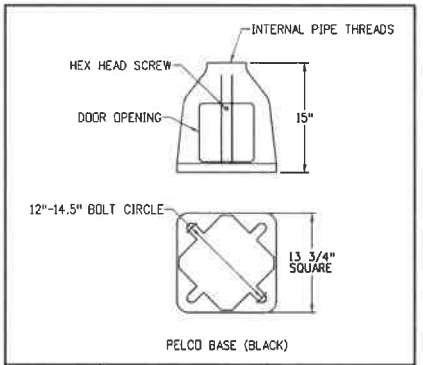


FOR THIS INFORMATION	SEE TABLE
MEMBER SIZES	1
MATERIAL DATA	2

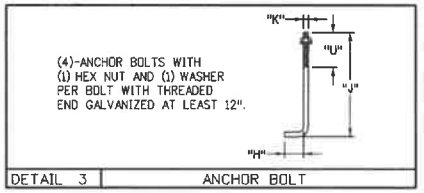
CP POLE SERIES



DETAIL 1 — POLE TOP



DETAIL 2 — PELCO BASE



DETAIL 3 — ANCHOR BOLT

TABLE 1: POLE SCHEDULE

DESIGNATION		POLE DATA					ANCHOR BOLT DATA			
POLE SERIES	POLE TYPE	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	THICK (IN)	BASE TYPE	DIA. "K" (IN)	LENGTH "J" (IN)	HOOK "H" (IN)	THREAD LENGTH "U" (IN)
PELCO	AL	4.50	4.50	15.83	0.337	PELCO	0.75	18	3	7

TABLE 2: MATERIAL DATA

COMPONENT	DESIGNATION	MIN. YIELD (KSI)
4" NOMINAL ALUM. SCH 80 PIPE	ASTM B249 (BLACK)	35
ALUM. PELCO BASE	PB-5334(BLACK)	
ANCHOR BOLTS	AASHTO M314 GR.55	55
STRUCTURE FINISH BLACK (PELOC SPECIFICATION 3099)		

APPROVED BY THE CITY OF CASTLE PINES

Lan Hoang
Director of Public Works

DATE 8/19/22

CITY OF CASTLE PINES

PEDESTRIAN POLE

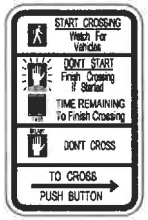
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022

Revised:

Standard Drawing No. SI.7

POLARA IN23TNLY
STANDARD PEDESTRIAN STATION

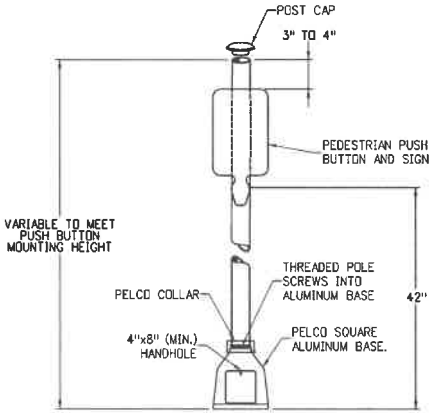


R10-3e L OR R
(9"x15")

WHEN MOUNTING (2) PEDESTRIAN PUSH BUTTON ASSEMBLIES ON A 4.5" O.D. PEDESTRIAN POLE, APPROVED STAND-OFF MOUNTING BRACKETS (POLARA INPBF2S-4.5B OR EQUIVALENT) SHALL BE USED TO ACCOMMODATE THE 9"x15" PEDESTRIAN SIGNAGE

TYPICAL PEDESTRIAN PUSH-BUTTON STATION AND SIGN

SIGNS SHALL BE MOUNTED SQUARE TO POLE.

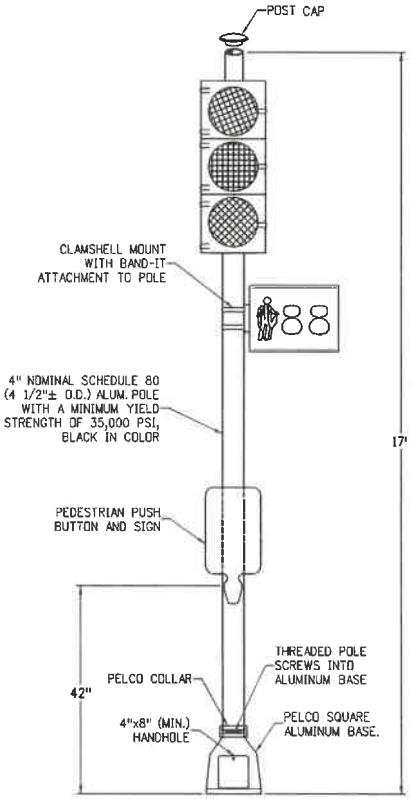


PEDESTRIAN PUSH BUTTON POLE

SHALL BE ALUMINUM (BLACK) ON PELCO BASE (BLACK)

FINISH REQUIREMENTS

ALL PEDESTRIAN PUSH BUTTON AND PEDESTAL POLES SHALL BE FACTORY FINISHED (BLACK)



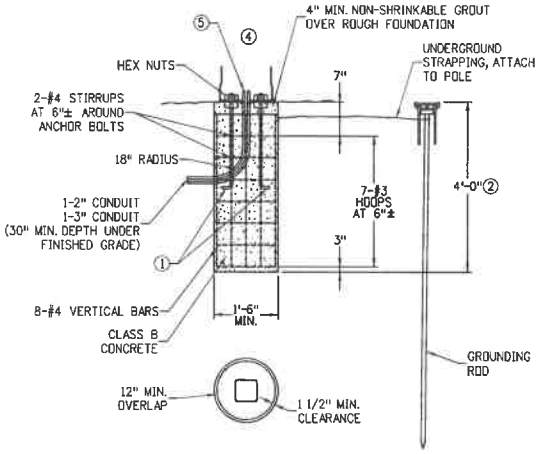
TYPICAL PEDESTRIAN POLE DETAIL

1/4" SPLIT PIN SHALL BE INSTALLED IN THE UPPER PORTION OF THE ALUMINUM BASE AND SHALL COMPLETELY PENETRATE BASE AND POLE TO SECURE POLE TO PREVENT MOVEMENT OR TWISTING. PELCO COLLAR TO BE INSTALLED.

SHALL BE ALUMINUM (BLACK) ON PELCO BASE (BLACK)

FOOTING NOTES

1. ANCHOR BOLTS (FURNISHED WITH POLE) PER MANUFACTURER'S TEMPLATE.
2. THESE DESIGN REQUIRE THAT THE FOOTING BE FOUNDED IN COMPACT SAND, CLAY OR SANDY CLAY, AND BE LOCATED ABOVE THE WATER TABLE. IF, BY VISUAL INSPECTION OF THE HOLE OTHER MATERIAL IS PRESENT, THE FOUNDATION DESIGN MAY NEED TO BE MODIFIED.
3. 5/8"x8' COPPERWELD GROUND ROD THROUGH GROUND, OR DRIVEN IN ADJACENT PULL BOX AND BONDED TO POLE WITH UNDERGROUND STRAPPING.
4. HANDHOLE SHALL BE PROVIDED.
5. 3" MINIMUM CONDUIT HEIGHT ABOVE FOUNDATION.



TYPICAL PEDESTRIAN POLE FOOTING

(CAST IN PLACE)

APPROVED BY THE CITY OF CASTLE PINES

Jerry Nunno
Director of Public Works

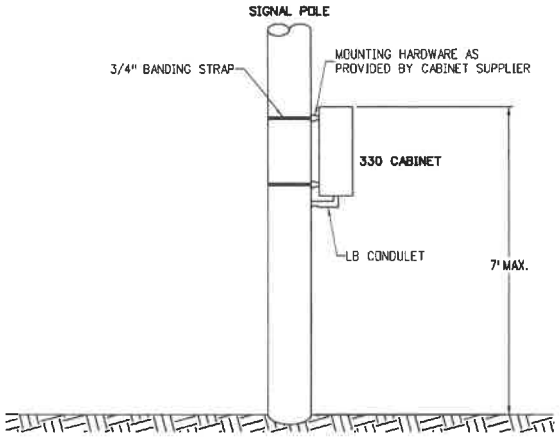
DATE 6/15/22

CITY OF CASTLE PINES

PEDESTRIAN PUSH BUTTON POLE
PEDESTAL POLE

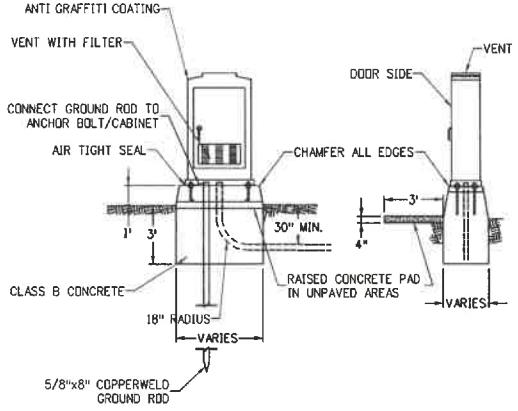
CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.8



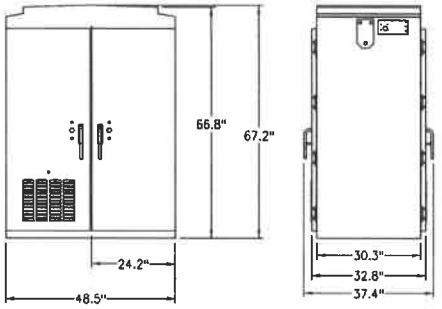
TYPICAL SIDE-OF-POLE MOUNTED CONTROLLER CABINET

(FOR SPECIAL USE, WITH PRIOR APPROVAL OF THE CITY ONLY)



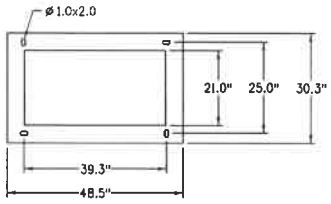
BASE MOUNTED CONTROLLER CABINET INSTALLATION AND CONCRETE FOUNDATION

(FOR SPECIAL USE, WITH PRIOR APPROVAL OF THE CITY ONLY)

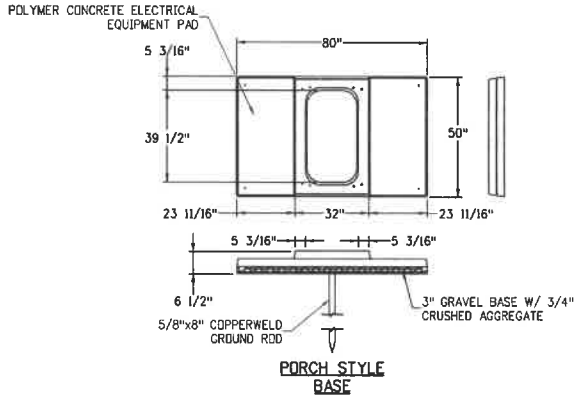


FRONT SIDE

CABINET TYPE	W	D	H
332D	49"	30"	67"



BASE



PORCH STYLE BASE

TYPICAL BASE MOUNTED CONTROLLER CABINET INSTALLATION

NOTE: FIBERGLASS BASE MAY BE SUBSTITUTED ONLY IF DIRECTED BY ENGINEER

APPROVED BY THE CITY OF CASTLE PINES

Larry Hamm
Director of Public Works

DATE 6/15/22

CITY OF CASTLE PINES

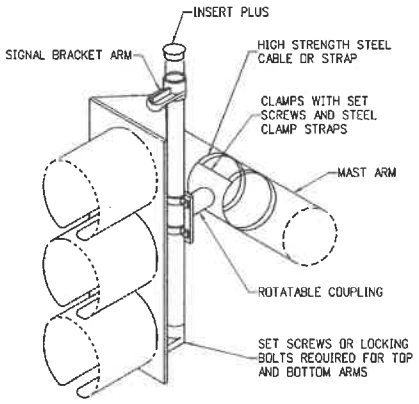
CONTROLLER CABINET INSTALLATION

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

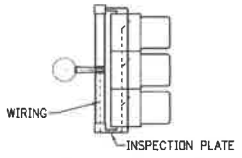
Issued: 6/15/2022

Revised:

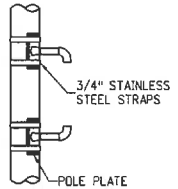
Standard Drawing No. SI.9



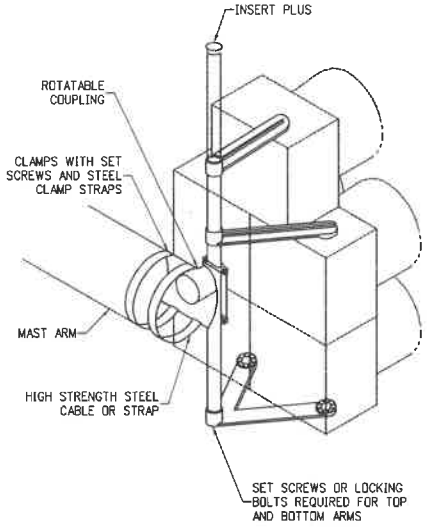
DETAIL OF MAST ARM MOUNTING
FOR IN-LINE SIGNAL HEAD
(3-SECTION, 4-SECTION OR 5-SECTION)



WIRING DIAGRAM



TYPICAL SIDE OF POLE
SIGNAL MOUNTING



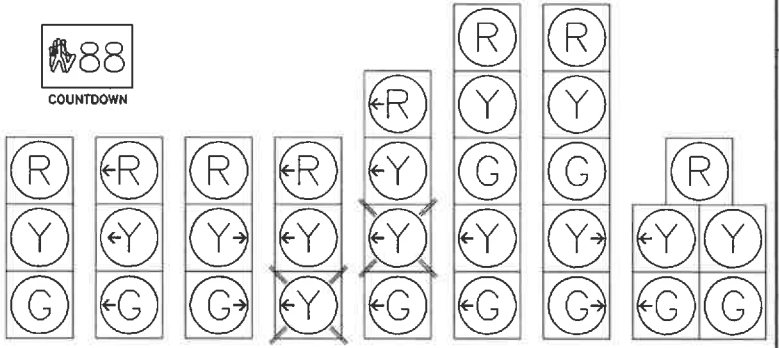
DETAIL OF MAST ARM MOUNTING
FOR DOGHOUSE SIGNAL HEAD
(5-SECTION)

MOUNTING NOTES

1. PIPE COUPLINGS FOR SIGNAL BRACKETS SHALL BE EITHER 1-1/2 OR 2 INCH DEPENDING UPON THE SIGNAL HEAD TO BE INSTALLED. SIGNAL BRACKETS SHALL BE FURNISHED BY THE MANUFACTURER OF THE SIGNAL HEADS.
2. UNLESS OTHERWISE SPECIFIED, ALL TRAFFIC SIGNALS MOUNTED ABOVE THE ROADWAY SHALL BE APPROXIMATELY LEVEL WITH ONE ANOTHER AND HAVE A HEIGHT OF 17' TO 19' ABOVE THE PAVEMENT GRADE AT THE ROADWAY CENTER, ALL SIDE-OF-POLE MOUNTED TRAFFIC SIGNALS SHALL HAVE A HEIGHT OF 10' ABOVE GROUND LINE AND PEDESTRIAN SIGNALS SHALL HAVE A HEIGHT OF 8' ABOVE GROUND LINE AS MEASURED TO THE BOTTOM OF THE SIGNAL HEAD HOUSING OF BRACKET.
3. MAST ARM MOUNTED SIGNAL HEADS SHALL USE ASTRO-TYPE MOUNTING BRACKETS. ALL SIGNAL HEADS SHALL BE MOUNTED IN SUCH A MANNER AS TO BE EASILY REMOVED FROM THEIR SUPPORTING STRUCTURE.
4. GASKET SEALING COMPOUND SHALL BE USED IN ADDITION TO ANY LEAD WASHERS REQUIRED FOR CREATING A WATER-TIGHT CONNECTION BETWEEN THE SIGNAL HEAD AND MOUNTING BRACKET.
5. SIGNAL HEADS SHALL BE SECURELY AFFIXED BY USE OF A SERRATED COUPLING OF OTHER ACCESSORIES RECOMMENDED BY THE SIGNAL MANUFACTURER.
6. WIRING FROM INSIDE MAST ARM THROUGH A 1" FIELD DRILLED HOLE IN ARM SHALL BE BROUGHT THROUGH THE MOUNTING SUPPORT TUBE AND LOWER ARM (AS SHOWN). FIELD DRILLED HOLES SHALL HAVE RUBBER GROMMETS INSTALLED.

NOTES

1. ALL VEHICLE SIGNAL HEADS SHALL BE POLYCARBONATE AND BLACK IN COLOR WITH 12" SECTIONS AND TUNNEL VISORS. ALL SIGNAL FACES SHALL BE LED.
2. ALL OVERHEAD SIGNAL HEADS SHALL HAVE LOUVERED BACKPLATES WITH A 2" DIAMOND GRADE FLUORESCENT YELLOW RETROREFLECTIVE BORDER.
3. ALL PEDESTRIAN HEADS SHALL BE POLYCARBONATE AND BLACK IN COLOR. PEDESTRIAN SIGNAL FACES SHALL BE LED.
4. SIDE OF POLE MOUNT SHALL BE 90° MOUNT. NO "T"S ALLOWED. SEE "TYPICAL SIDE OF POLE SIGNAL MOUNTING" DRAWING.



TYPICAL PEDESTRIAN AND VEHICLE SIGNAL HEADS

GENERAL WIRING NOTES

1. TRAFFIC SIGNAL CONDUIT SHALL NOT CARRY WIRING OF OTHER UTILITIES.
2. ALL SPLICES SHALL BE IN HANDHOLES AT POLE BASES AND NOT IN PULL BOXES.
3. PEDESTRIAN AND VEHICLE SIGNAL HEADS SHALL BE INDIVIDUALLY WIRED FROM THE POLE BASE TO THE SIGNAL HEAD.
4. CONTRACTOR SHALL PROVIDE TWO WIRING DIAGRAMS OF THE SIGNAL INSTALLATION TO THE CITY.
5. UNLESS ALLOWED BY THE ENGINEER, WIRE SHALL NOT OCCUPY MORE THAN 40% OF THE INSIDE AREA OF CONDUIT.

SIGNAL HEAD MOUNTING
SHALL BE ALUMINUM (BLACK) ON PELCO BASE (BLACK)

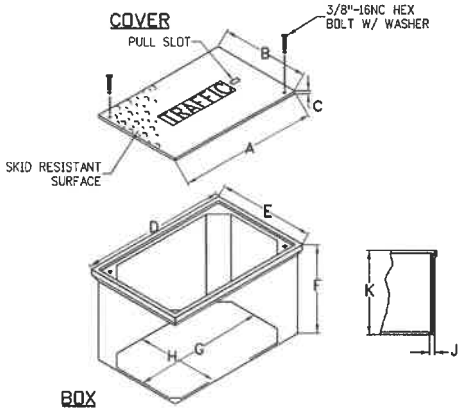
APPROVED BY THE CITY OF CASTLE PINES
Director of Public Works
DATE 6/15/22

CITY OF CASTLE PINES

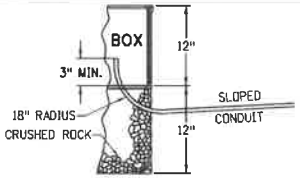
SIGNAL HEADS AND MOUNTING
GENERAL WIRING NOTES

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
Revised:
Standard Drawing No. SI.10



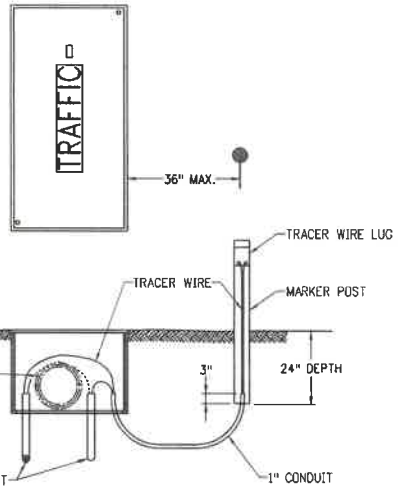
BOX



TWO BOXES AND EXTENSION
(FOR MODIFICATIONS ONLY)

GENERAL NOTES

1. PAVEMENT HOLE FOR PULL BOX SHALL BE SAWCUT TO FULL DEPTH, IN A RECTANGLE THAT EXTENDS 6" BEYOND THE EXPANSE OF THE PULL BOX.

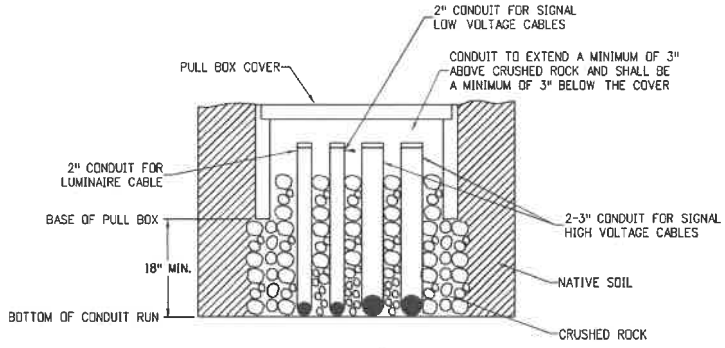


TYPICAL FIBER PULLBOX

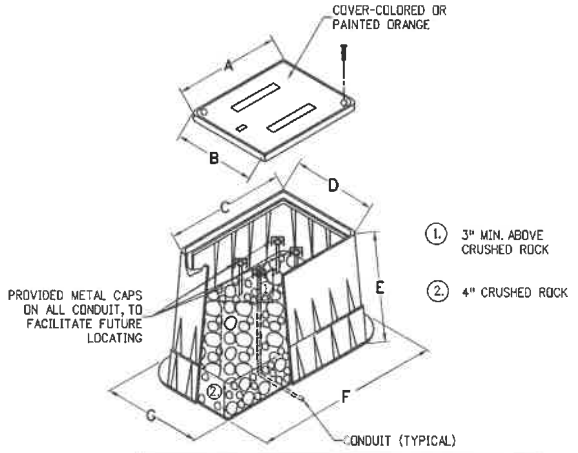
TABLE OF DIMENSIONS (MINIMUMS)

TYPE	DESCRIPTION	DIMENSIONS (IN.)									
		A	B	C	D	E	F	G	H	J	K
IS	LARGE 17x30x12	30 1/2	17 1/2	2	32 1/4	19 1/4	12	28 1/2	13 1/2		
IF	LARGE/DEEP 17x30x18 FOR FIBER OPTICS	30 1/2	17 1/2	2	32 1/4	19 1/4	18	28 1/2	13 1/2		
IF2	LARGE/XTRA DEEP 17x30x24 FOR FIBER OPTICS RUNS	30 1/2	17 1/2	2	32 1/4	19 1/4	24	28 1/2	13 1/2		
II	MEDIUM 13x24x12	23 1/4	13 3/4	2	25	15 1/2	12	19 1/4	9 3/4		
III	SMALL 12x12x12-FOR DETECTORS & ELECTRICAL SERVICE	12 7/8	12 7/8	5/8	14	14	12 3/4	10 1/2	10 1/2	1	12
VAULT	30x48x18 FOR HOME RUN/FIBER SPLICE	47 5/8	30 1/8	3	49 5/8	32 1/8	18	45 5/8	28 1/8		

PERMANENT (PRECAST) PULL BOX
(FOR USE WITH ALL OPERATIONAL SIGNALS)
FIBERGLASS REINFORCED POLYMER CONCRETE DESIGNED FOR SERVICE LOAD (MINIMUM) OF 15,000 LBS. OVER A 10" SQUARE



TYPICAL PULL BOX



PULL BOX MEASUREMENTS (MINIMUM)						
A	B	C	D	E	F	G
11"	11"	12"	12"	13"	12"	12"

TEMPORARY (PLASTIC) PULL BOX DETAIL
(FOR USE WHEN APPROVED BY THE CITY FOR SPECIAL INSTALLATIONS)

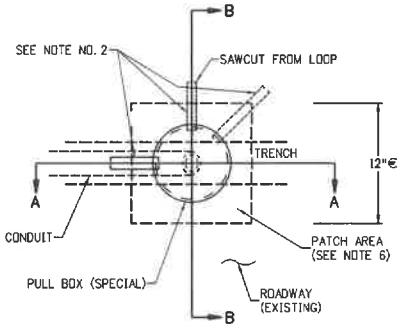
APPROVED BY THE CITY OF CASTLE PINES
Director of Public Works
DATE 6/14/22

CITY OF CASTLE PINES

PERMANENT (PRECAST) PULL BOX
TEMPORARY (PLASTIC) PULL BOX

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

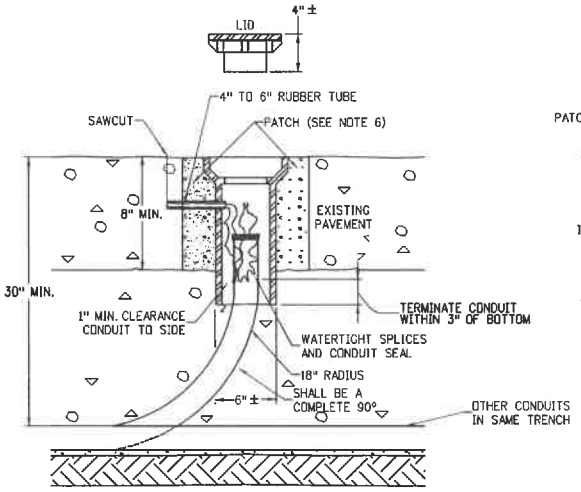
Issued: 6/15/2022
Revised:
Standard Drawing No. SI.11



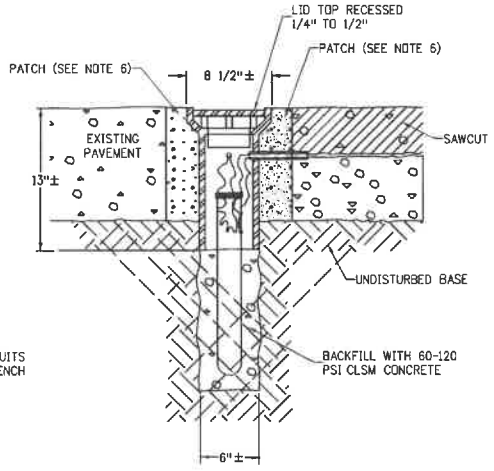
TOP VIEW

GENERAL NOTES

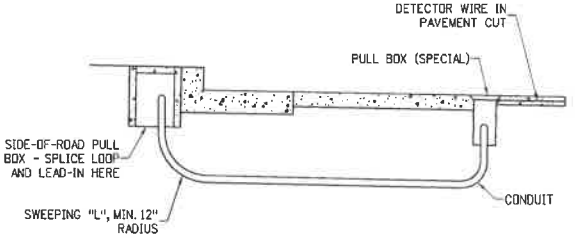
1. PULL BOX (SPECIAL) SHALL BE A WATER VALVE STEM TYPE PULL BOX MADE OF CAST IRON OR STEEL. THE PULL BOX SHALL HAVE CAPABILITY OF ACCEPTING RISER RINGS FOR FUTURE OVERLAYS. THE LID SHALL HAVE THE WORD "TRAFFIC" PRINTED ON IT.
2. PULL BOXES SHALL HAVE 3/4" TO 1" DIAMETER HOLES DRILLED OR TORCHED 3" FROM TOP TO ACCEPT A 4" TO 6" RUBBER TUBE (3/4" GARDEN HOSE). THE NUMBER OF HOLES SHALL BE AS PER PLANS OR AS DIRECTED BY THE ENGINEER.
3. CARE SHALL BE TAKEN DURING BACKFULL COMPACTION PREVENT COLLAPSE OF THE TUBES.
4. 2' MINIMUM SLACK OF LOOP WIRES IS TO BE PROVIDED SO THAT ALL TESTING CAN BE DONE OUTSIDE OF THE PULL BOX. SPLICE DETECTOR LEADS IN SIDE-OF-ROAD PULL BOX, NOT IN PULL BOX SPECIAL.
5. PULL BOX IS TO BE LOCATED IN AN AREA OF THE STREET NOT HEAVILY TRAVELED. FOR EDGE-OF-ROAD LOCATIONS, MAINTAIN A MINIMUM OF 12" FROM CONCRETE GUTTER PAN.
6. PAVEMENT HOLE FOR PULL BOX SHALL BE EITHER CORE DRILLED TO FULL DEPTH, OR SAW CUT TO FULL DEPTH IN 12"x12" SQUARE WITH NO OVERLAPPING CUTS. FOR CORE DRILLING AND SAWCUT, GROUT PULL BOX IN PLACE.



SECTION A-A



SECTION B-B



LOOP DETECTOR LEAD-IN

PULL BOX (SPECIAL)

APPROVED BY THE CITY OF CASTLE PINES
Larry Potito
Director of Public Works
DATE 6/15/22

CITY OF CASTLE PINES

PULL BOX (SPECIAL)
LOOP DETECTOR LEAD-IN

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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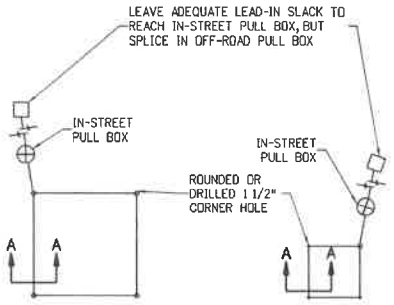


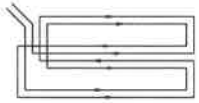
TYPICAL 6'x6' LOOP

TYPICAL 3'x3' LOOP

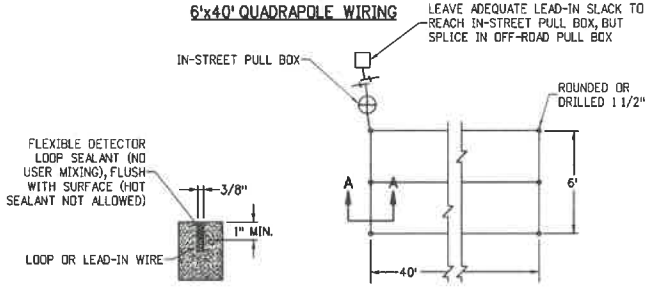
SIZE OF LOOP	NO. OF TURNS
6'x6'	4
3'x3'	4

LOOP TURNS

NO. OF TURNS MAY BE ADJUSTED BY ENGINEER IN FIELD. WIRING CONNECTIONS TO BE FIELD DETERMINED.



6'x40' QUADRAPOLE WIRING

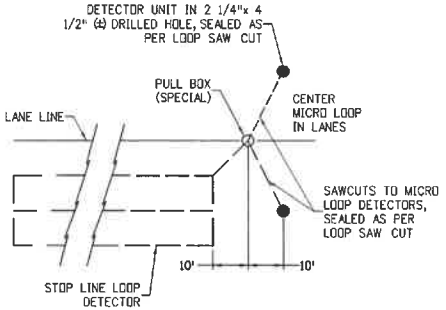


SECTION A-A

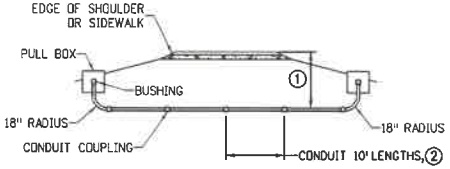
TYPICAL 6'x40' QUADRAPOLE LOOP

WHERE SAWCUT SPANS CONCRETE AND ASPHALT, CONTRACTOR SHALL DRILL 1 1/2" HOLES

LOOP SAW CUT AND INSTALLATION



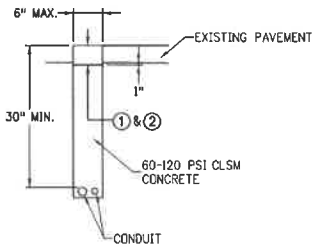
MICRO LOOP DETECTOR



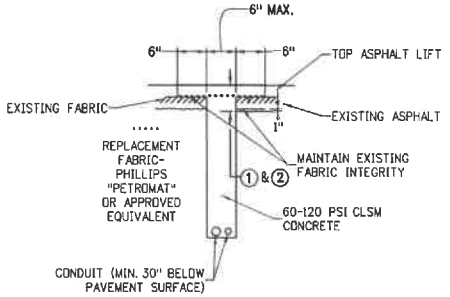
CONDUIT PLACEMENT UNDER PAVEMENT OR SIDEWALK

NOTES

1. MINIMUM CONDUIT DEPTH: UNDER PAVEMENT 30" UNDER SIDEWALK 24"
2. ALL PVC CONDUIT SHALL BE SCHEDULE 80.



CONDUIT TRENCH DETAIL- WITHOUT PAVEMENT FABRIC



CONDUIT TRENCH DETAIL- WITH PAVEMENT FABRIC

NOTES

1. HOT BITUMINOUS PAVEMENT (PATCHING) OR PORTLAND CEMENT CONCRETE PATCH, FULL DEPTH PLUS 1" (4" MIN.). MATCH EXISTING PAVEMENT TYPE.
2. FOR ASPHALT PATCH, 48 HOUR NOTICE TO THE ENGINEER REQUIRED PRIOR TO INSPECTION.

NOTES

1. ALL DETECTOR LOOP WIRE SHALL MEET IMSA SPECIFICATION 51.5, ENCASED IN PVC OR POLYETHYLENE TUBING.
2. IMMEDIATELY BEFORE LAYING THE LOOP CABLE, THOROUGHLY CLEAN WITH WATER AND DRY SAW CUT WITH HIGH PRESSURE OIL-FREE COMPRESSED AIR.
3. LOOP WIRE IN ADJACENT LOOPS SHALL BE LAID UNIFORMLY IN EITHER A CLOCKWISE OR COUNTER-CLOCKWISE DIRECTION AND THE LOOP TAGGED TO INDICATE THE DIRECTION.
4. USE A BLUNT, NON-METALLIC INSTRUMENT TO PUSH WIRE INTO SLOT. DO NOT COIL LEADS.
5. LOOP WIRE SHALL BE CONTINUOUS (NO SPLICES) FOR THE PULL BOX. SPLICES IN PULL BOX SHALL BE WATERPROOFED WITH SPLICE KIT.
6. CONTINUITY TEST FOR EACH LOOP SHALL BE CONDUCTED 1) BEFORE ANY LOOP SEALER IS INSTALLED AND 2) AFTER LOOP SEALER IS INSTALLED AND LEAD-IN CABLE IS SPLICED AND TRAINED TO THE CONTROLLER. "RESISTANCE-TO-GROUND" AND "INDUCTANCE" SHALL BE MEASURED AND RECORDED OFR EACH TEST.
7. DETECTOR WIRE ACROSS BRIDGE JOINTS SHALL BE ENCASED IN A 122" SECTION OF 3/4" PVC PIPE THAT SPANS THE JOINT AREA.

APPROVED BY THE CITY OF CASTLE PINES

Larry Nimtz
Director of Public Works

DATE 6/14/22

CITY OF CASTLE PINES

DETECTORS CONDUIT INSTALLATION

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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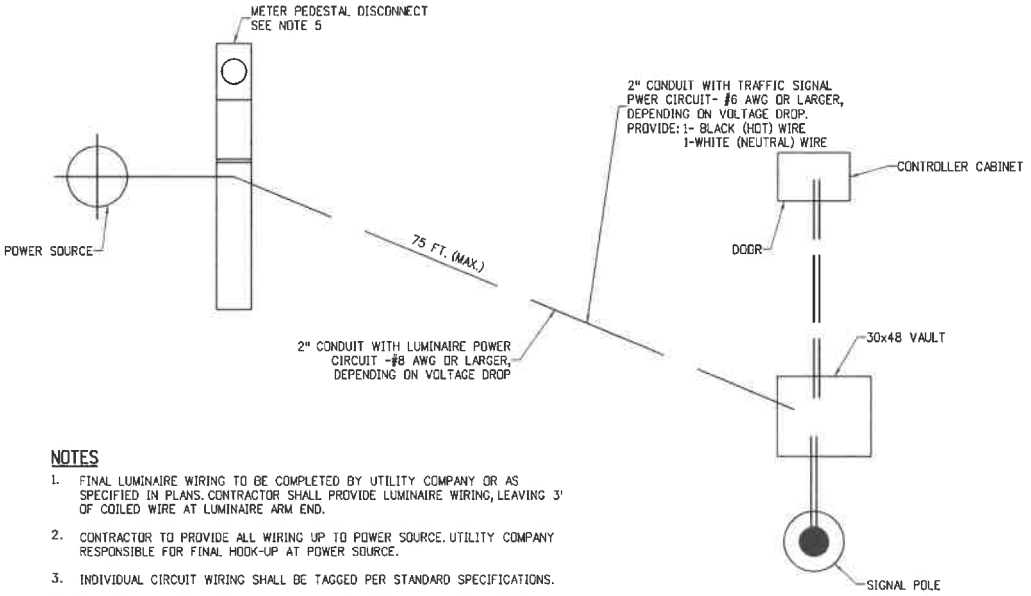
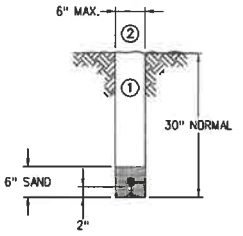


NOTES

1. FINAL LUMINAIRE WIRING TO BE COMPLETED BY UTILITY COMPANY OR AS SPECIFIED IN PLANS. CONTRACTOR SHALL PROVIDE LUMINAIRE WIRING, LEAVING 3' OF COILED WIRE AT LUMINAIRE ARM END.
2. CONTRACTOR TO PROVIDE ALL WIRING UP TO POWER SOURCE. UTILITY COMPANY RESPONSIBLE FOR FINAL HOOK-UP AT POWER SOURCE.
3. INDIVIDUAL CIRCUIT WIRING SHALL BE TAGGED PER STANDARD SPECIFICATIONS.
4. IF POWER DOES NOT FEED DIRECTLY INTO CONTROLLER PULL BOX, PROVIDE A SEPARATE 2" CONDUIT FOR POWER SOURCE, THROUGH INTERMEDIATE PULL BOXES, TO CONTROLLER PULL BOX.
5. MATER PEDESTAL/DISCONNECT NO FURTHER THAN 75 FT. FROM VAULT/CABINET/HOMERUN PULLBOX.
6. WHERE REQUIRED BY UTILITY COMPANY, CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING PERMIT AND INSPECTION FROM THE CITY OF CASTLE PINES.
7. CONTRACTOR SHALL STRICTLY ADHERE TO THE CITY OF CASTLE PINES ELECTRICAL INSPECTION REQUIREMENTS. CONTACT THE CITY OF CASTLE PINES BUILDING DEPARTMENT FOR FURTHER INFORMATION.

UNDERGROUND POWER SOURCE SCHEMATIC FOR SIGNALS

(NO SCALE)



UNDER GRASS/GROUND TRENCHING DETAIL

NOTES

1. BACKFILL AND TAMP WITH NATIVE MATERIAL TO MATCH COMPACTION OF SURROUNDING GROUND.
2. RESEED OR RESOD SURFACE AT DIRECTION OF THE ENGINEER.

APPROVED BY THE CITY OF CASTLE PINES

Director of Public Works

DATE 6/15/22

CITY OF CASTLE PINES

UNDERGROUND POWER
SCHEMATIC-SIGNALS / GROUND
TRENCHING

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

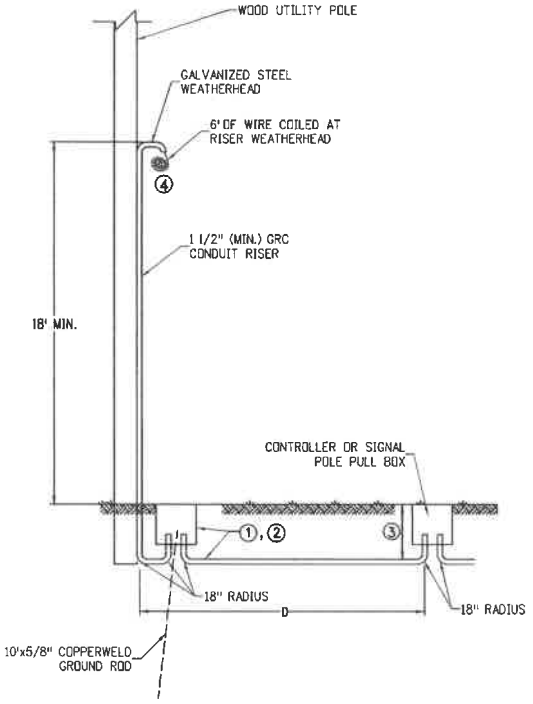
Issued: 6/15/2022

Revised:

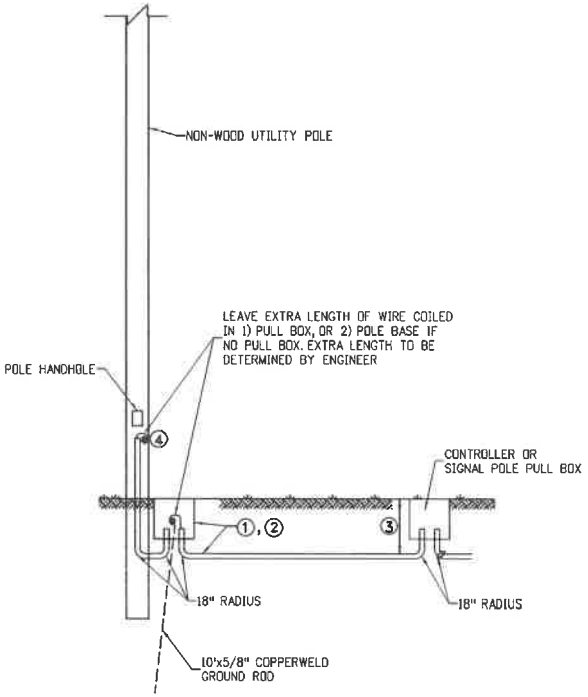
Standard Drawing No. SI.14

NOTES

1. PROVIDE TYPE III PULL BOX/GROUND ROD AND 2" PVC CONDUIT ONLY IF D EXCEEDS 10'.
2. PROVIDE 2" GRC CONDUIT WITHOUT PULL BOX/GROUND ROD IF D IS LESS THAN 10'.
3. MINIMUM CONDUIT DEPTHS:
   UNDER GROUND
   AND PAVEMENT
4. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A PERMIT AND SCHEDULING ELECTRICAL INSPECTION FROM THE CITY OF CASTLE PINES BUILDING DEPARTMENT.

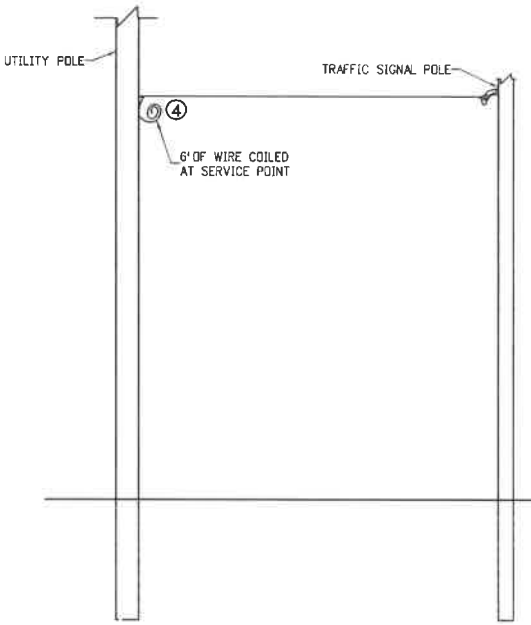


WITH WOOD UTILITY POLE



WITH NON-WOOD UTILITY POLE

OVERHEAD POWER SCHEMATIC
SIGNALS / GROUND TRENCHING



TYPICAL OVERHEAD POWER FEED FOR
TRAFFIC SIGNAL ASSEMBLIES

APPROVED BY THE CITY OF CASTLE PINES
Larry Nimmo
Director of Public Works
DATE 6/16/22

CITY OF CASTLE PINES

OVERHEAD POWER
SCHEMATIC-SIGNALS / GROUND TRENCHING

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

Issued: 6/15/2022
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Standard Drawing No. SI.15

FINISH REQUIREMENTS

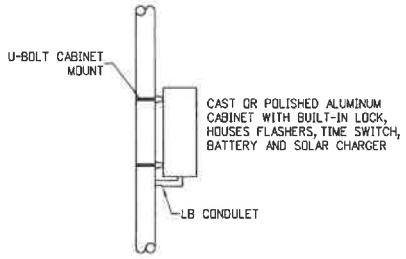
ALL PEDESTRIAN PUSH BUTTON AND PEDESTAL POLES SHALL BE FACTORY FINISHED (BLACK)

FLASHING BEACONS

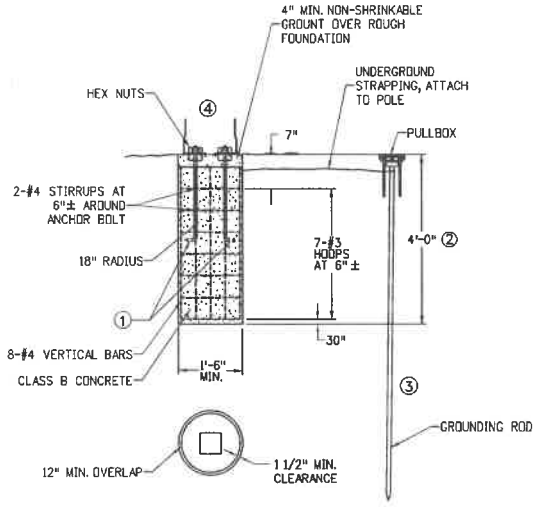
ALL FLASHING BEACONS SHALL BE POLYCARBONATE WITH TUNNEL VISORS AND YELLOW HOUSINGS. SOLAR DESIGN VARIES.

FOOTINGING NOTES

1. ANCHOR BOLTS (FURNISHED WITH POLE PER MANUFACTURER'S TEMPLATE.
2. THESE DESIGN REQUIRE THAT THE FOOTING BE FOUNDED IN COMPACT SAND, CLAY OR SANDY CLAY, AND BE LOCATED ABOVE THE WATER TABLE. IF, BY VISUAL INSPECTION OF THE HOLE OTHER MATERIAL IS PRESENT, THE FOUNDATION DESIGN MAY NEED TO BE MODIFIED.
3. 5/8"x8' COPPERWELD GROUND ROD THROUGH GROUND OR DRIVEN IN ADJACENT PULL BOX AND BONDED TO POLE WITH UNDERGROUND STRAPPING.
4. HANDHOLE SHALL BE PROVIDED.



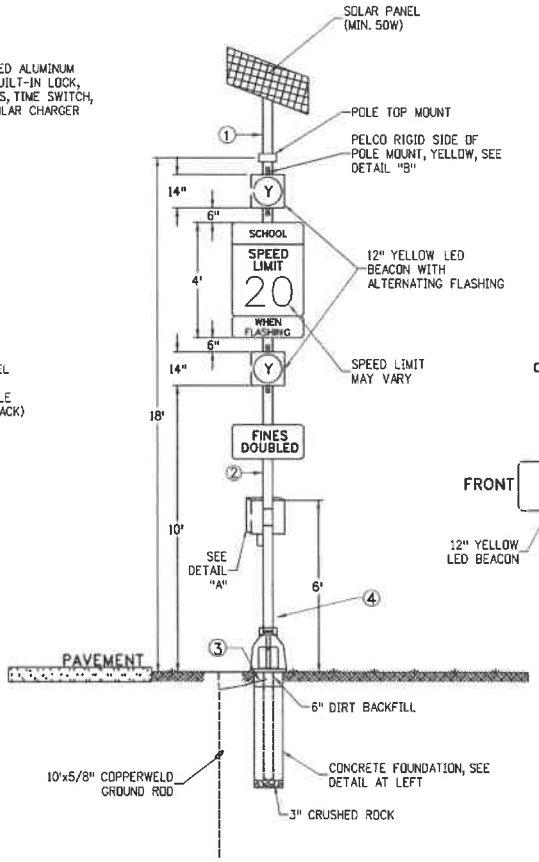
DETAIL "A"



TYPICAL POLE FOOTING
(CAST IN PLACE)

NOTES

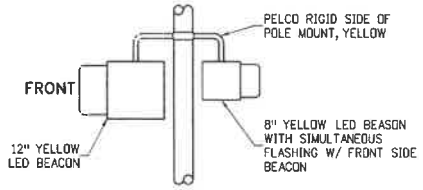
1. POLE TOP SOLAR MOUNT WITH PANEL
2. 4" NOMINAL SCHEDULE 80 ALUM. POLE WITH PELCO COLLAR AND BASE (BLACK)
3. BONDING STRAP IN BACKFILL
4. PELCO COLLAR AND BASE (BLACK)



SCHOOL FLASHING BEACON ASSEMBLY
SIDE OF ROAD

DETAIL "B"

OPPOSITE DIRECTION 8" FLASHER



APPROVED BY THE CITY OF CASTLE PINES
Larry Howard
Director of Public Works
DATE 6/15/22

CITY OF CASTLE PINES

SCHOOL FLASHING BEACONS - SIDE OF ROAD

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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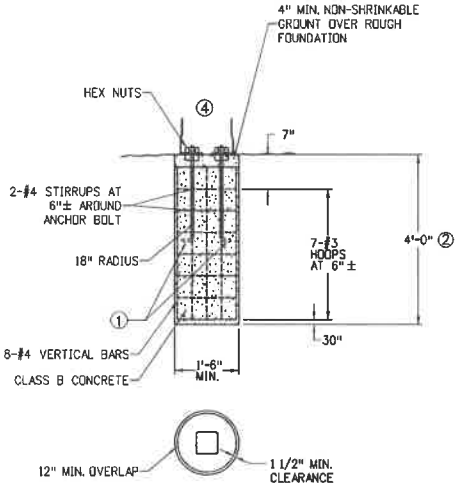
Standard Drawing No. SI.16

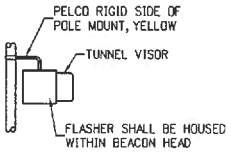
FOOTINGING NOTES

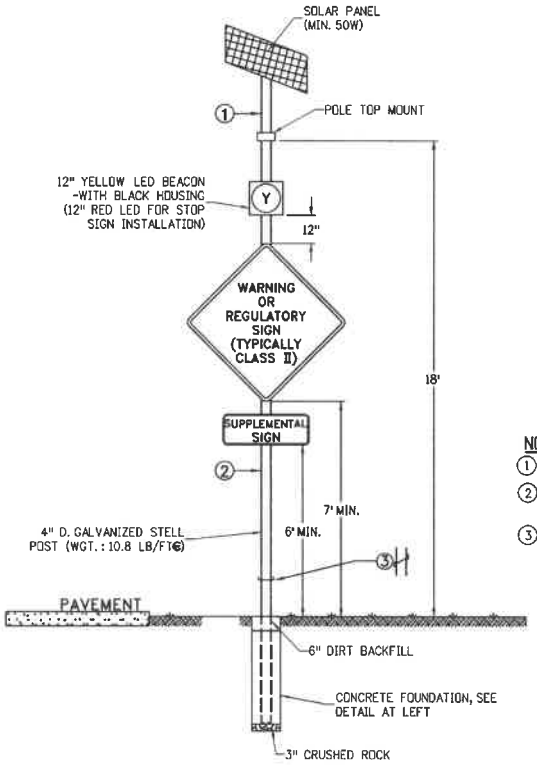
1. ANCHOR BOLTS (FURNISHED WITH POLE PER MANUFACTURER'S TEMPLATE.
2. THESE DESIGN REQUIRE THAT THE FOOTING BE FOUNDED IN COMPACT SAND, CLAY OR SANDY CLAY, AND BE LOCATED ABOVE THE WATER TABLE. IF, BY VISUAL INSPECTION OF THE HOLE OTHER MATERIAL IS PRESENT, THE FOUNDATION DESIGN MAY NEED TO BE MODIFIED.
3. HANDHOLE SHALL BE PROVIDED.



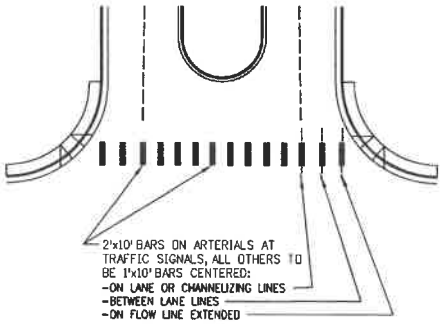
TYPICAL POLE FOOTING
(CAST IN PLACE)

BEACON SIDE VIEW





WARNING OR REGULATORY SIGN
FLASHING BEACON ASSEMBLY



NOTE: ALL LONGITUDINAL LINES TO BE 12" SIDE (OR AS DIRECTED BY THE CITY PUBLIC WORKS DEPARTMENT) AND SPACED 12" TO 60 APART. CENTER CROSSWALK ON CURB RAMPS. IF CURB RAMPS ARE NOT PRESENT, CENTER ON SIGNAL POLES, WHEREVER PRACTICAL.

TYPICAL CROSSWALK MARKING
(SEE CHAPTER 9 OF THE CASTLE PINES ROADWAY AND CONSTRUCTION STANDARDS FOR COMPLETE SIGNING AND STRIPING STANDARDS)

NOTES

1. POLE TOP SOLAR MOUNT WITH PANEL
2. 4" NOMINAL SCHEDULE 80 ALUM. POLE WITH PELCO COLLAR AND BASE (BLACK)
3. PELCO COLLAR AND BASE (BLACK) OR BREAKAWAY SLIP BASE PER PLAN.

Approved by the City of Castle Pines
Larry Nimmo
Director of Public Works
DATE 6/15/22

CITY OF CASTLE PINES

WARNING / REGULATORY FLASHING BEACON TYPICAL CROSSWALK MARKING

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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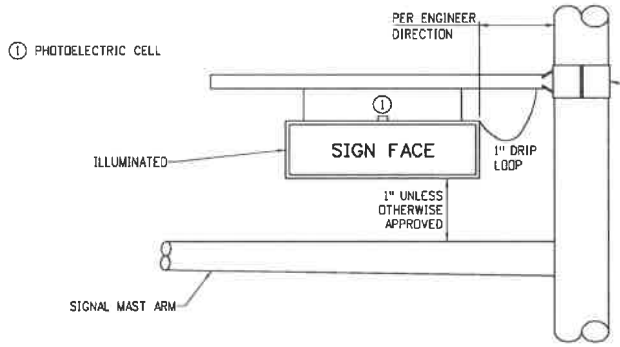
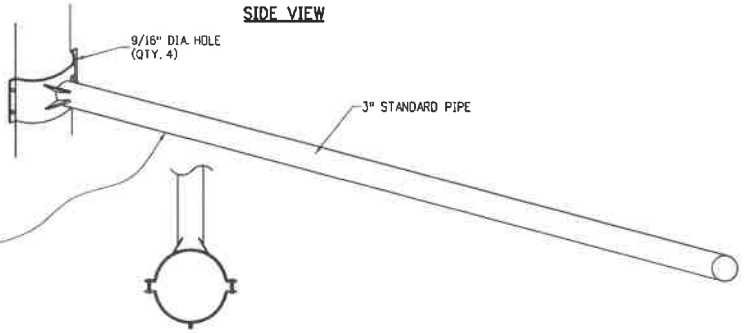
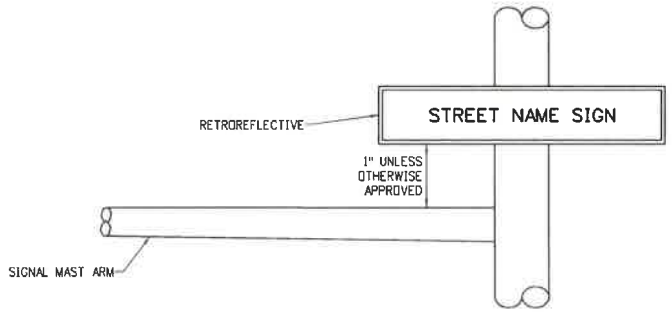


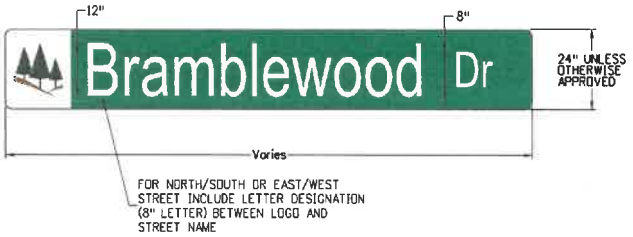
ILLUMINATED STREET NAME SIGN



PELCO PART NO. AP-3130, AP-3079
OR APPROVED EQUAL



STANDARD STREET NAME SIGN



TYPICAL SIGN LAYOUT

NOTES

1. FOR ILLUMINATED STREET NAME SIGN SPECIFICATIONS, SEE CHAPTER 9 OF THE CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS.
2. FOR STANDARD STREET NAME SIGN SPECIFICATIONS, SEE CHAPTER 9 OF THE CASTLE PINES ROADWAY DESIGN AND CONSTRUCTION STANDARDS.

APPROVED BY THE CITY OF CASTLE PINES
Larry Nimmo
Director of Public Works
DATE 6/14/22

CITY OF CASTLE PINES

STREET NAME SIGNS

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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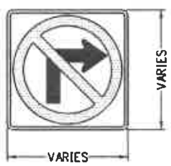
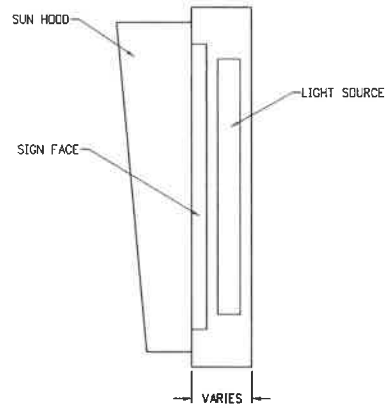
NOTES

1. SIGN MAY BE SINGLE-SIDED OR DOUBLE SIDED PER ENGINEER'S DIRECTION.
2. SIGN COLOR, LEGEND AND SIZE PER ENGINEER'S DIRECTION.

SAMPLE LEGEND



TYPICAL SIGN LAYOUT



SIDE VIEW

NOTES

1. LIGHT SOURCE SHALL BE LIGHT-EMITTING DIODE (LED). PER DIRECTION OF THE ENGINEER. SIGN FACE SHALL BE COMPLETELY DARK WHEN NOT ENERGIZED.
2. LIGHT SOURCE SHALL BE READILY ACCESSIBLE THROUGH HINGED DOORS OR SLIDING PANELS.
3. LED'S SHOULD BE WIRED TO INCORPORATE FAULT TOLERANCE OR BYPASS TO ISOLATE LED FAILURES OR A PARTICULAR LED ALLOWING REMAINING LED'S TO OPERATE NORMALLY.
4. HOUSING COLOR PER DIRECTION OF THE ENGINEER.

GENERAL NOTES

1. SIGN FIXTURE AND PANELS SHALL WITHSTAND 90 MPH WIND LOADING, WITH STRUCTURAL REQUIREMENTS MEETING AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS," LATEST EDITION.
2. HOUSING SHALL BE CONSTRUCTED OF ALUMINUM UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
3. NEOPRENE GASKETS SHALL BE INSTALLED BETWEEN THE SIGN PANEL AND FIXTURE HOUSING TO PREVENT WATER ENTRANCE. SCREENED WEEP HOLES SHALL BE PROVIDED ON HOUSING BOTTOM FOR DRAINAGE.
4. BLANKOUT REGULATORY/WARNING SIGNS SHALL BE MOUNTED WITH ASTROTYPE MOUNTING BRACKETS. SEE "SIGNAL HEADS AND MOUNTING GENERAL WIRING NOTES" SHEET FOR FURTHER DETAIL.
5. BLANKOUT SIGN SHALL BE WIRED AS SPECIFIED IN THE PLANS.

APPROVED BY THE CITY OF CASTLE PINES

Director of Public Works

DATE 9/14/22

CITY OF CASTLE PINES

BLANK-OUT REGULATORY/WARRING SIGN

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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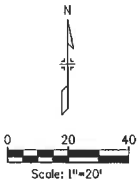
Standard Drawing No. SI.19



SIGNAL PHASING

Ø IS MAIN PHASE

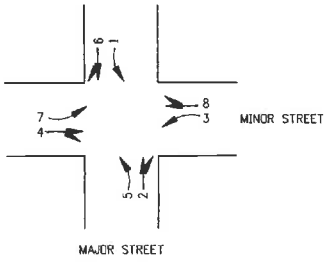
IF MAIN PHASE IS NORTHBOUND

Ø 1 S/B LEFT TURN
Ø 2 N/B THROUGH
Ø 3 W/B LEFT TURN
Ø 4 E/B THROUGH
Ø 5 N/B LEFT TURN
Ø 6 S/B THROUGH
Ø 7 E/B LEFT TURN
Ø 8 W/B THROUGH

IF MAIN PHASE IS EASTBOUND

Ø 1 W/B LEFT TURN
Ø 2 E/B THROUGH
Ø 3 N/B LEFT TURN
Ø 4 S/B THROUGH
Ø 5 E/B LEFT TURN
Ø 6 W/B THROUGH
Ø 7 S/B LEFT TURN
Ø 8 N/B THROUGH

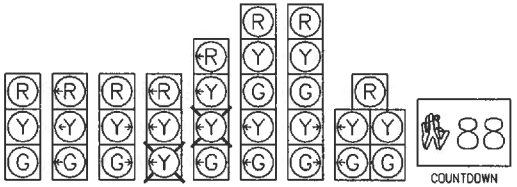
PHASING LAYOUT



NOTES

1. ALL VEHICLE SIGNAL HEADS SHALL BE POLYCARBONATE WITH 12" SECTIONS AND TUNNEL VISORS.
2. ALL VEHICLE AND PEDESTRIAN SIGNAL HEADS SHALL BE
3. BLACK IN COLOR.

BACKPLATES WHERE INDICATED SHALL BE LOUVERED TYPE, WITH 2" DIAMOND GRADE FLUORESCENT YELLOW RETROREFLECTIVE TAPE BORDER.



SIGNAL HEADS

CITY OF CASTLE PINES SIGNALIZED INTERSECTION STANDARD WIRING

MAIN STREET	CONDUCTOR COLOR	CONDUCTOR #
MAIN STREET GREEN BALL	GREEN	4
MAIN STREET YELLOW BALL	ORANGE	5
MAIN STREET RED BALL	RED	3
MAIN STREET LT GREEN ARROW	BLUE	6
MAIN STREET LT YELLOW ARROW	BLACK	1
MAIN STREET FLASHING YELLOW ARROW	ORANGE/GREEN	21
MAIN STREET LT RED ARROW	RED/GREEN	20
MAIN STREET WALK	GREEN/WHITE	14
MAIN STREET DON'T WALK	RED/WHITE	13
SIDE STREET		
SIDE STREET GREEN BALL	GREEN/BLACK	9
SIDE STREET YELLOW BALL	ORANGE/BLACK	10
SIDE STREET RED BALL	RED/BLACK	8
SIDE STREET LT GREEN ARROW	BLUE/RED	19
SIDE STREET LT YELLOW ARROW	ORANGE/RED	18
SIDE STREET FLASHING YELLOW ARROW	BLACK/RED	16
SIDE STREET LT RED ARROW	RED (2)	24
SIDE STREET WALK	BLUE/WHITE	15
SIDE STREET DON'T WALK	BLACK/WHITE	12
RIGHT TURN		
RIGHT TURN OL GREEN ARROW	BLUE/BLACK	11
RIGHT TURN OL YELLOW BALL	BLACK (2)	22
AC-RETURN		
AC-RETURN	WHITE	2
AC-RETURN	WHITE (2)	23
SPARE		
SPARE	WHITE/BLACK	7
SPARE	WHITE/RED	17
SPARE	GREEN (2)	25

INTERSECTION APPROACH HAND HOLE AND PULLBOX

TAPE COLOR		
RED		NORTH
ORANGE		EAST
GREEN		SOUTH
BLUE		WEST
WHITE		LEFT TURN
YELLOW		PED INDICATION
YELLOW	YELLOW	PED PUSH BUTTON
BROWN		RIGHT TURN
PURPLE		SPARE

LEGEND

- TRAFFIC SIGNAL POLE
- SPAN WIRE POLE
- MAST ARM AND POLE
- TRAFFIC SIGNAL FACE
- TRAFFIC SIGNAL FACE WITH BACKPLATE
- TRAFFIC SIGNAL FACE FOR TURNING MOVEMENT
- PEDESTRIAN SIGNAL FACE
- PEDESTRIAN PUSH BUTTON & SIGN
- LUMINAIRE
- TRAFFIC SIGNAL CONTROLLER & CABINET
- MAST ARM, POLE MOUNTED SIGN W/IDENTIFIER
- ISN — ILLUMINATED STREET NAME SIGN
- BDR — BLANK-OUT REGULATORY SIGN
- BDW — BLANK-OUT WARNING SIGN
- METER PEDESTAL
- PULL BOX (TYPE I)
- PULL BOX (TYPE II)
- PULL BOX (TYPE III)
- PULL BOX (SPECIAL)
- 30x48 VAULT
- 40' — LOOP DETECTOR (6'x40')
- 30' — LOOP DETECTOR (6'x30')
- LOOP DETECTOR (6'x6')
- CAMERA DETECTION
- RADAR DETECTION
- MICRO LOOP DETECTOR W/ SAW CUT LEAD
- CONDUIT-SCHEDULE 80 PVC
- OPTICOM DETECTOR
- SF-X — SCHOOL FLASHING BEACON (TYPE X)
- WF — WARNING FLASHING BEACON
- RF — REGULATORY FLASHING BEACON
- RADIO ANTENNA
- TRAVEL TIME DEVICE
- PTZ CAMERA

APPROVED BY THE CITY OF CASTLE PINES

Larry Manno
Director of Public Works

DATE 6/14/22

CITY OF CASTLE PINES

SIGNAL PHASING / STANDARD INTERSECTION WIRING / TYPICAL LEGEND

CITY OF CASTLE PINES STANDARD SIGNAL DETAILS

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