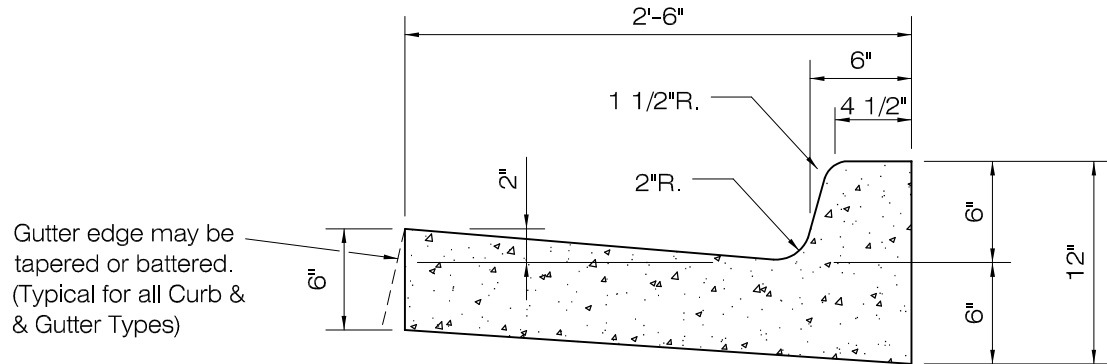
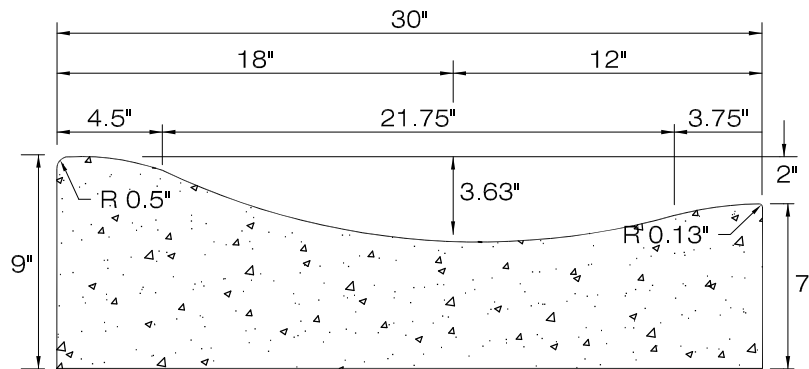


APPENDIX A – STANDARD DRAWINGS

701	Curb and Gutter	1408L	Bicycle and Parking Pavement Markings – Loveland (GMA and City Limits)
702	Curb and Gutter/Sidewalk	1409L	Bicycle/Parking Sign – Loveland (GMA and City Limits)
702L	Curb and Gutter/Sidewalk (Loveland)	1410	Bicycle Lane Approaching Vehicle Right Turn Lane
703	Median (Island Curbs)	1411	Street Name Sign
704B	Standard Details for Raised Median	1412	Urban Roundabout Sign Details
705	Standard Details for Raised Median	1412L	Future Road Extension Sign (Loveland)
705A	Standard Details for Raised Median	1413	Standards Temporary Dead End Barricades
706.1	Standard Driveway Approach (Type I)	1414	Cantilever Arm Bracket for Flat or Extruded Blades
706.2	Standard Driveway Approach (Type II)	1415	Delineator Detail
706.3	Standard Driveway Approach (Type II Bypass)	1416L	Signs and Pavement Markings for Speed Tables – Loveland (City Limits only)
707.1	Standard Driveway Approach (High Volume Drive, Type III)	1417L	Signs and Pavement Markings for Raised Crossings – Loveland (City Limits only)
707.2	Standard Driveway Approach (High Volume Drive, Type IV)	1418	Fire Access Road Signs
708	Street Intersection Crossspan	1419	Fire Apparatus Access Road Stenciling & Fire Lane Sign Installation
709	Standard Details for Drainage Under Sidewalk	1420	New FHWA Arrows (Elongated)
710	Asphalt Paving Detail (Crossspan)	1421	Rectangular Rapid Flashing Beacon (RRFB)
711	Bus Bay and Stop Standard	1422	Conduit and Pull Box For Fiber Optic Lines
713.1F	Subdrain Service Wye Detail – Fort Collins (GMA and City Limits)	1601	Standard Sidewalk
713.1L	Subdrain Service Wye Detail – Loveland (GMA and City Limits)	1602	Sidewalk Detail
713.2F	Subdrain Main Installation Details – Fort Collins (GMA and City Limits)	1603	Access Ramp Details
713.2L	Underdrain Main – Bedding Requirements – Loveland (GMA and City Limits)	1604	Detached Walk/Intersection Detail
801	Standard Details for Raised Median Geometry	1605	Detached Walk/Intersection Detail
802	Forced Turn Barrier (Splitter Island)	1606	Pedestrian Ramp Detail (For New Construction and Alterations)
802.1L	Right-In Right-Out Access (Loveland)	1606a	Residential Local Street Access Ramps
802.2L	Roundabout Truck Apron Curb (Loveland)	1607	Access Ramp Scoring
803	Alley Intersections	1608	Median Islands and Pedestrian Refuge Area
901	Access on Rural Roadways (without Curb and Gutter)	1609L	Raised Speed Table – Loveland (GMA and City Limits)
1101	Handrail Details	1610	Decorative Concrete Crosswalk (Patterned/Colored Concrete)
1102L	Oklahoma TR-1 Bridge Railing – Loveland (GMA and City Limits)	1611	Enhanced Asphalt Crosswalk (Patterned/Colored Asphalt)
1103L	Safety-Shaped Concrete Bridge Railing – Loveland (GMA and City Limits)	1612	Enhanced Concrete Crosswalk (Construction Detail)
1104L	Nevada Concrete Safety Shape – Loveland (GMA and City Limits)	1613	Raised Crosswalk Detail
1105L	Texas Type HT – Loveland (GMA and City Limits)	1701	Bicycle Rack Details
1106L	Texas Type TT – Loveland (GMA and City Limits)	1702	Bicycle Rack Details
1107	Type C Aluminum Bridge Railing	1703	Bicycle Rack Details
1108	Bridge Railing/Parapet Wall Configuration Detail	1704	Bicycle Rack Foundation Details
1201	Standard Manhole Cover	1705	Bicycle Rack Details
1202	Sleeve Locations	1706F	Bicycle Rack Details – Fort Collins (GMA and City Limits)
1401	Sign Post	1707	Bicycle Rack Details
1402a	No Parking Bike Lane Sign Detail	1801F	14' Local Speed Hump – Fort Collins (GMA and City Limits)
1402b	No Parking Anytime Sign Detail	1802F	22' Speed Hump – For Collins (GMA and City Limits)
1403	Standard Pavement Markings	2201	Trench Detail
1404	Standard Pavement Markings with Turn Lane	2501	Sidewalk Details
1405	Pavement Markings for Bike Crossing		
1406	Typical Bicycle Lane Pavement Markings		
1407	Handicap Parking Requirements (as per “ADA”)		



VERTICAL



ROLL-OVER
(LOVELAND)

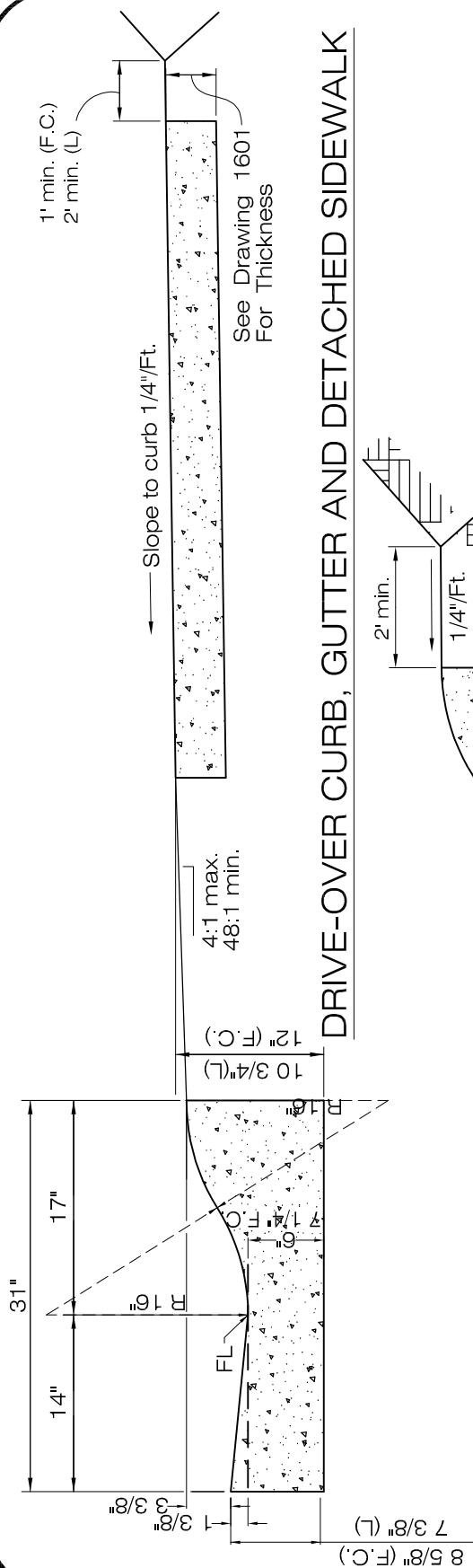
CURB AND GUTTER

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

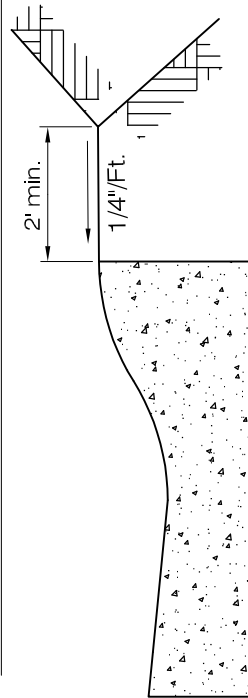
CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 03/01/02

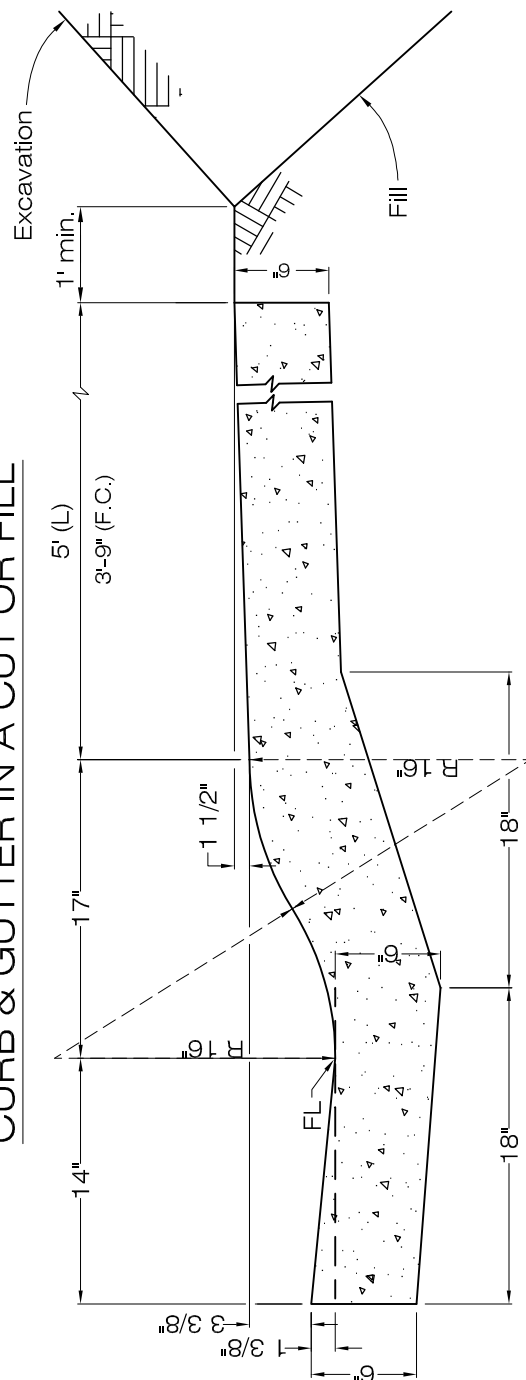
DRAWING
701



DRIVE-OVER CURB, GUTTER AND DETACHED SIDEWALK



CURB & GUTTER IN A CUT OR FILL



DRIVE-OVER CURB, GUTTER AND ATTACHED SIDEWALK

CURB AND GUTTER/SIDEWALK

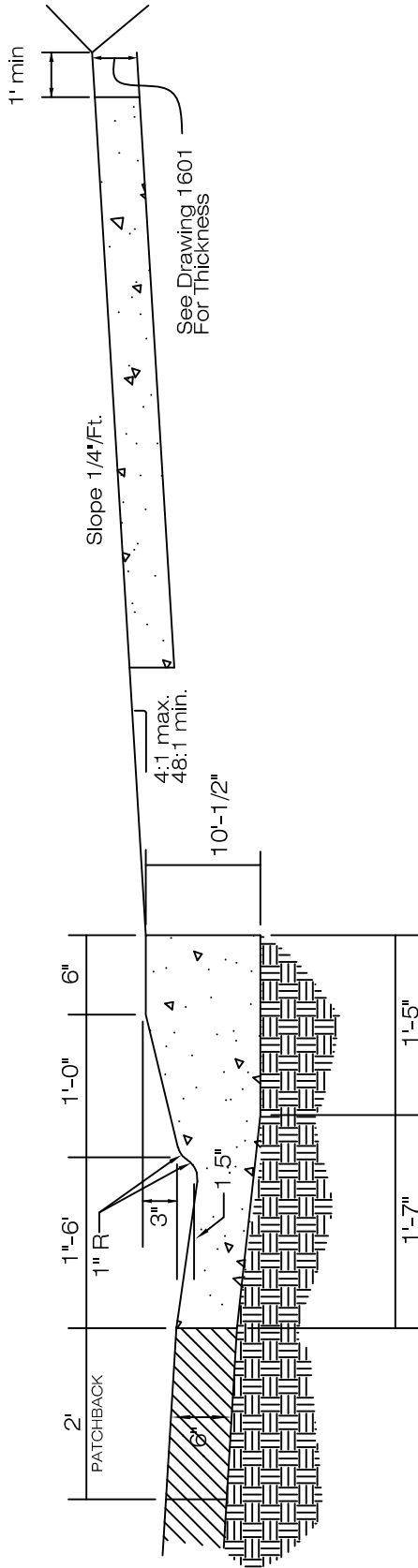
LARIMER COUNTY URBAN AREA STREET STANDARDS

CONSTRUCTION DRAWINGS

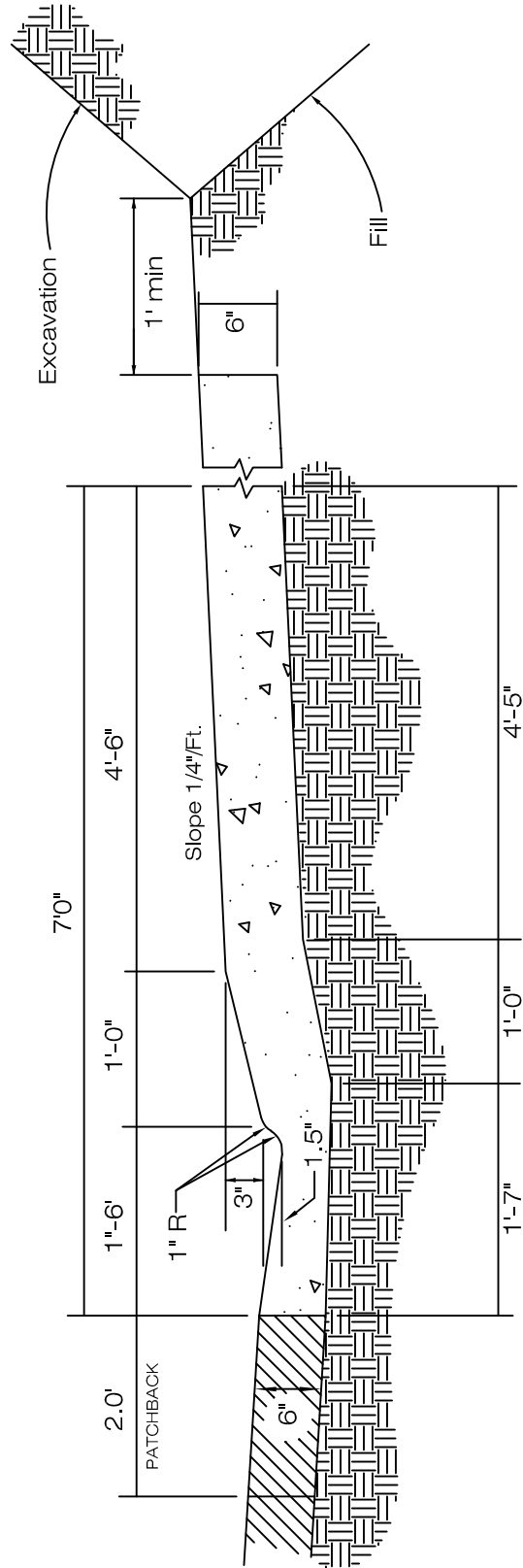
REVISION NO:	1
DATE:	03/01/02

DRAWING
702

LOVELAND ONLY



DRIVE-OVER CURB, GUTTER & DETACHED SIDEWALK



DRIVE-OVER CURB, GUTTER & ATTACHED SIDEWALK

NOTES:

1. GUTTER SLOPE- 1/2" IN 1'-6"
2. WALK SLOPE- 1/4" IN 1'-0"
3. RESIDENTIAL ONLY
4. TOTAL FLOWLINE DEPTH = 4.5" (3" + 1.5")
5. COMBINATION CURB, GUTTER & ATTACHED SIDEWALK REQUIRES CITY ENGINEER APPROVAL

DRIVE-OVER CURB, GUTTER & SIDEWALK

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

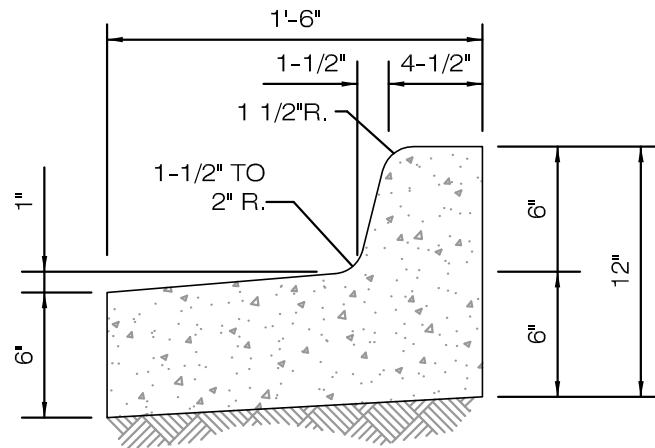
CONSTRUCTION
DRAWINGS

REVISION NO:

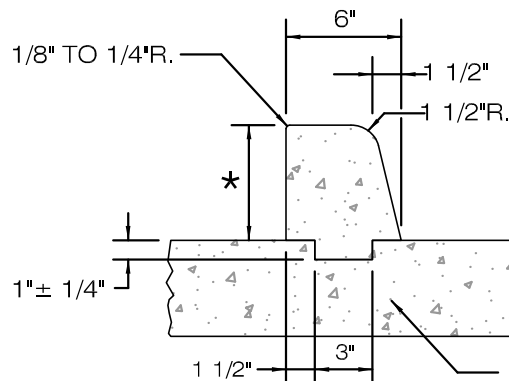
DATE: 08/01/21

DRAWING

702L



**OUT FALL CURB & GUTTER
(FORT COLLINS ONLY)**

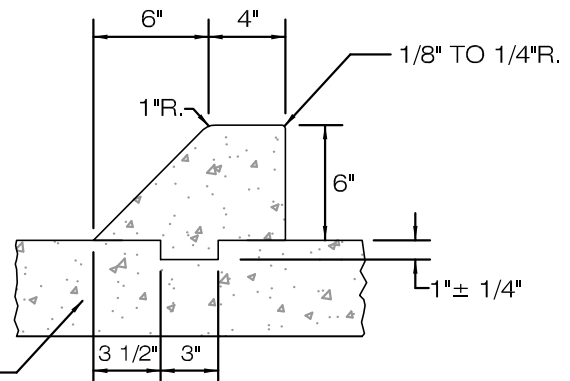


* 6" w/concrete pavement
8" w/asphalt

ASPHALT OR
CONCRETE PAVEMENT

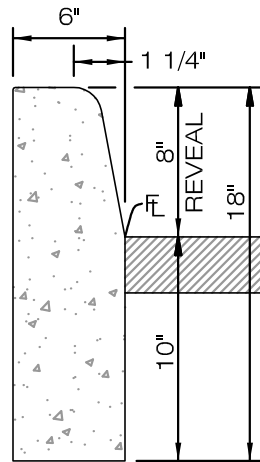
BARRIER CURB (KEY WAY OR EPOXY)

(SECTION B)



MOUNTABLE CURB (KEY WAY OR EPOXY)

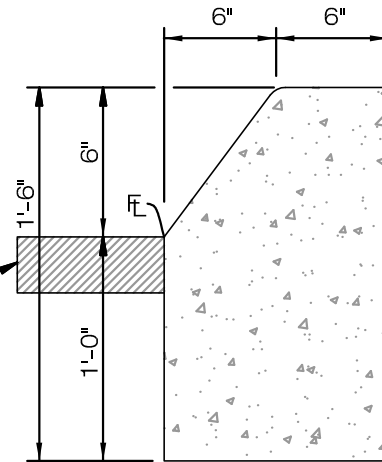
(SECTION M)



8" BARRIER CURB

(CDOT TYPE 2 SECTION B M-609-1 CURB W/8" REVEAL)

ROADWAY
PAVEMENT



6" MOUNTABLE CURB

Notes:

- Bottom of curb shall be poured to a depth no less than on the compacted subgrade of the pavement.
- Raised center medians shall be 8" barrier curb or 8" epoxy curb only.

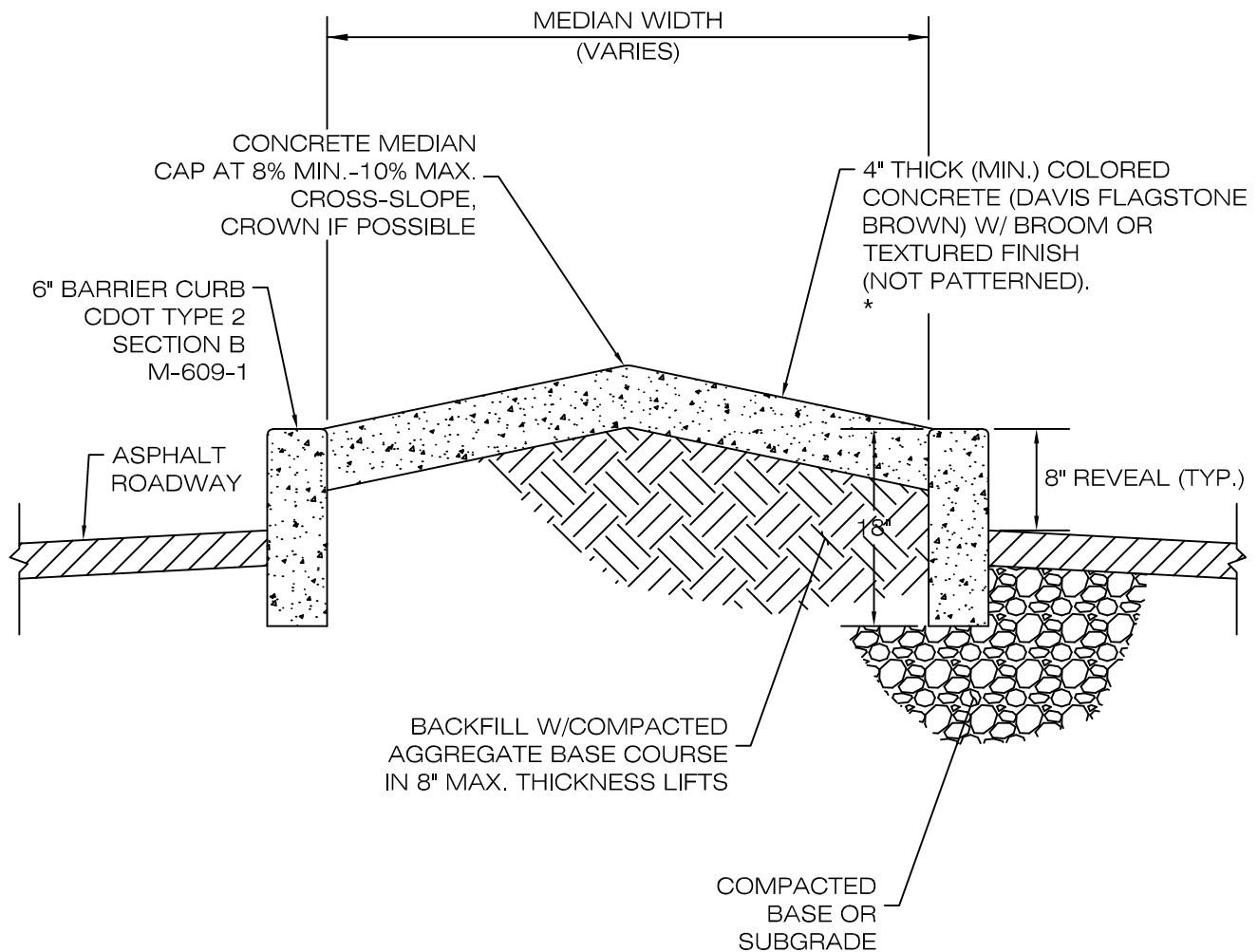
MEDIAN (ISLAND CURBS)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
703



NOTES:

1. For areas where the median area is less than 5.5' wide and landscaping cannot be achieved.
2. May be used for portions where the median area is > 5.5' if a variance is granted by the local entity engineer.
3. Glue down curb may be used only if approved by the local entity engineer.

* Design engineer to specify control joint pattern to prevent cracks.

STANDARD DETAILS FOR RAISED MEDIAN

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

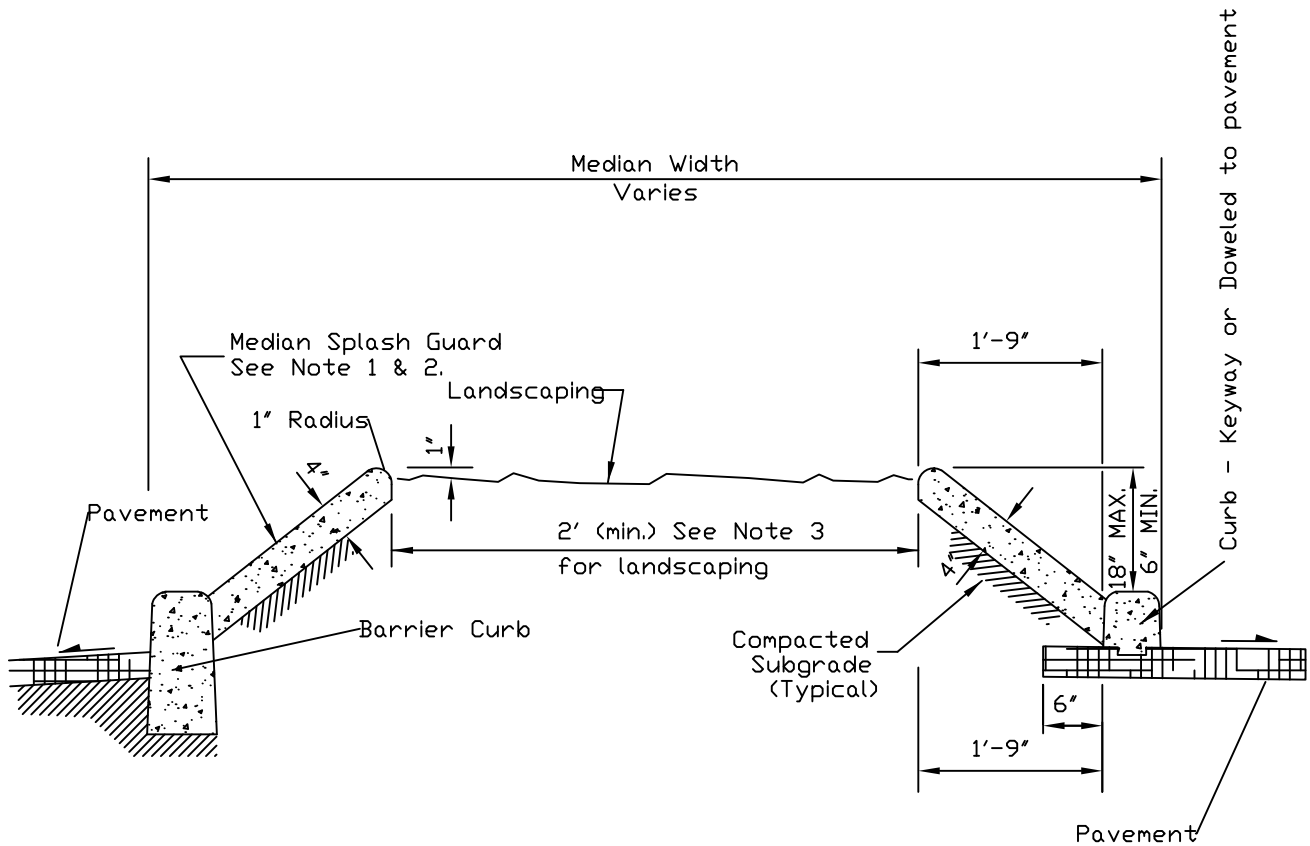
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/01/21

DRAWING

704-B



NOTES:

1. All Splash Guard shall be constructed of stamped concrete, colored concrete or equivalent, or exposed aggregate as required by the Local Entity.
2. Use 10' joint spacing on the Splash Guard concrete (match C&G joints).
3. For the portions of medians where the landscape area is less than 2' wide, the landscape area shall be paved in concrete (same material as the Splash Guard)
4. Any median trees shall be trimmed so the minimum branch height is 8' above the pavement.
5. A drainage system may be required whenever an irrigation system is proposed within the median.
6. Concrete color shall be Davis Flagstone Brown in Loveland.
7. Glue down curb may be used only if approved by the local entity engineer.

STANDARD DETAILS FOR RAISED MEDIAN

**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

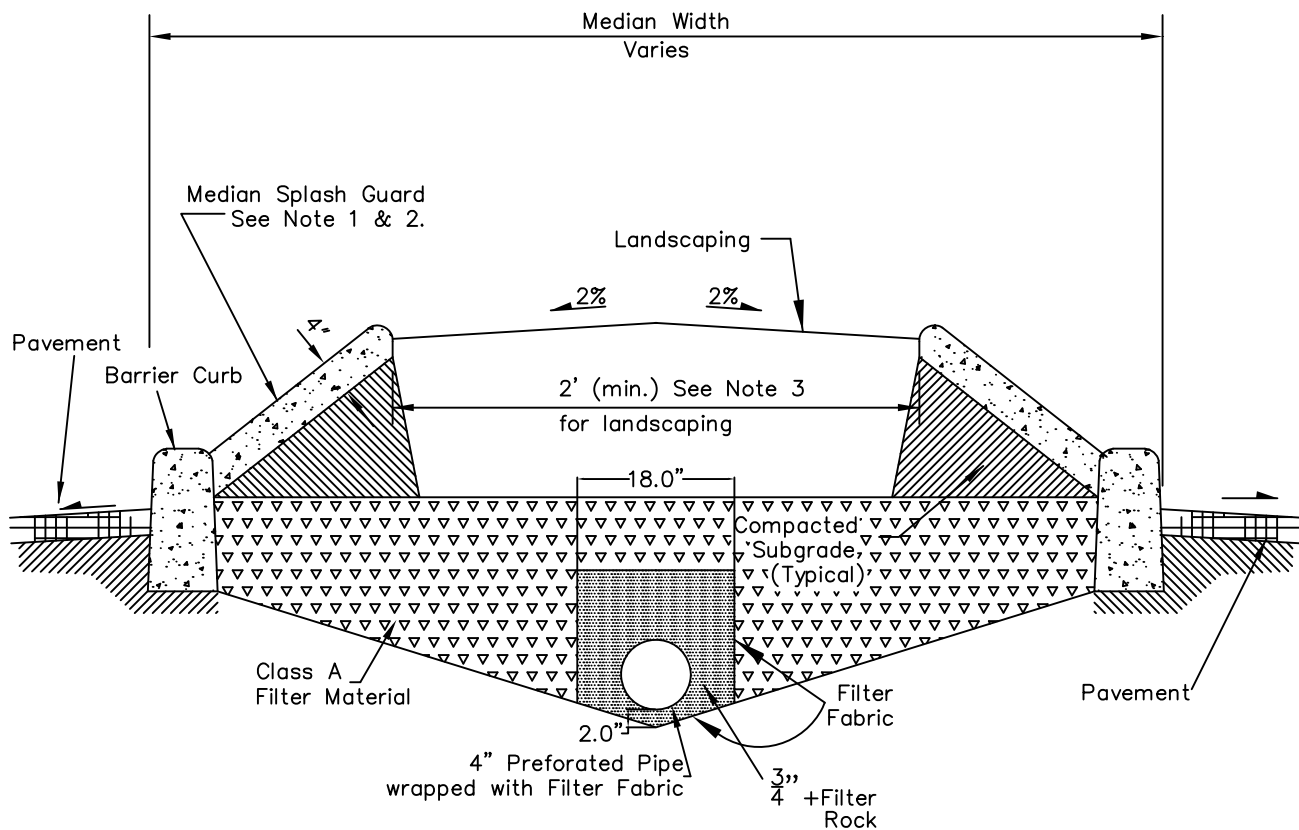
**CONSTRUCTION
DRAWINGS**

REVISION NO:

DATE: 08/01/21

DRAWING

705



NOTES:

1. All Splash Guard shall be constructed of stamped concrete, colored concrete or equivalent, or exposed aggregate as required by the Local Entity.
2. Use 10' joint spacing on the Splash Guard concrete (match C&G joints).
3. For the portions of medians where the landscape area is less than 2' wide, the landscape area shall be paved in concrete (same material as the Splash Guard)
4. Any median trees shall be trimmed so the minimum branch height is 8' above the pavement.
5. A drainage system may be required whenever an irrigation system is proposed within the median.
6. Concrete color shall be Davis Flagstone Brown in Loveland.
7. Glue down curb may be used only if approved by the local entity engineer.

LANDSCAPING AND DRAIN DETAILS FOR RAISED MEDIAN

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

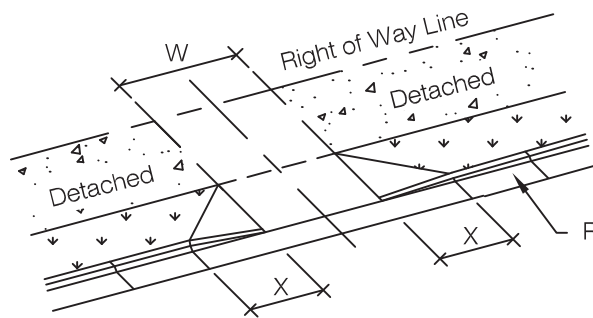
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/01/21

DRAWING

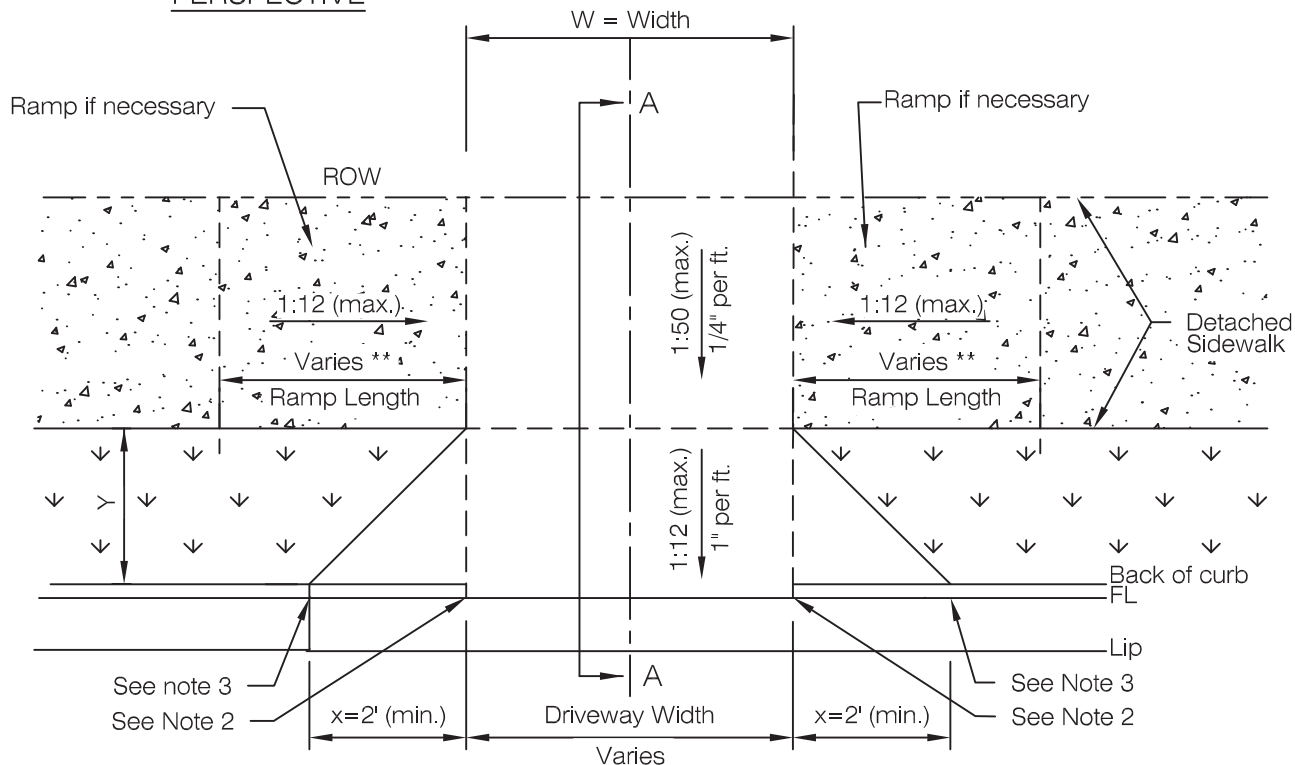
705a



X = Curb Transition Length
Y = Parkway Width Varies
W = Driveway Width, See Standard Drawing Series 707
T = Concrete Thickness - 6" Residential, 8" Commercial

Refer to Chapter 25 for minimum removal dimensions.

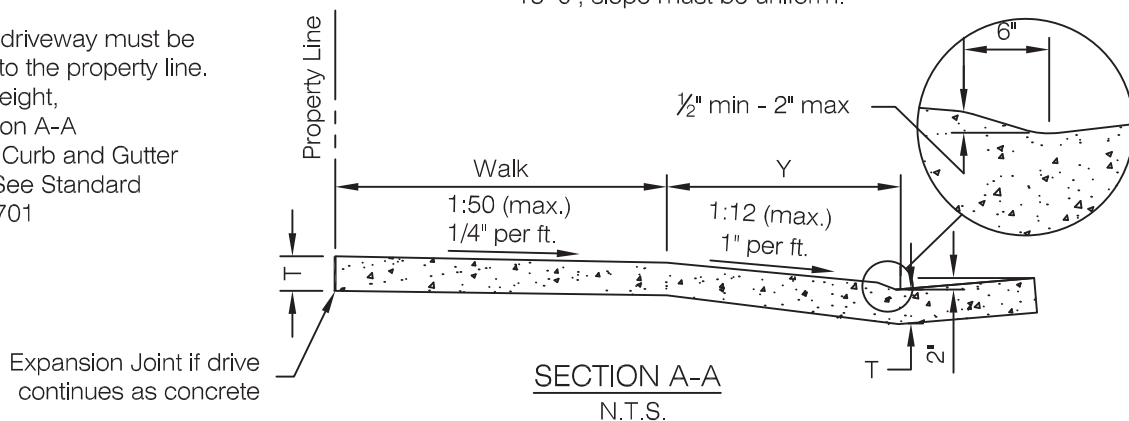
PERSPECTIVE



NOTE:

1. Concrete driveway must be provided to the property line.
2. 0" Curb Height, See Section A-A
3. Standard Curb and Gutter Section, See Standard Drawing 701

** Ramp length not to exceed 15'-0", slope must be uniform.



NOT TO SCALE

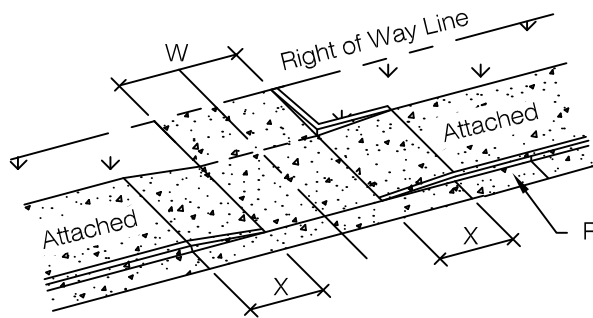
STANDARD DRIVEWAY APPROACH DETACHED WALK (Type I)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 02/17/15

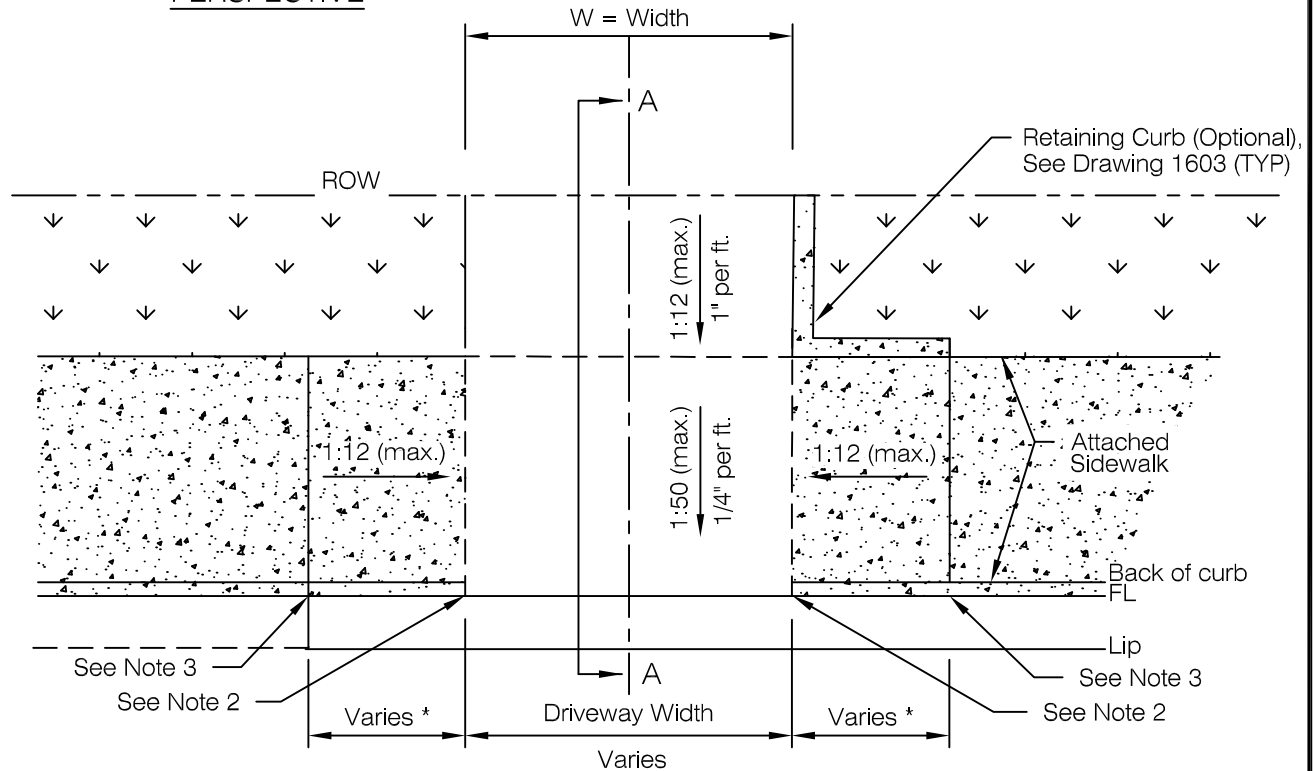
DRAWING
706.1



X = Curb Transition Length, Varies*
W = Driveway Width (See Drawing Series 707)
T = Concrete Thickness - 6" Residential,
8" Commercial.

Refer to Chapter 25 for minimum removal dimensions.

PERSPECTIVE

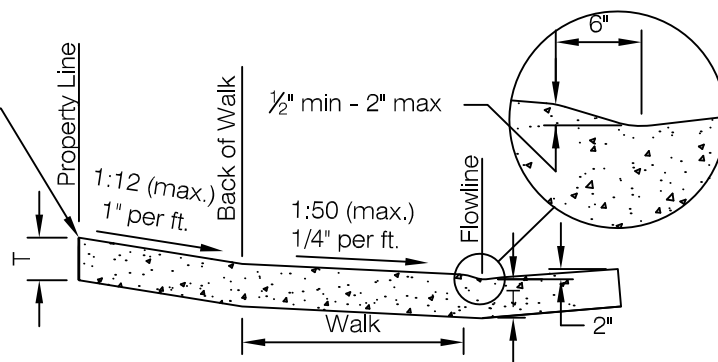


* Ramp length not to exceed 15'-0", slope must be uniform.

Expansion Joint if driveway continues as concrete

NOTE:

1. Concrete driveway shall be provided to the property line.
2. 0" Curb Height, See Section A-A
3. Full Curb and Gutter, See Standard Drawing 701.



SECTION A-A
N.T.S.

NOT TO SCALE

STANDARD DRIVEWAY APPROACH ATTACHED WALK (TYPE II)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 02/17/15

DRAWING
706.2

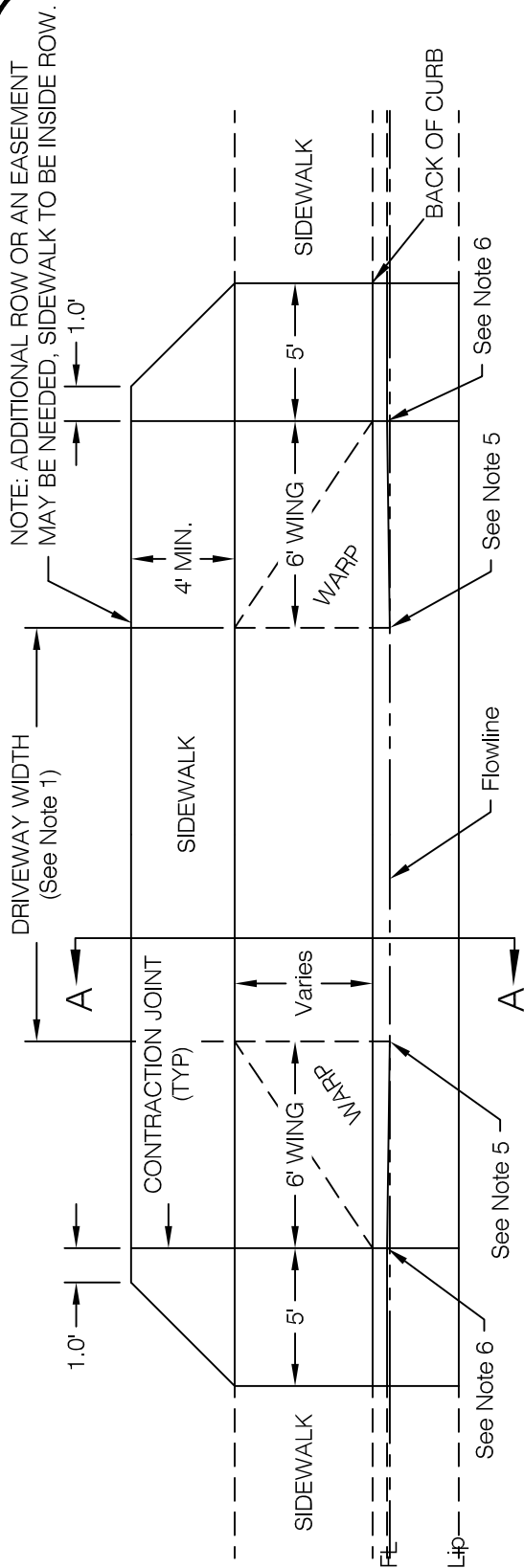
DRIVEWAY WITH ADA BYPASS SIDEWALK (TYPE II BYPASS)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

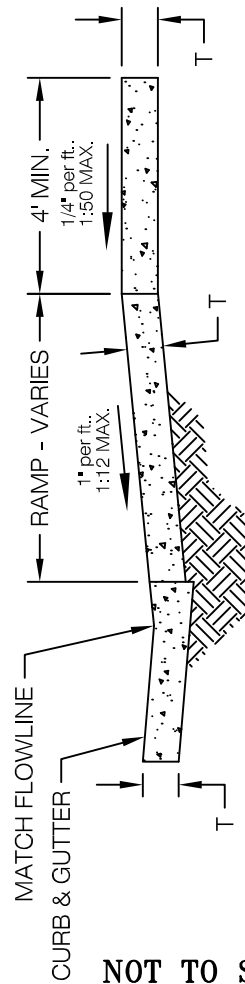
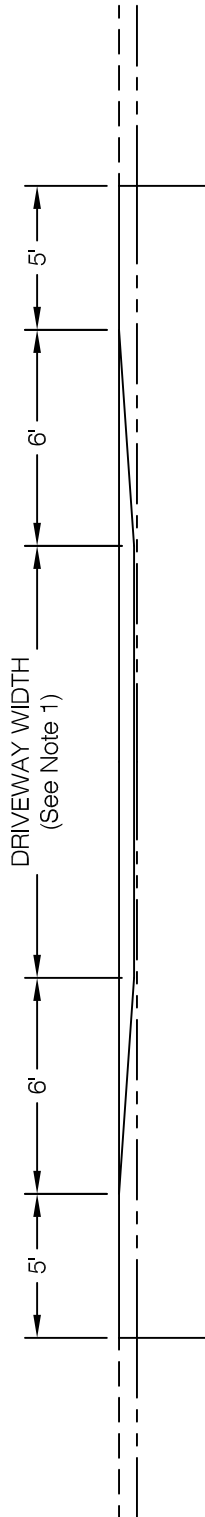
CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 02/17/15

DRAWING
706.3



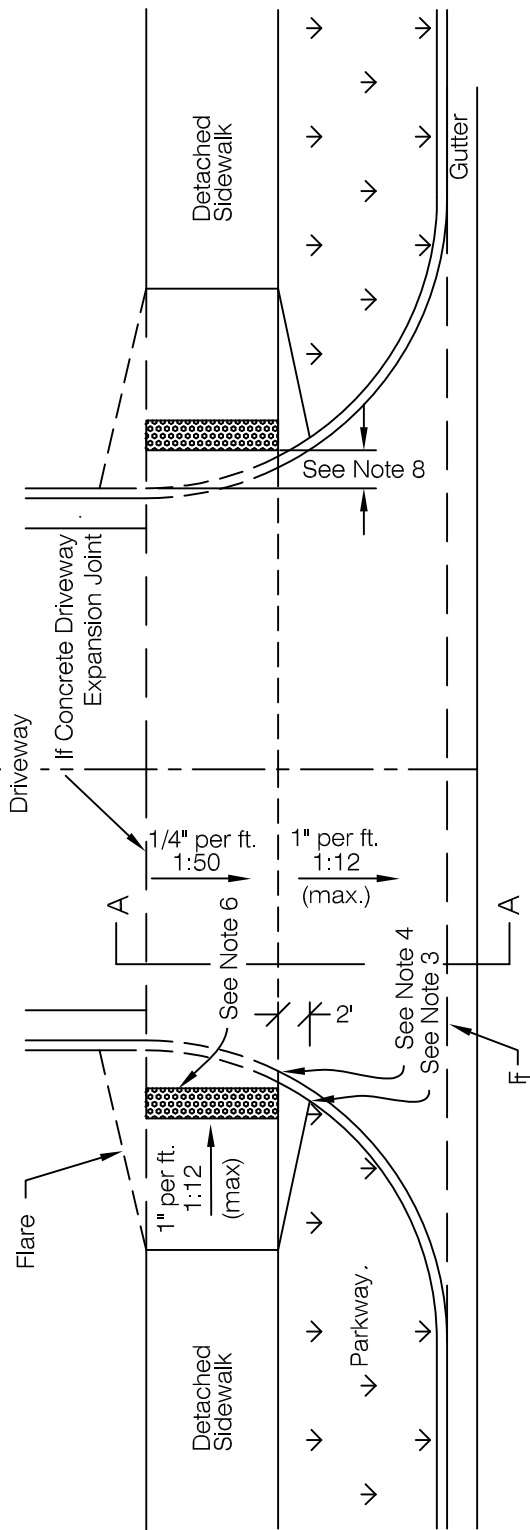
DRIVEWAY WITH SIDEWALK ATTACHED TO CURB



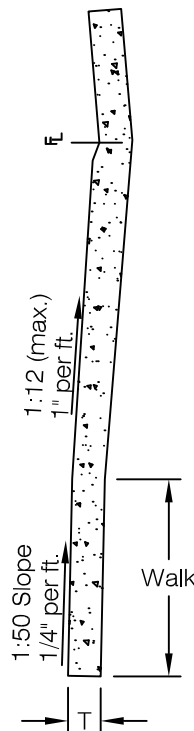
NOT TO SCALE

SECTION A-A

- NOTES:
1. See LCUASS Drawing Series 707 for driveway width.
 2. Concrete class per LCUASS Section 22
 3. Rough broom finish full width of ramp and wings. Trowel and use light hair broom finish for sidewalk area
 4. T = 6\"/>
 - 5. 0\"/>
 - 6. Standard curb and gutter section, See Standard Drawing 701



TYPE III
DETACHED WALK



SECTIONS A-A
N.T.S.

NOTES:

1. 6' wide pan for residential streets.
2. All intersections to have access ramps.
3. Standard Curb and Gutter Section, See Standard Drawing 701
4. 0" Curb Height, See Section A-A
5. All of these pedestrian improvements shall be in ROW or a pedestrian or public access easement.
6. Detectable Warning to extend the full width of the ramp and be 2'-0" in the direction of travel. Maximum slope in the direction of travel shall be no more than 5.0 percent (1:20). Material to be approved by local engineer
7. T = 6" for residential and 8" for commercial.
8. Distance from back of curb to the beginning of Detectable Warning cannot be greater than 5'-0"

NOT TO SCALE

DRIVEWAY WIDTHS

CLASSIFICATION	APPROACH TYPE	MINIMUM WIDTH	MAXIMUM WIDTH
RESIDENTIAL:			
Single Family ●	I or II	12'	24' *
Multi Family ●	I, II, III, or IV	24'	36' * *
Commercial	I, II, III, or IV	24'	36' * *
Industrial	I, II, III, or IV	24'	36'

● High volume driveways (Type III or IV) allowed for 350 or greater trip ends/day.

* 30' maximum for 3 car garages.

* No single opening shall exceed 36'. Wider driveways shall be divided w/a median not less than 6' wide.

STANDARD DRIVEWAY APPROACH (HIGH VOLUME DRIVE TYPE III)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 02/17/15

DRAWING
707.1

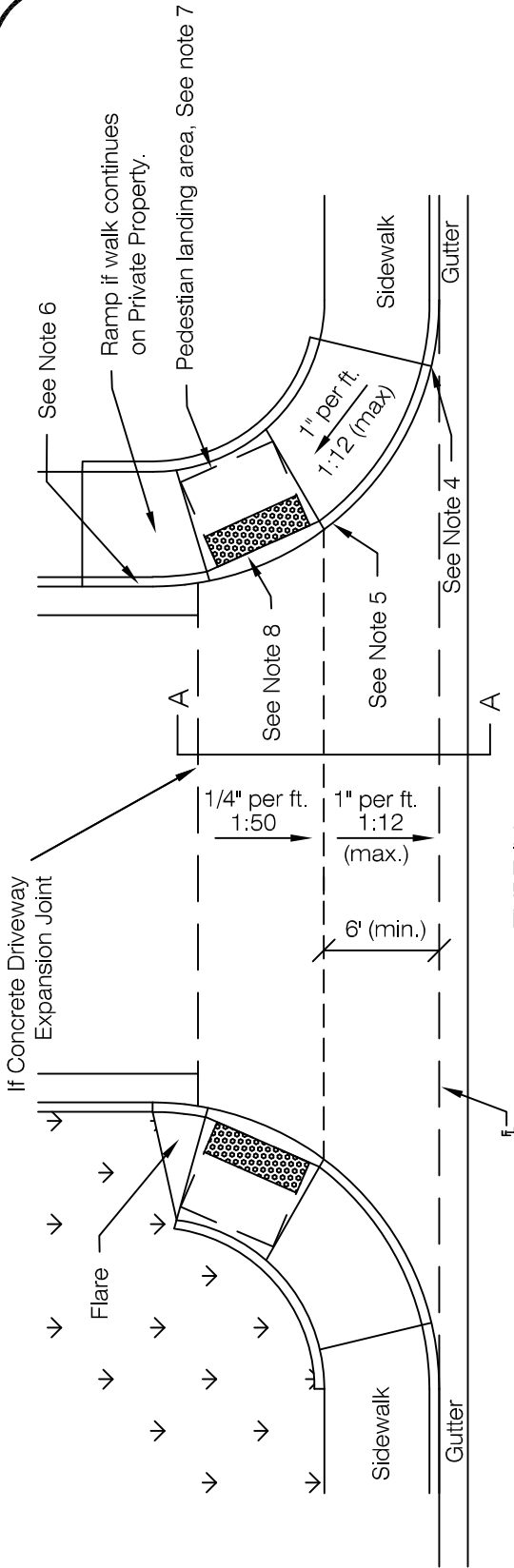
STANDARD DRIVEWAY APPROACH (HIGH VOLUME DRIVE TYPES IV)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

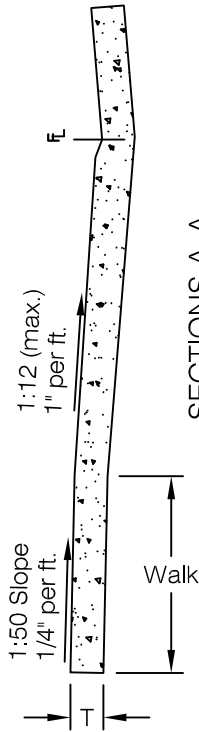
CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 08/01/21

DRAWING
707.2



TYPE IV
ATTACHED WALK



NOTES:

- For construction of access ramps, see Standards detail 1603.
- 6' wide pan for residential streets.
- All intersections to have access ramps.
- Standard Curb and Gutter Section, See Standard Drawing 701.
- 0" Curb Height, See Section A-A
- All of these pedestrian improvements must be in ROW or a pedestrian or public access easement.
- Pedestrian landing area, minimum required 4 ft length x 4 ft width, max slope in any direction is 1:50 or $\frac{1}{4}$ " per foot.
- Detectable Warning to extend the full width of the landing area and be 2.0' in the direction of travel beginning 6" from flowline. Material to be approved by the local engineer.
- T = Concrete thickness, 6" for Residential and 8" for Commercial

NOT TO SCALE

DRIVEWAY WIDTHS

CLASSIFICATION	APPROACH TYPE	MINIMUM WIDTH	MAXIMUM WIDTH
RESIDENTIAL:			
Single Family ●	I or II	12'	24' *
Multi Family ●	I, II, III, or IV	24'	36' * *
Commercial	I, II, III, or IV	24'	36' * *
Industrial	I, II, III, or IV	24'	36'

- High volume driveways (Type III or IV) allowed for 350 or greater trip ends/day.
- * 30' maximum for 3 car garages.
- * * No single opening shall exceed 36'. Wider driveways shall be divided w/a median not less than 6' wide.

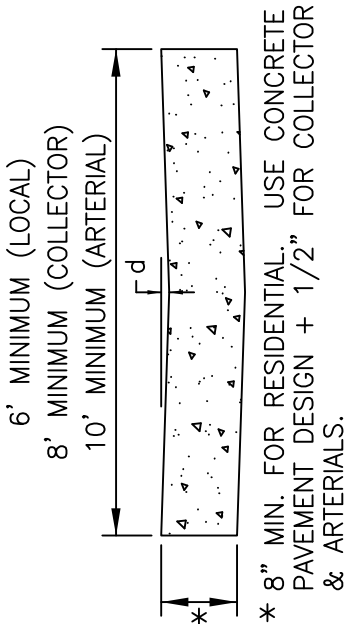
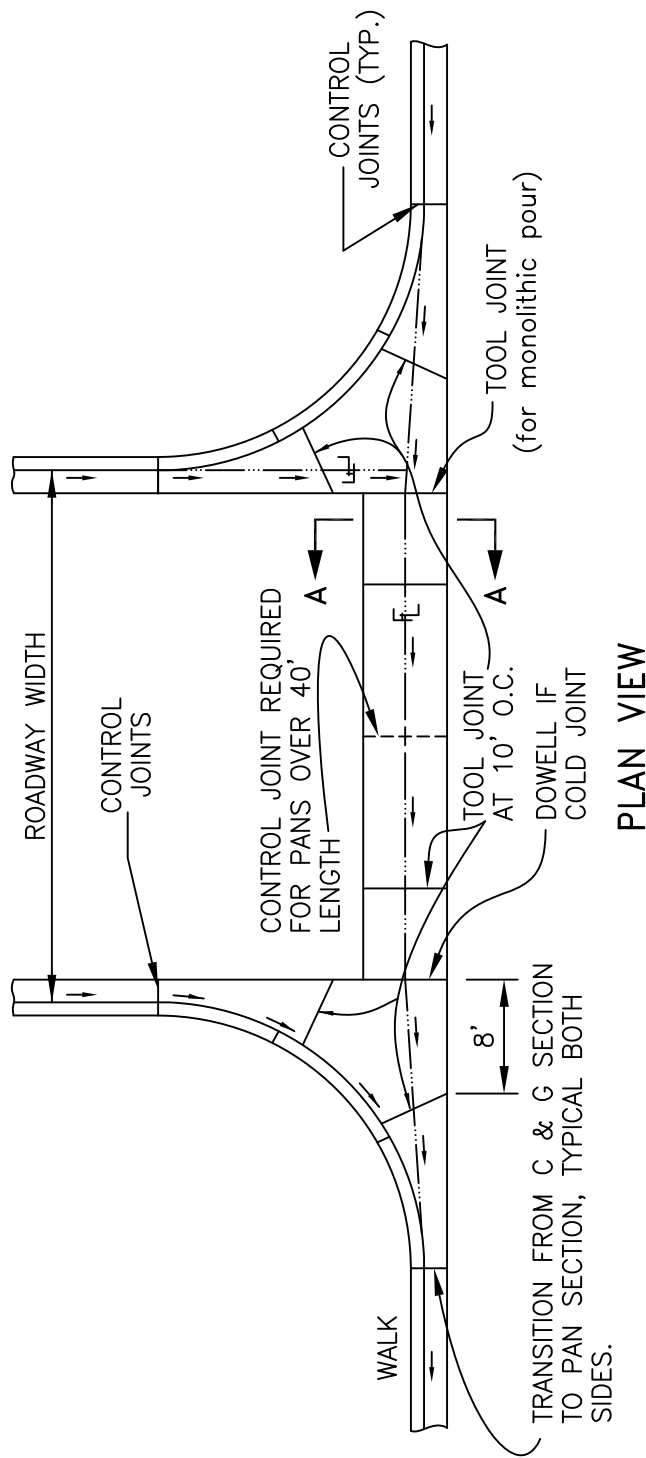
STREET INTERSECTION CROSSPAN

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 08/01/21

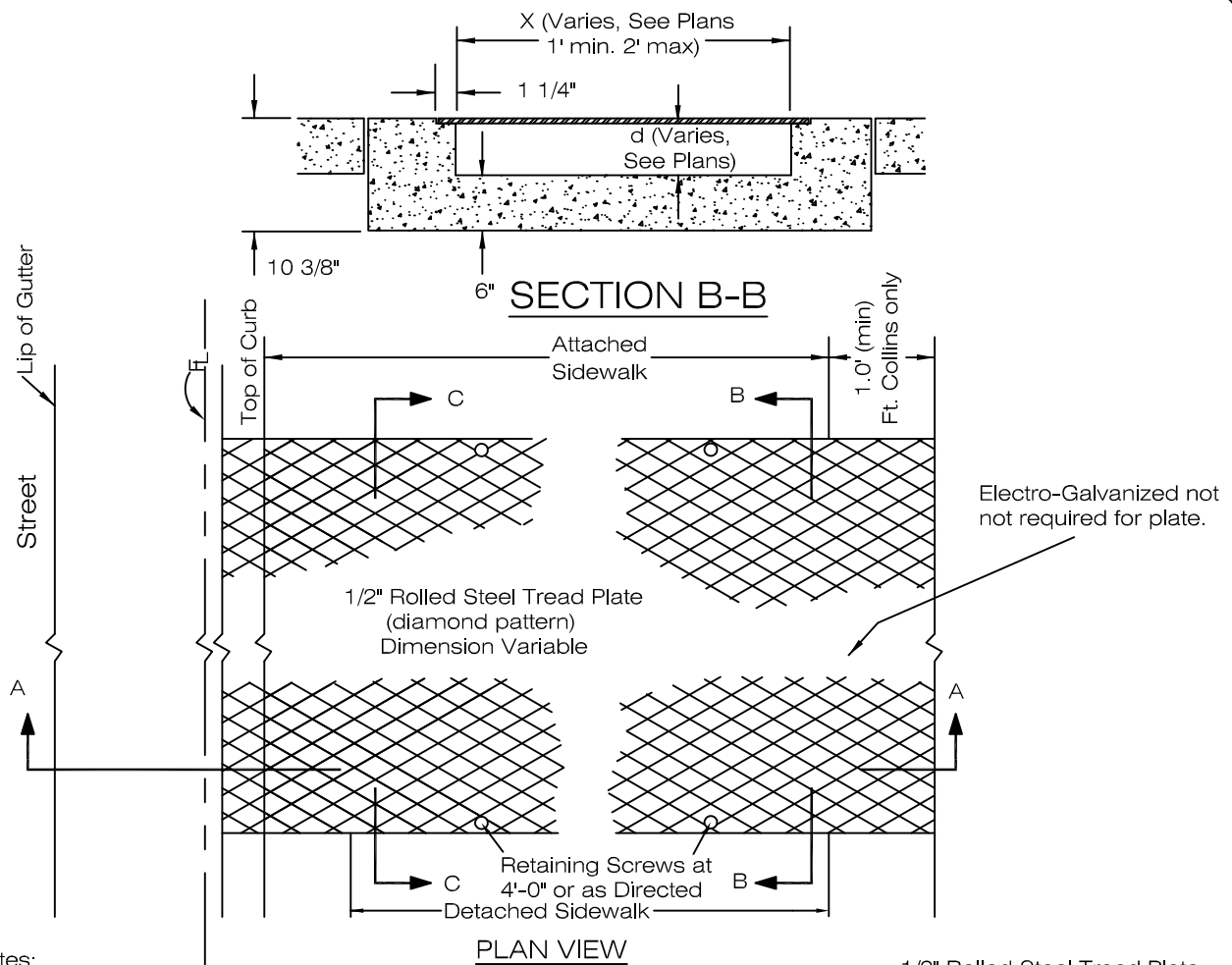
DRAWING
708



NOTE: ALL INTERSECTIONS TO HAVE ACCESS RAMPS

PARALLEL STREET CLASSIFICATION	W CROSS PAN WIDTH	LOVELAND DEPTH OF INVERT		FT. COLLINS DEPTH OF INVERT
		d (MIN.)	d (MAX.)	
Arterial	10'	1 1/4"	2 1/2"	1 1/2"
Collector	8'	1"	2"	1 1/8"
Local	6' **	3/4"	1 1/2"	7/8"

** 8' MIN. WIDTH WHERE CROSSING A COLLECTOR ROADWAY.

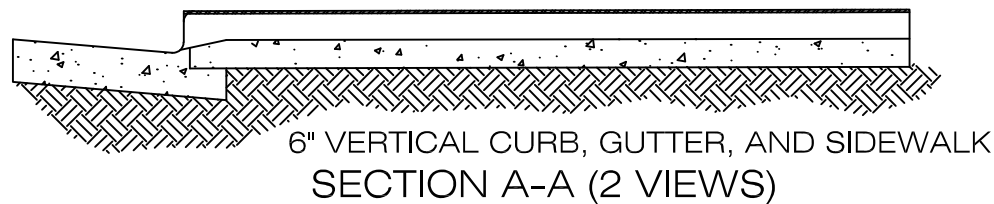
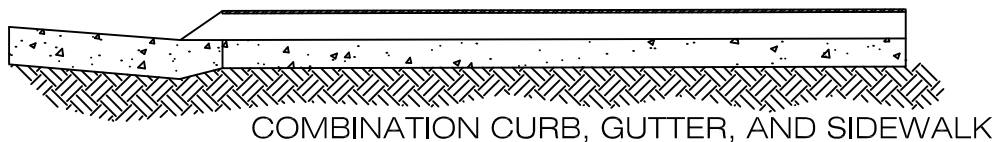
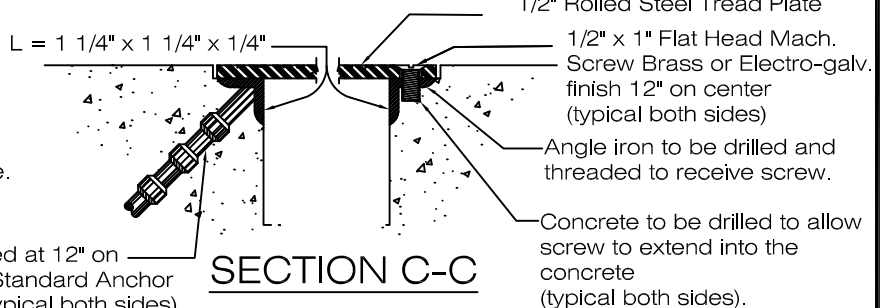


Notes:

1. Length of steel plate varies.
2. Chase and cover plate run from Right of Way line to flow line unless approved by the Engineer.
With curb walk, cover plate extends from property line to top of walk face.

3" #4 Bar Welded at 12" on center, Nelson Standard Anchor or equivalent. (typical both sides)

L = 1 1/4" x 1 1/4" x 1/4"



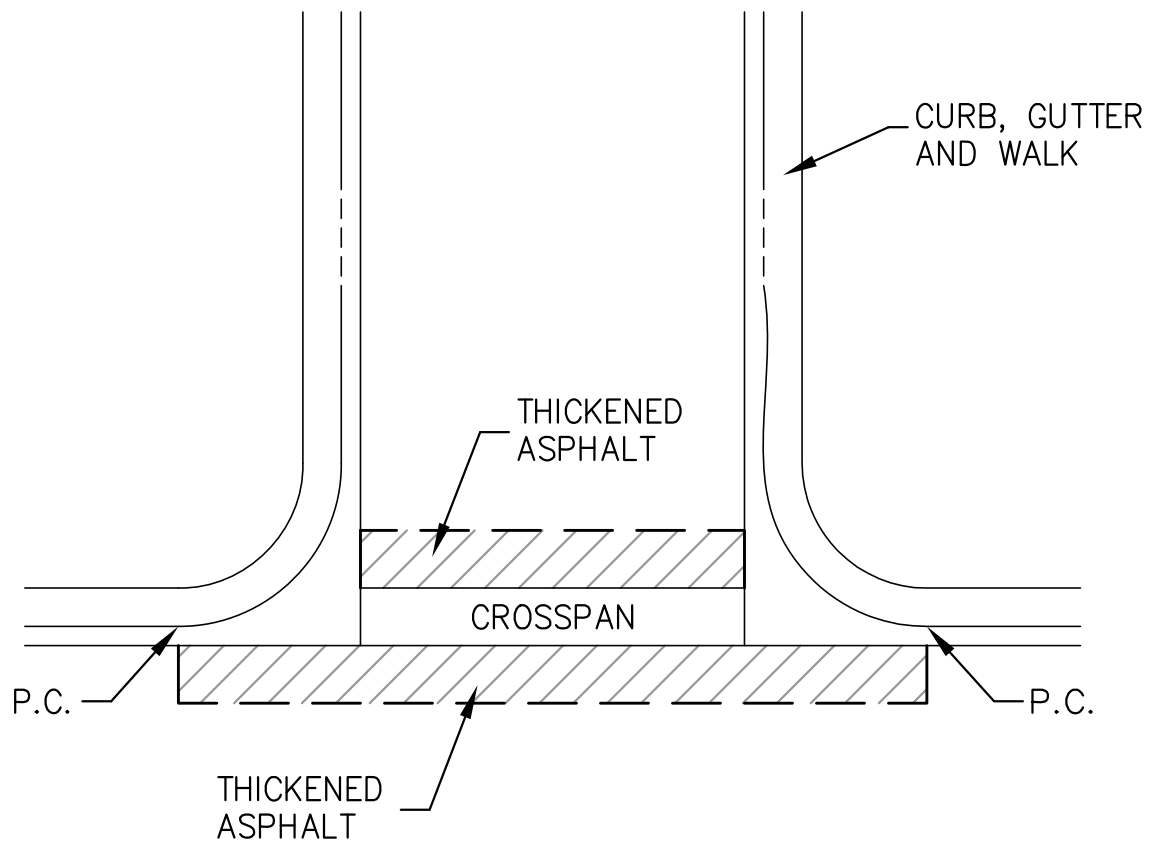
STANDARD DETAILS FOR DRAINAGE UNDER SIDEWALK

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

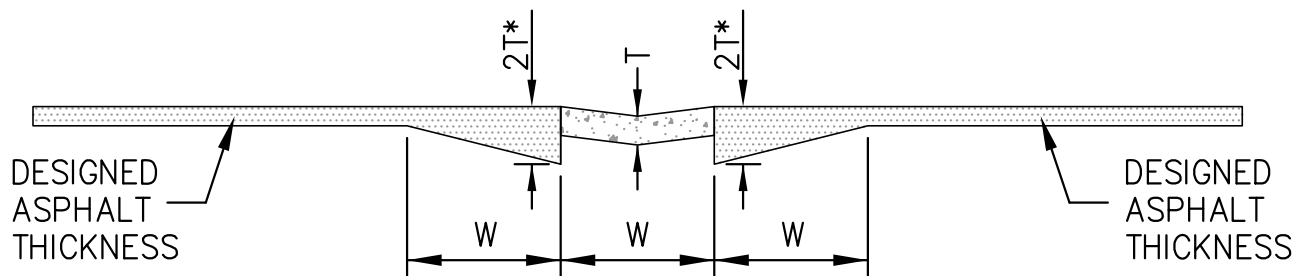
CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 08/01/21

DRAWING
709



T = THICKNESS OF CROSSSPAN
W = WIDTH OF CROSSSPAN



*—If subgrade is flyash treated, use T instead of 2T.

ASPHALT PAVING DETAIL (CROSSPAN)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 04/01/07

DRAWING
710

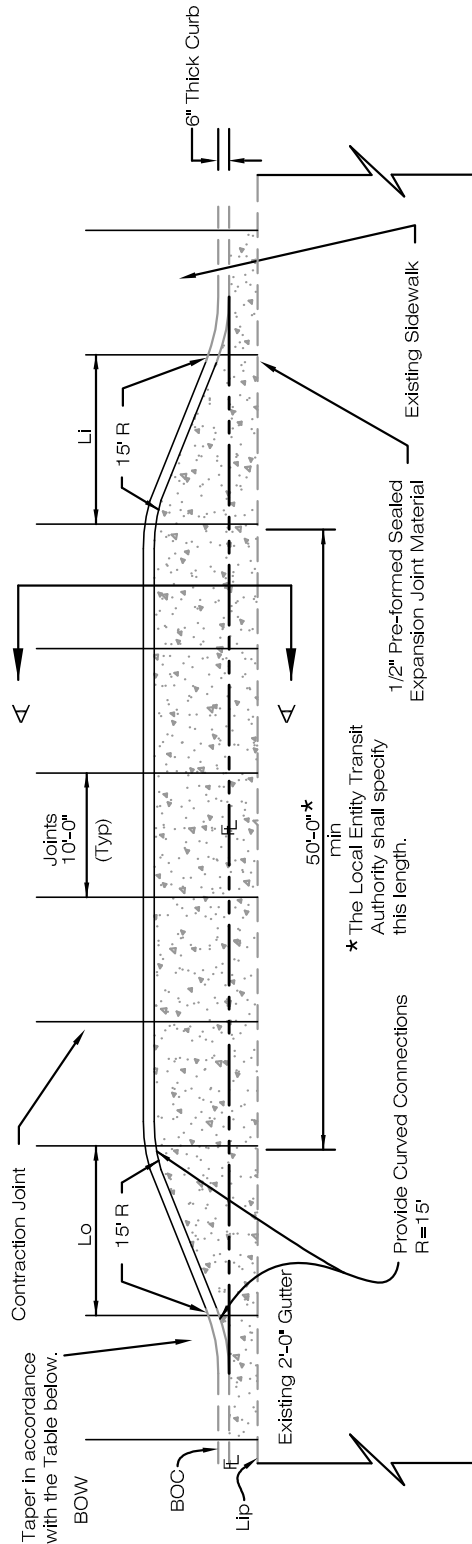
BUS BAY AND STOP STANDARD

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

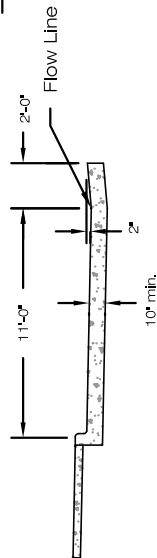
CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 04/01/07

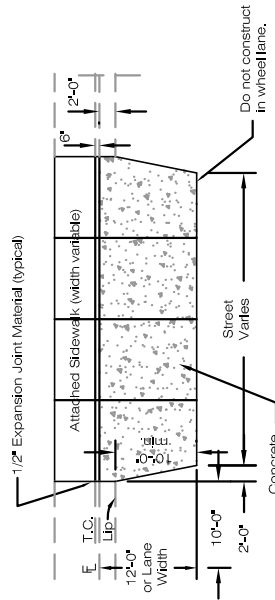
DRAWING
711



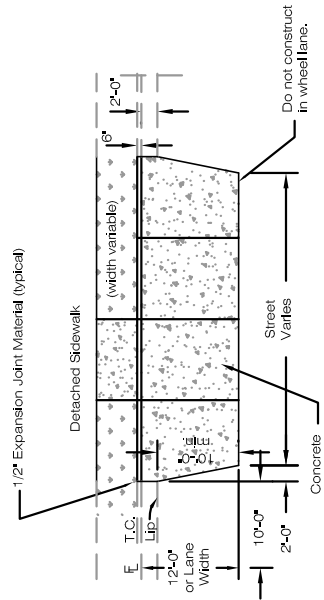
ASPHALT BUS BAY



SECTION A-A



Concrete Bus Pad - Attached



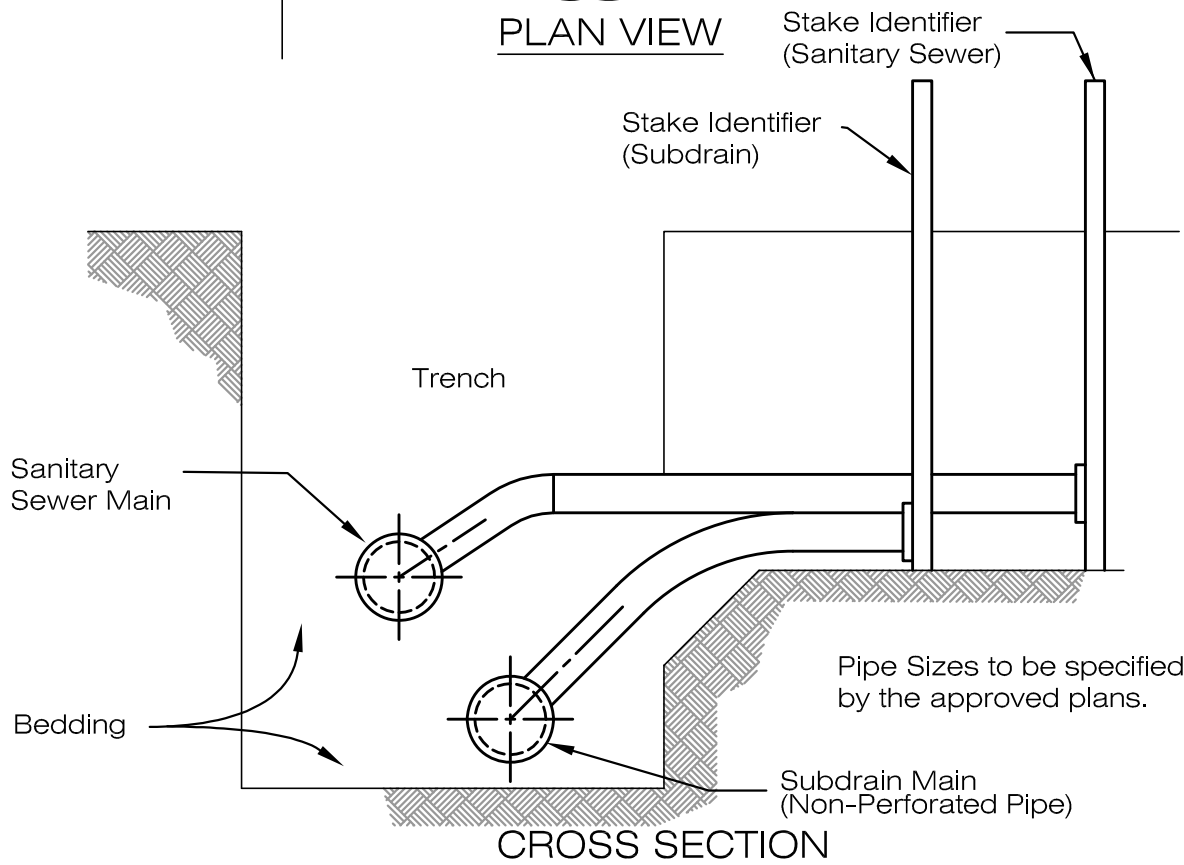
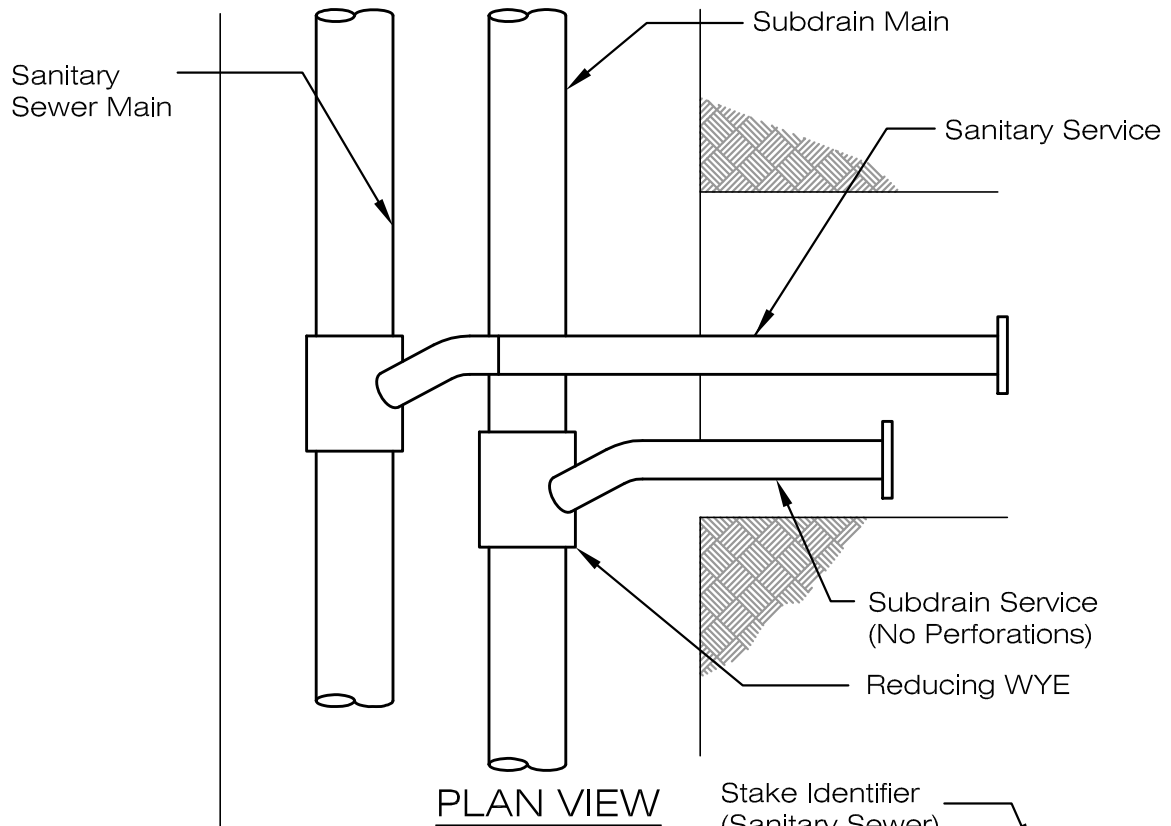
Concrete Bus Pad - Detached

BUS STOP

BUS BAY TRANSITION LENGTHS		
SPEED LIMIT	LEAD IN LENGTH (Li) (FT.)	LEAD OUT LENGTH (Lo) (FT.)
<35	60	60
40	100	70
45	150	80
50	200	90
55	250	100

- NOTE:
- Length of bus pad varies as directed by the Local Entity.
 - All pads shall be a minimum of 10" thick concrete.

FORT COLLINS ONLY



SUBDRAIN SERVICE DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

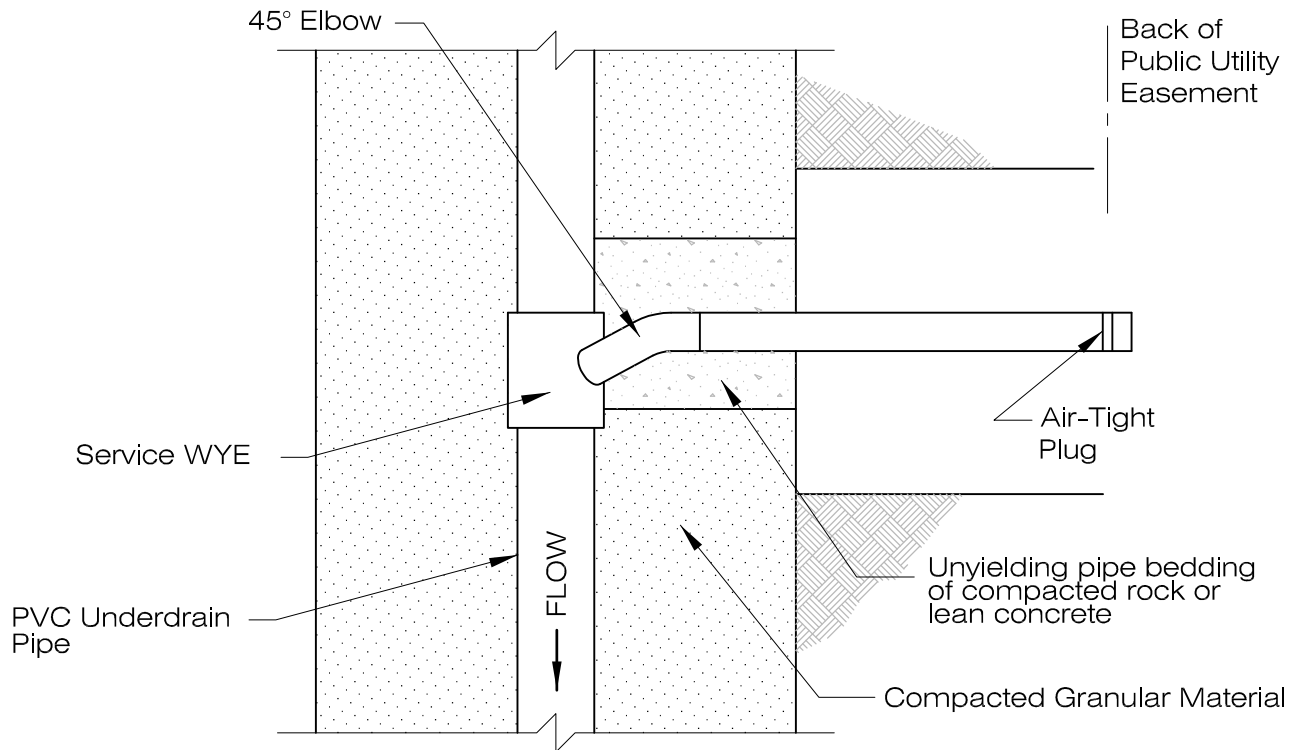
REVISION NO:

DATE: 04/01/07

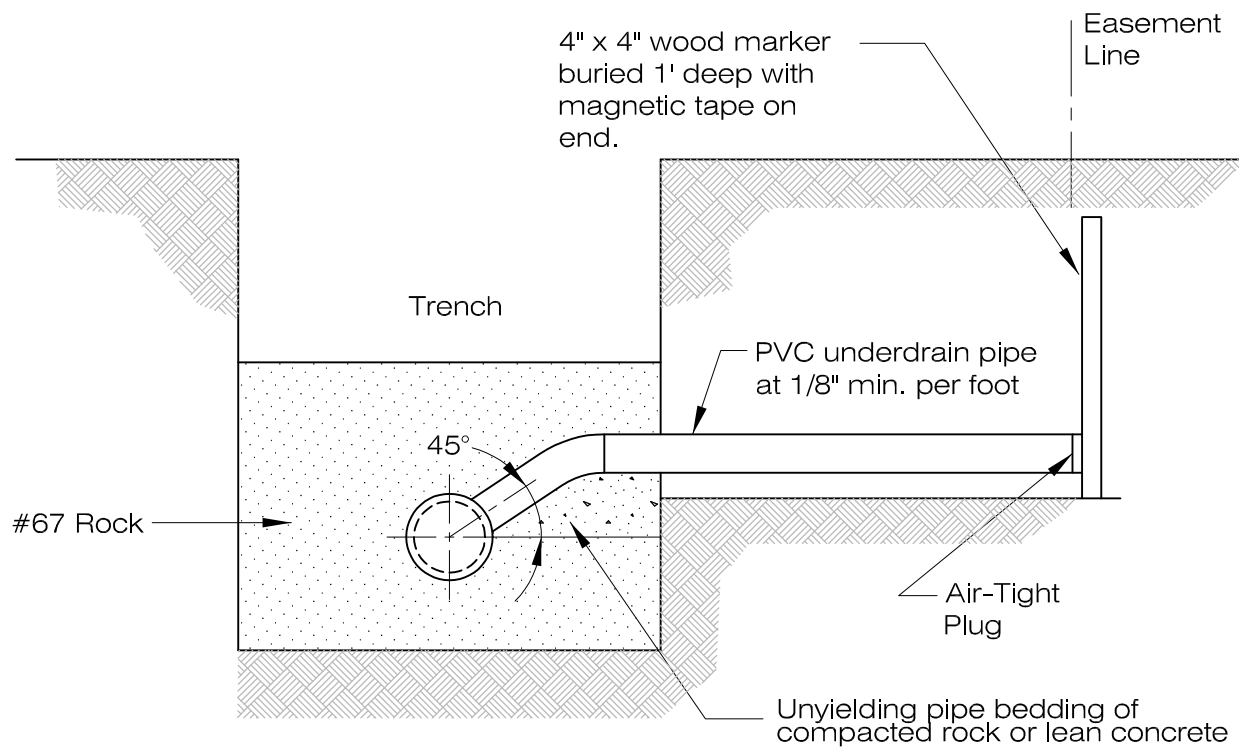
DRAWING

713.1F

LOVELAND ONLY



PLAN VIEW



CROSS SECTION

STANDARD UNDERDRAIN SERVICE CONNECTION

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

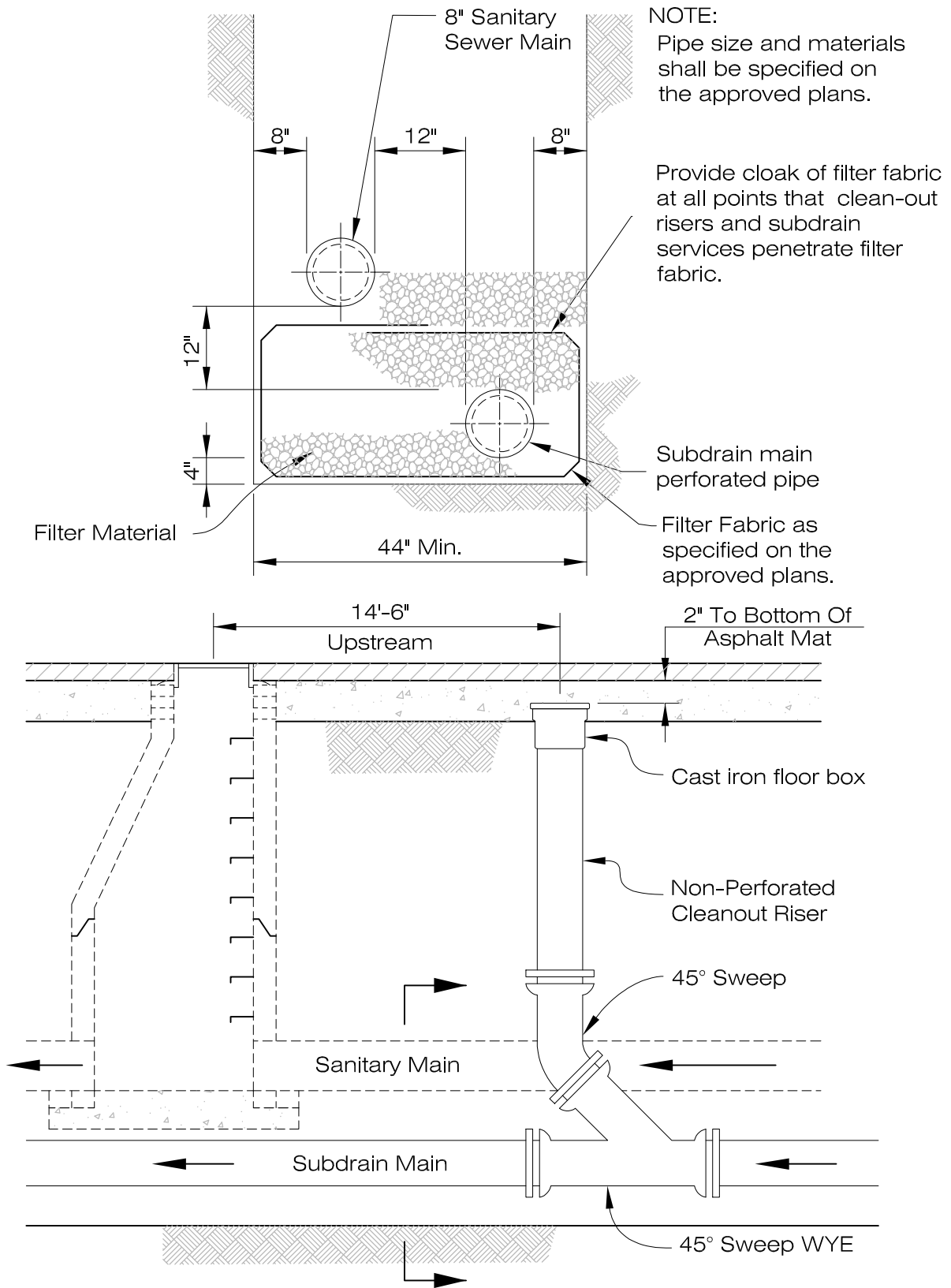
REVISION NO:

DATE: 10/25/01

DRAWING

713.1L

FORT COLLINS ONLY



SUBDRAIN MAIN - INSTALLATION DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

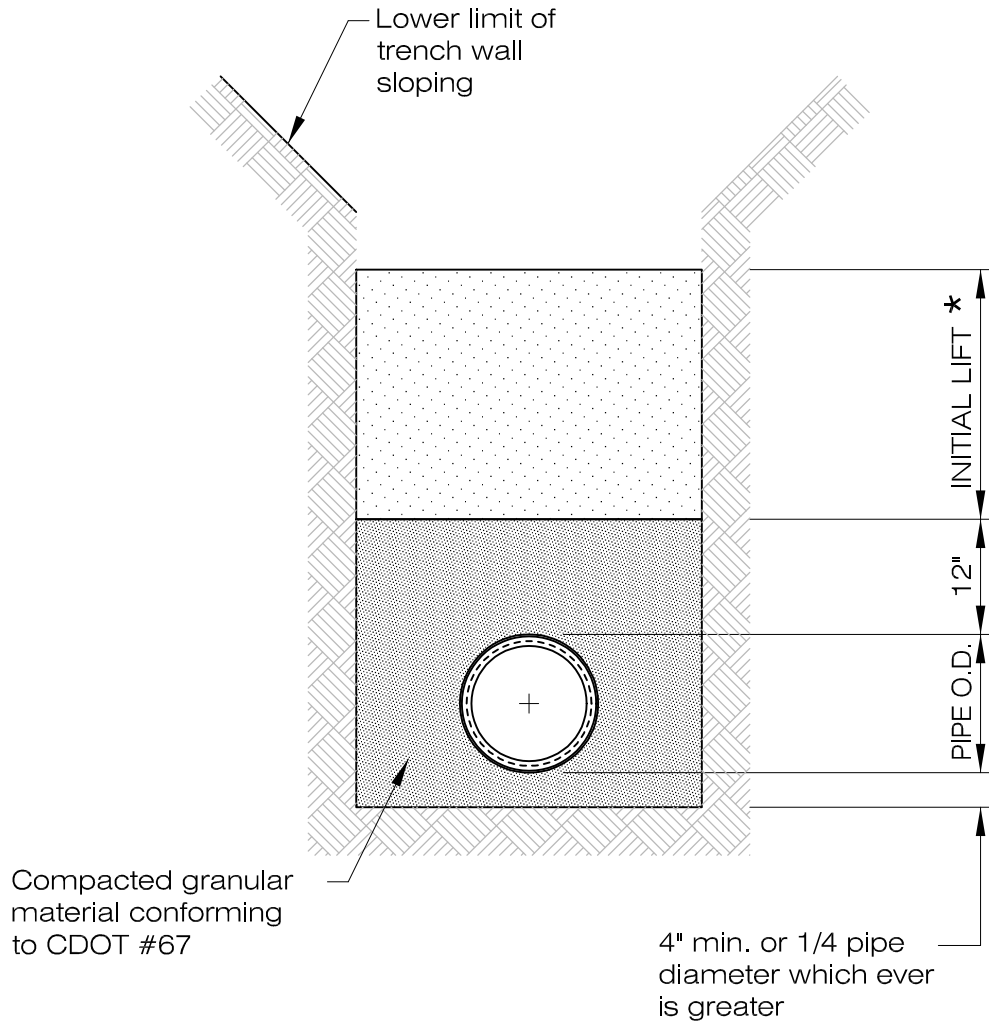
REVISION NO:

DATE: 10/25/01

DRAWING

713.2F

LOVELAND ONLY



- * Initial lift shall not exceed 3 feet in depth.

NOTE: All underdrain mains will be pressure tested and video taped by contractor.

UNDERDRAIN MAIN – BEDDING REQUIREMENTS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWING

REVISION NO:

DATE: 10/25/01

DRAWING

713.2L

STANDARD DETAILS FOR RAISED MEDIAN GEOMETRY

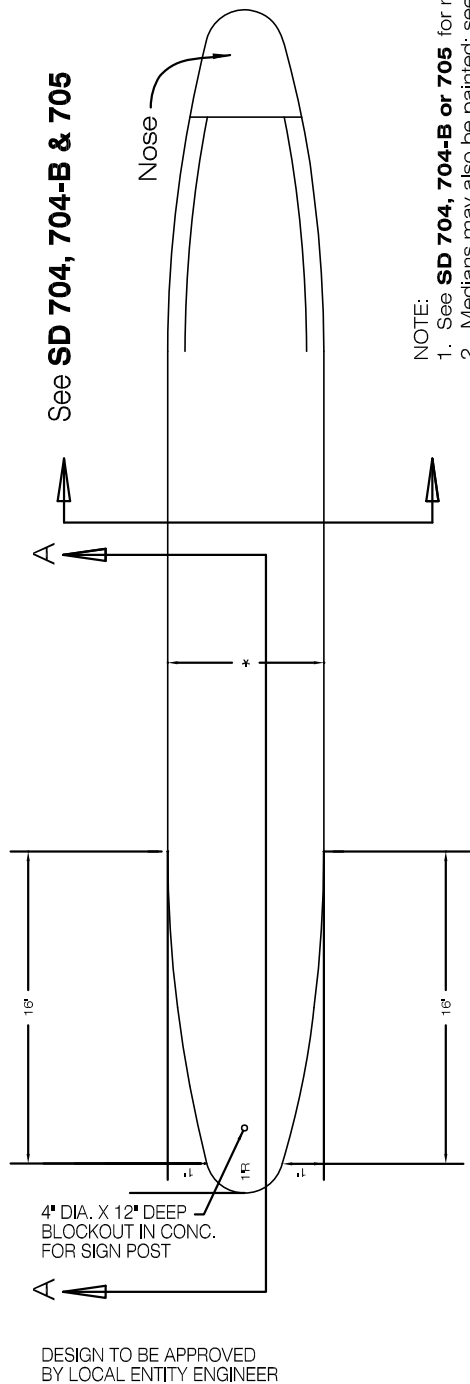
LARIMER COUNTY URBAN AREA STREET STANDARDS

CONSTRUCTION DRAWING

REVISION NO: 1

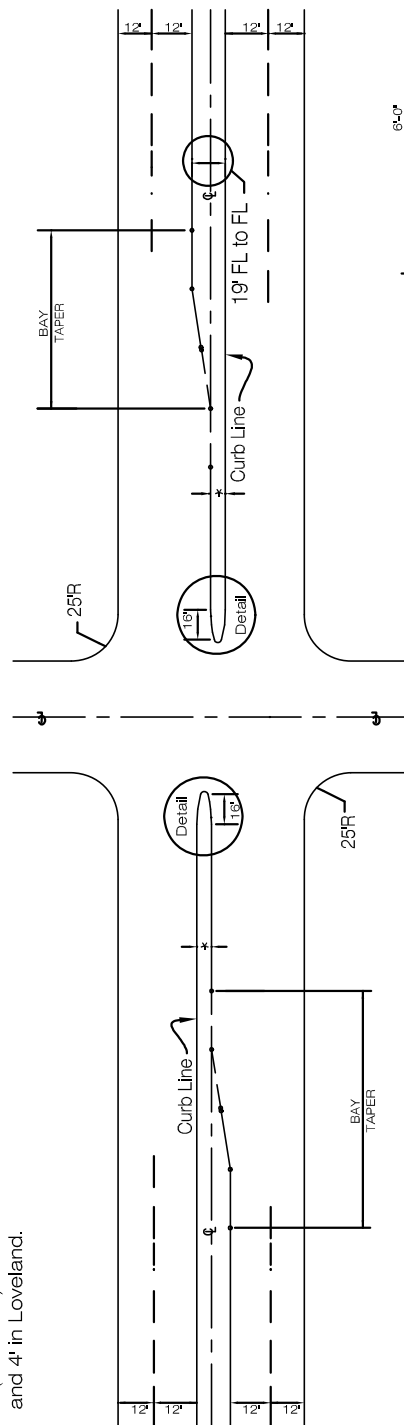
DATE: 04/01/07

DRAWING
801



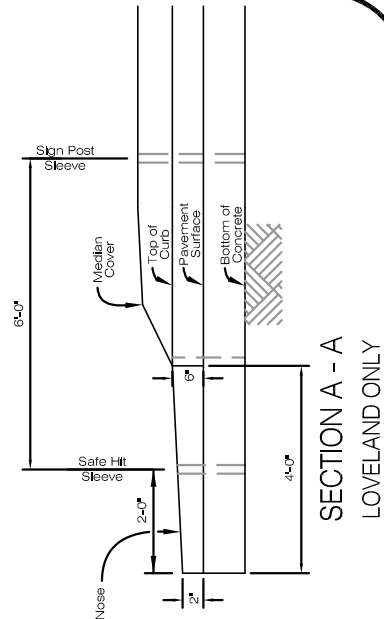
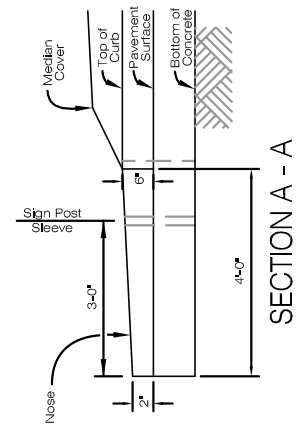
NOTE:

1. See **SD 704, 704-B or 705** for more details.
2. Medians may also be painted; see **Chapter 7**.

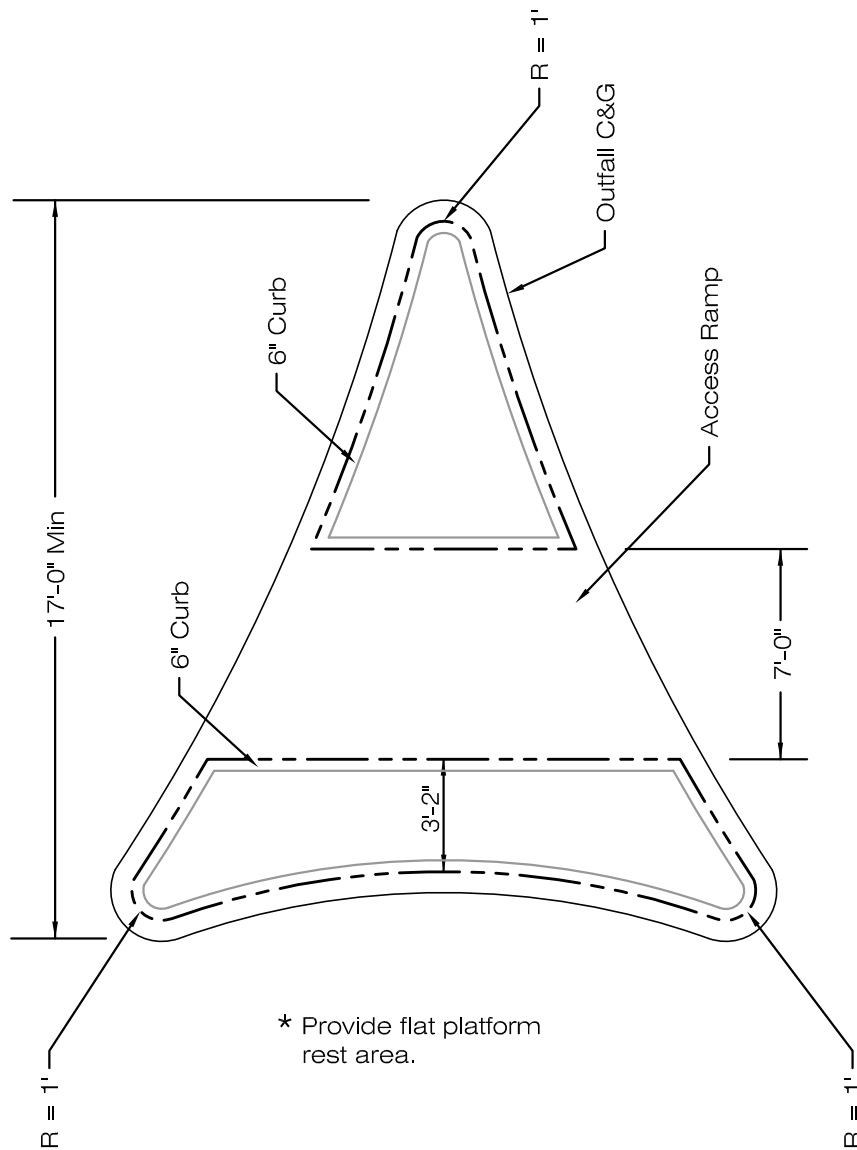


Cross Street
(typical)

PLAN

SECTION A - A
LOVELAND ONLY

SECTION A - A



FORCED TURN BARRIER (SPLITTER ISLAND)

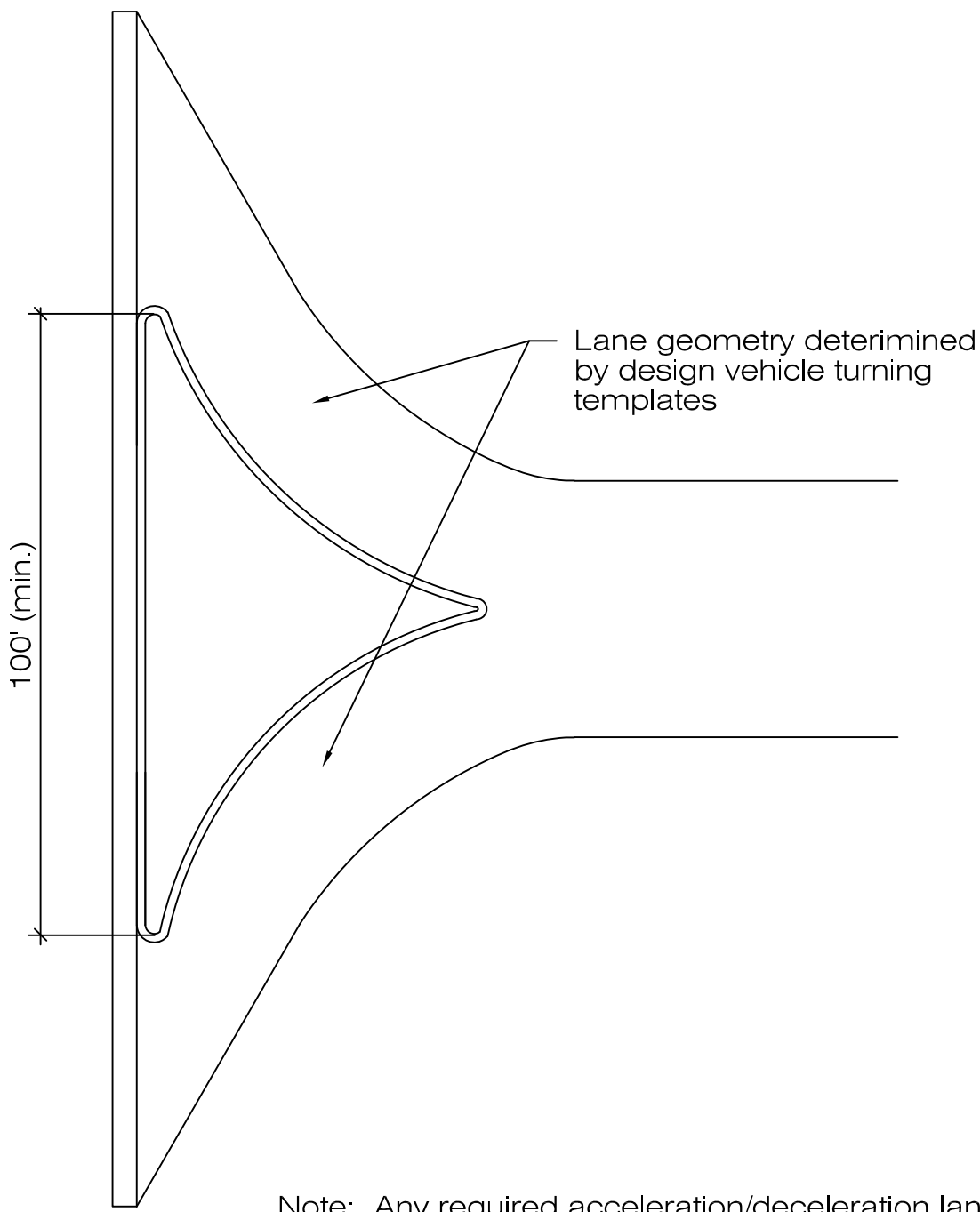
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
802

LOVELAND ONLY



Note: Any required acceleration/deceleration lanes at the access to accommodate the geometry.

Right-In Right-Out Access

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

DESIGN
FIGURE

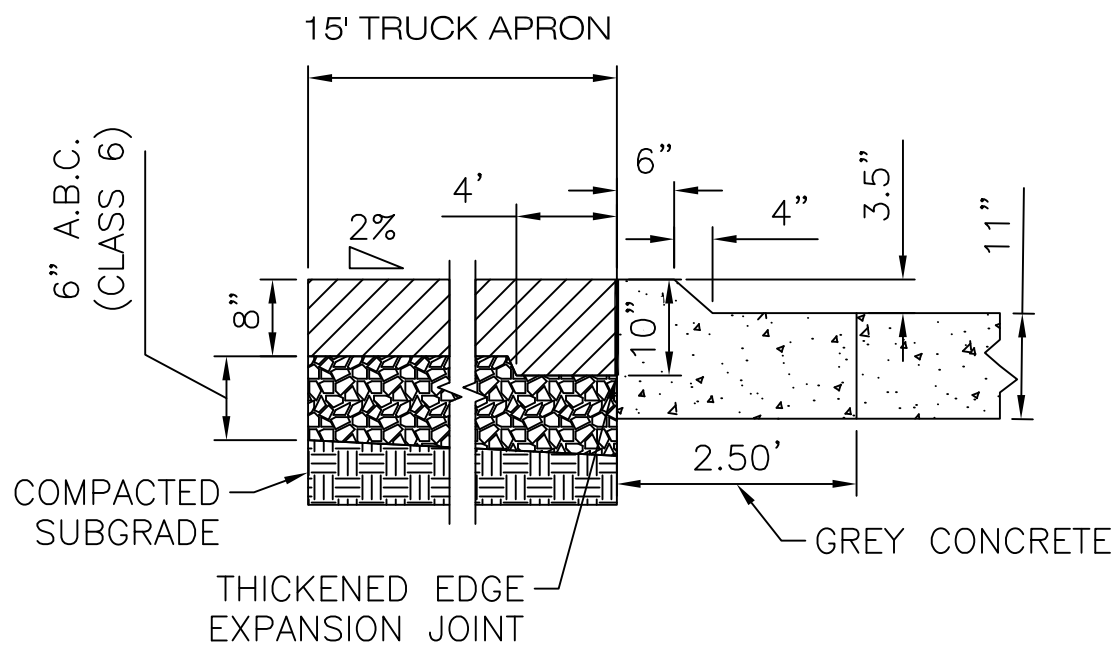
REVISION NO:

DATE: 08/01/21

DRAWING

802.1L

LOVELAND ONLY



Roundabout Truck Apron Curb

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

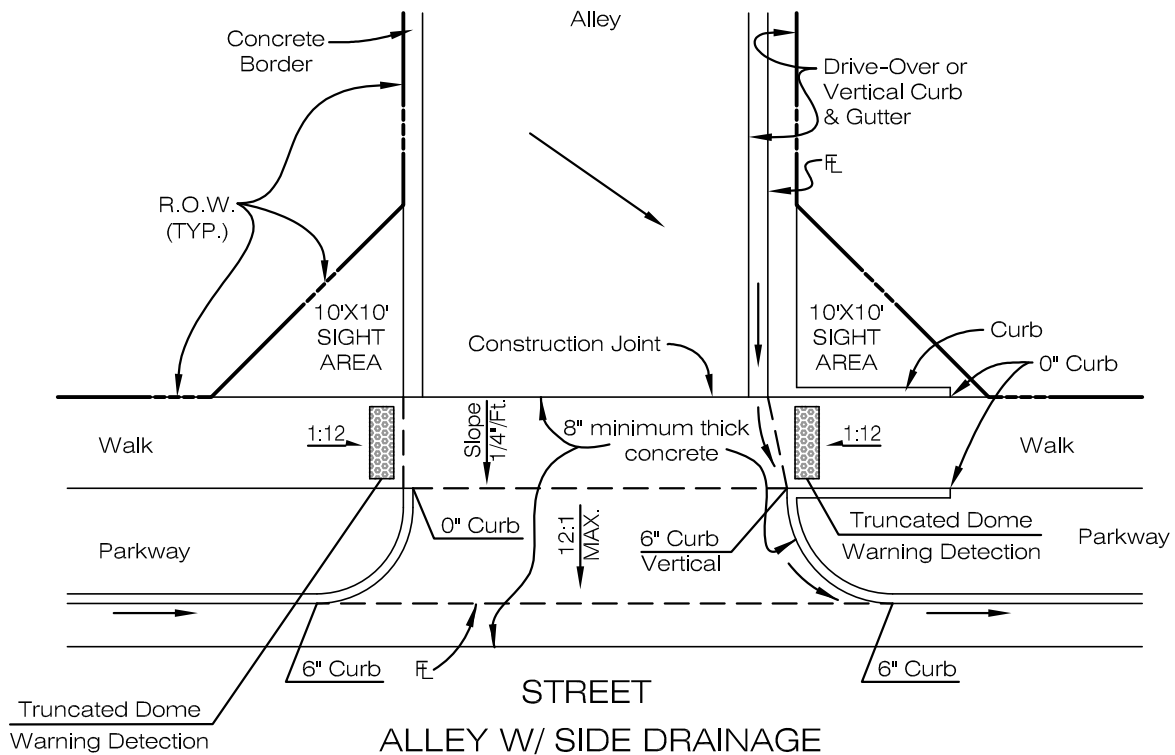
DESIGN
FIGURE

REVISION NO:

DATE: 08/01/21

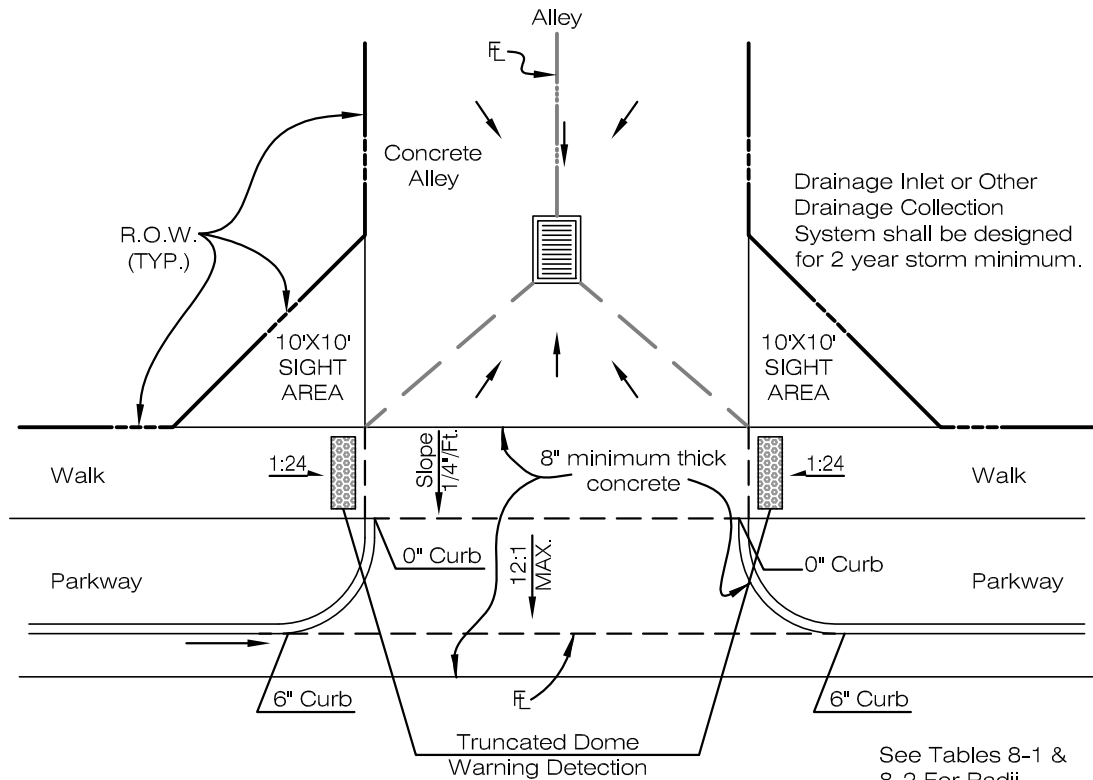
DRAWING

802.2L



ALLEY W/ SIDE DRAINAGE

Drainage May Cross the Walk Up to a Maximum of 0.5 cfs for the Design 2 Year Storm.



ALLEY W/ CENTER DRAINAGE

Drainage May Not Cross the Walk Unless The Water is Sheet Flow and does not interfere with pedestrian use of walk.

See Tables 8-1 & 8-2 For Radii Requirements

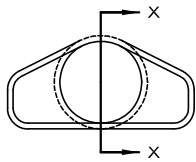
ALLEY INTERSECTIONS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

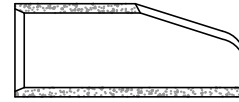
CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

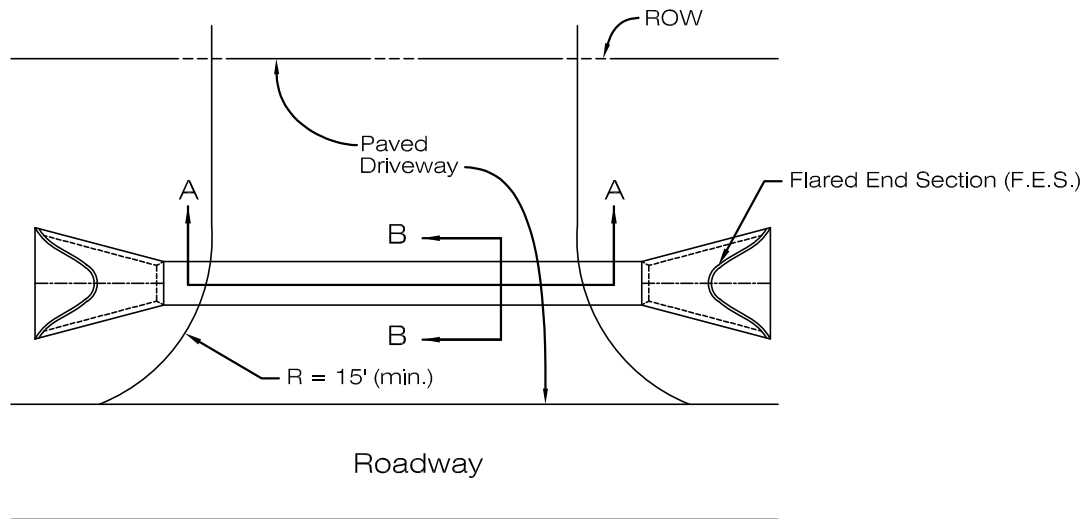
DRAWING
803



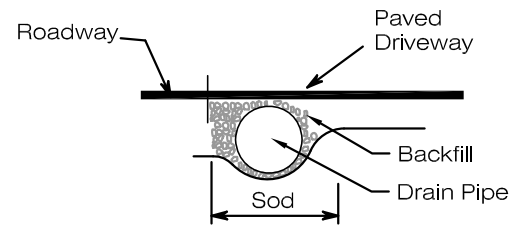
F.E.S. END VIEW



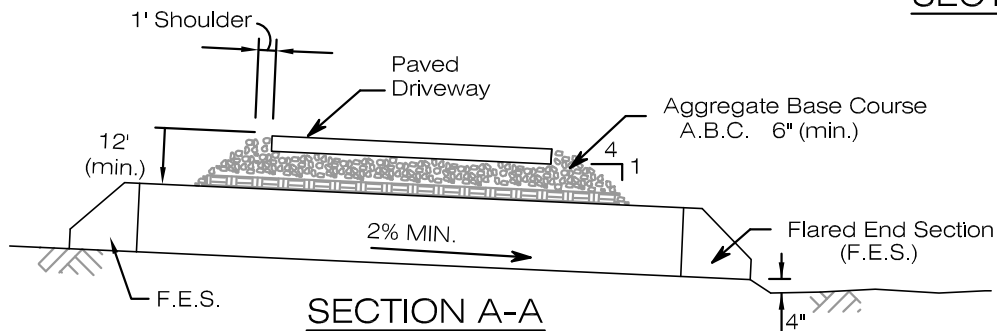
SECTION X-X



PLAN VIEW



SECTION B-B



SECTION A-A

NOTES:

1. Asphalt or concrete driveway.
2. F.E.S. required for each end of pipe. Reinforced concrete F.E.S. req'd. in Ft. Collins City Limits. Drain pipe to be 15" minimum diameter.
3. Ditch must be no more than 4:1 sideslope & sodded throughout.

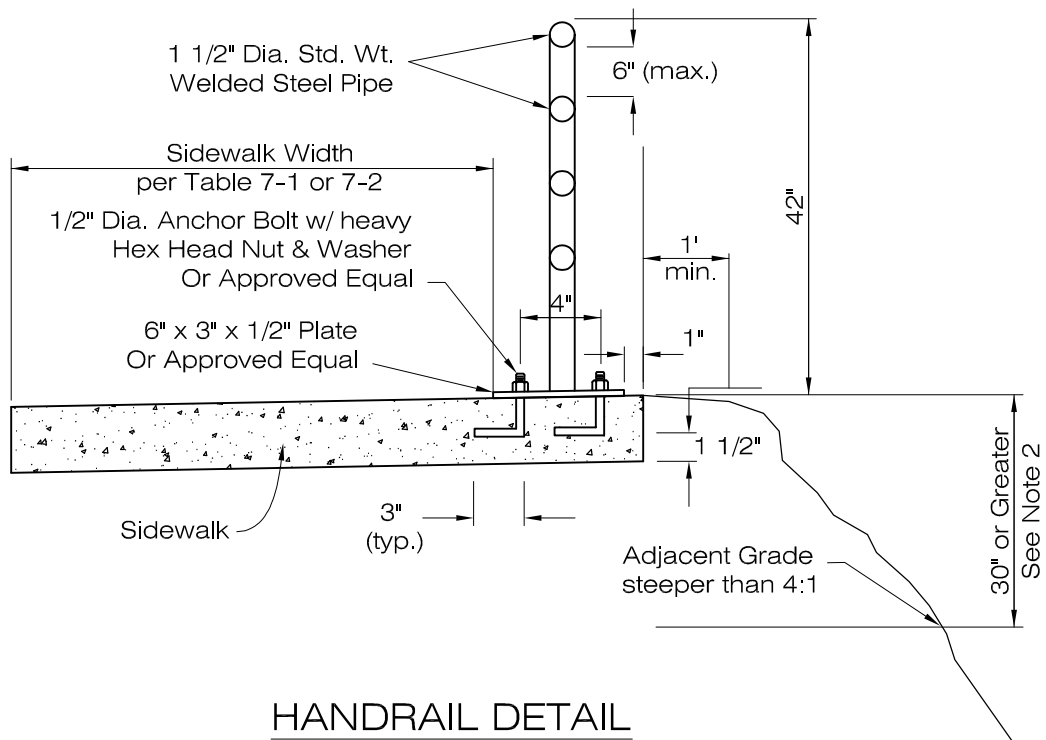
ACCESS ON RURAL ROADWAYS (W/O CURB AND GUTTER)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

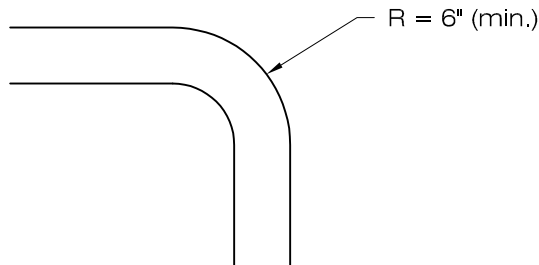
CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
901



HANDRAIL DETAIL



TOP RAIL CORNER DETAIL

NOTES:

1. The sidewalk width shall be increased by a minimum of 6" whenever handrail is used.
2. If a sidewalk is more than 30" above the adjacent grade, the handrail shall be used.
3. Open clearance between intermediate rails must be 4" or less.
4. Finish shall be either galvanized or semi-gloss enamel over a shop coat of metal primer.
5. When the slope behind the sidewalk is steeper than 4:1, the handrail must be used.
6. When slope behind sidewalk is less than or equal to 4:1 for a minimum distance of 10', a handrail is not required.

HANDRAIL DETAILS

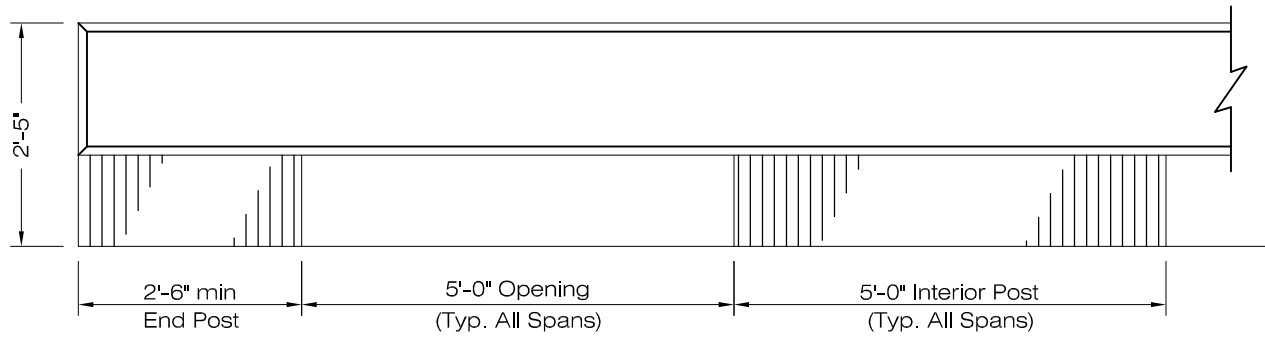
**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

**CONSTRUCTION
DRAWINGS**

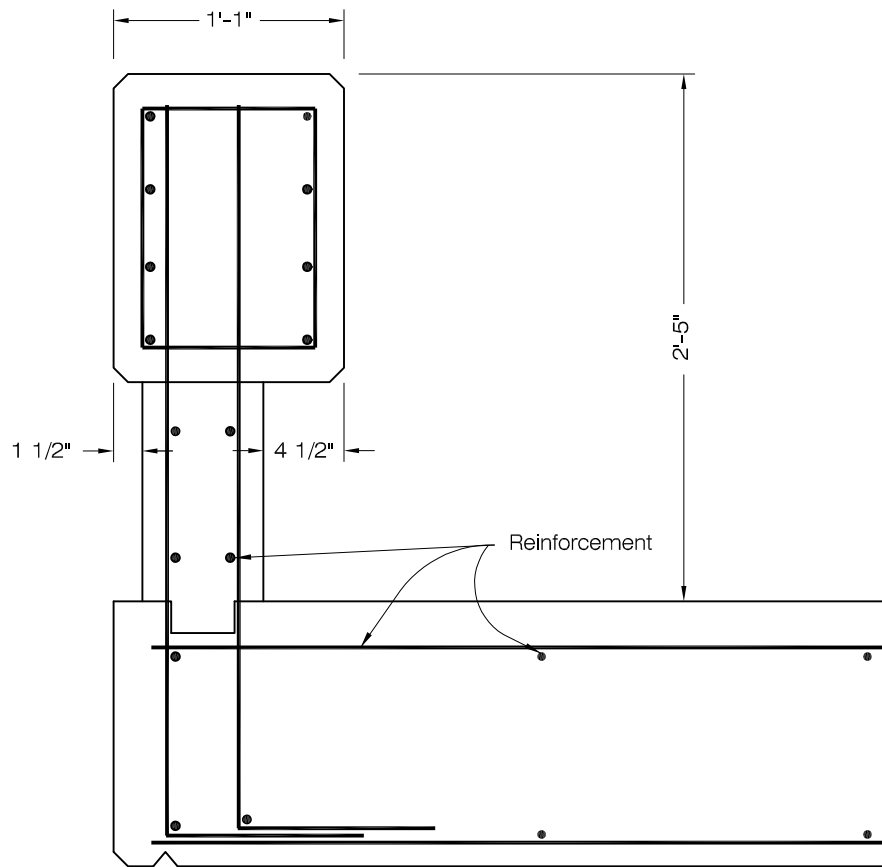
REVISION NO: 1
DATE: 03/01/02

**DRAWING
1101**

LOVELAND ONLY



Elevation of Traffic Rail



Section

Rail Height (in.)	29	
Test Vehicle (lb.)	1980# - Car	4660# - Car
Impact Speed (mph)	59	59
Impact Angle (degrees)	18.9	25.4

FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

OKLAHOMA TR-1 BRIDGE RAILING

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

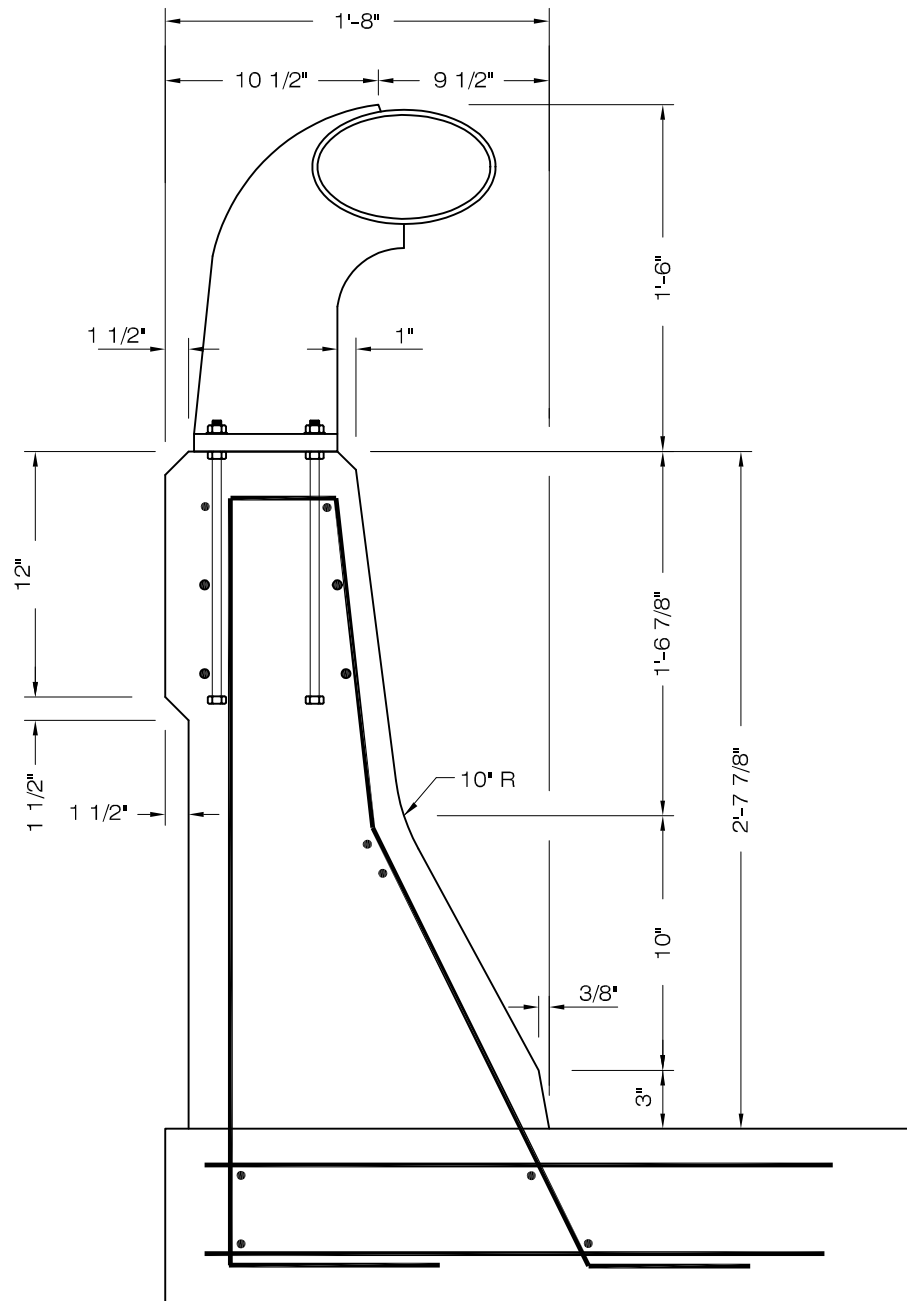
REVISION NO:

DATE: 08/07/00

DRAWING

1102L

LOVELAND ONLY



SECTION

Rail Height (in.)	50
Test Vehicle (lb.)	80,150- Truck
Impact Speed (mph)	48
Impact Angle (degrees)	14.5

FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

SAFETY-SHAPED CONCRETE BRIDGE RAILING

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

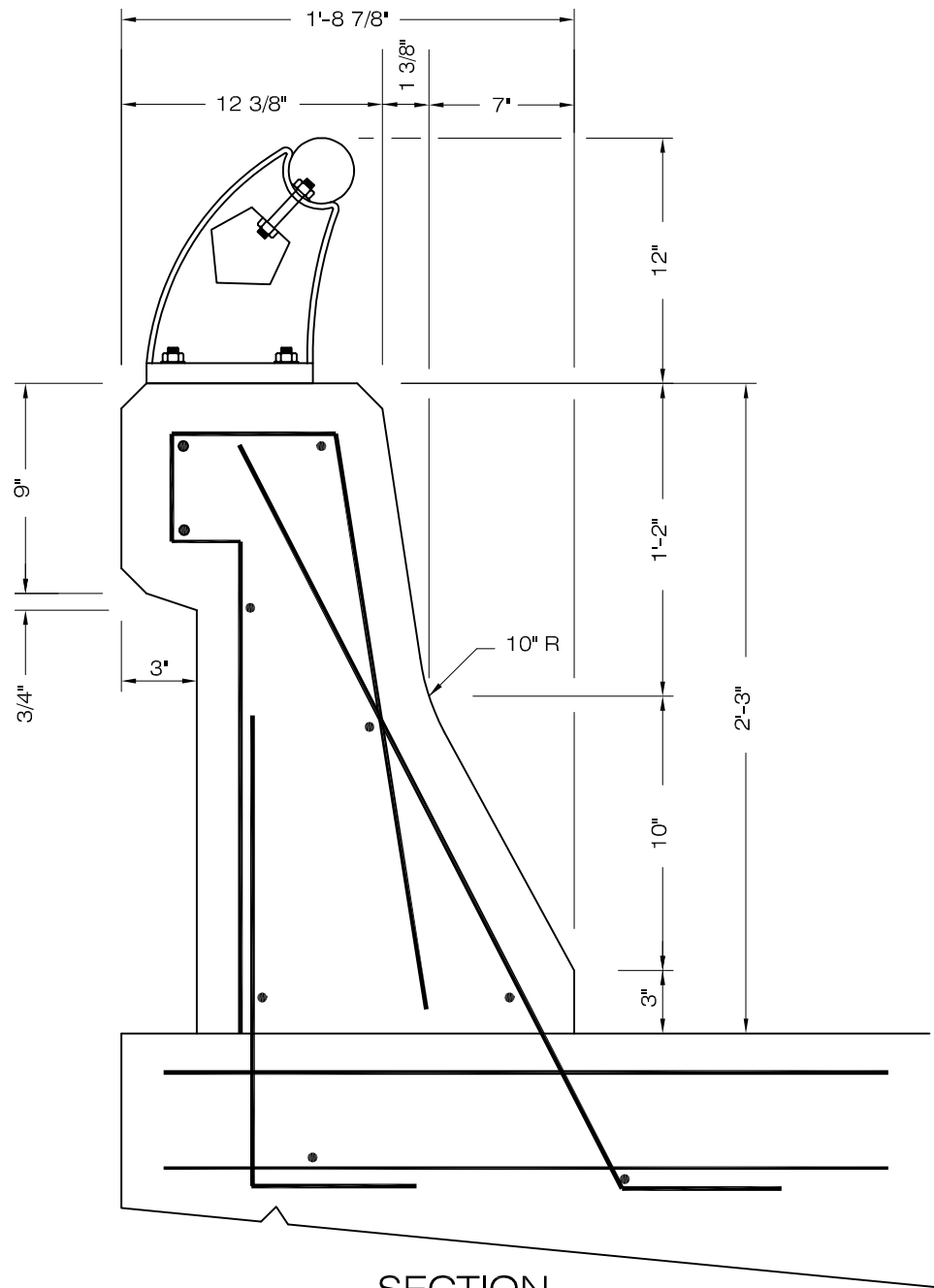
REVISION NO:

DATE: 08/07/00

DRAWING

1103L

LOVELAND ONLY



SECTION

Rail Height (in.)	39		
Test Vehicle (lb.)	1900- Car	4600- Car	40,000- Bus
Impact Speed (mph)	61	62	59
Impact Angle (degrees)	19.3	24.9	16.4

FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

NEVADA CONCRETE SAFETY SHAPE

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

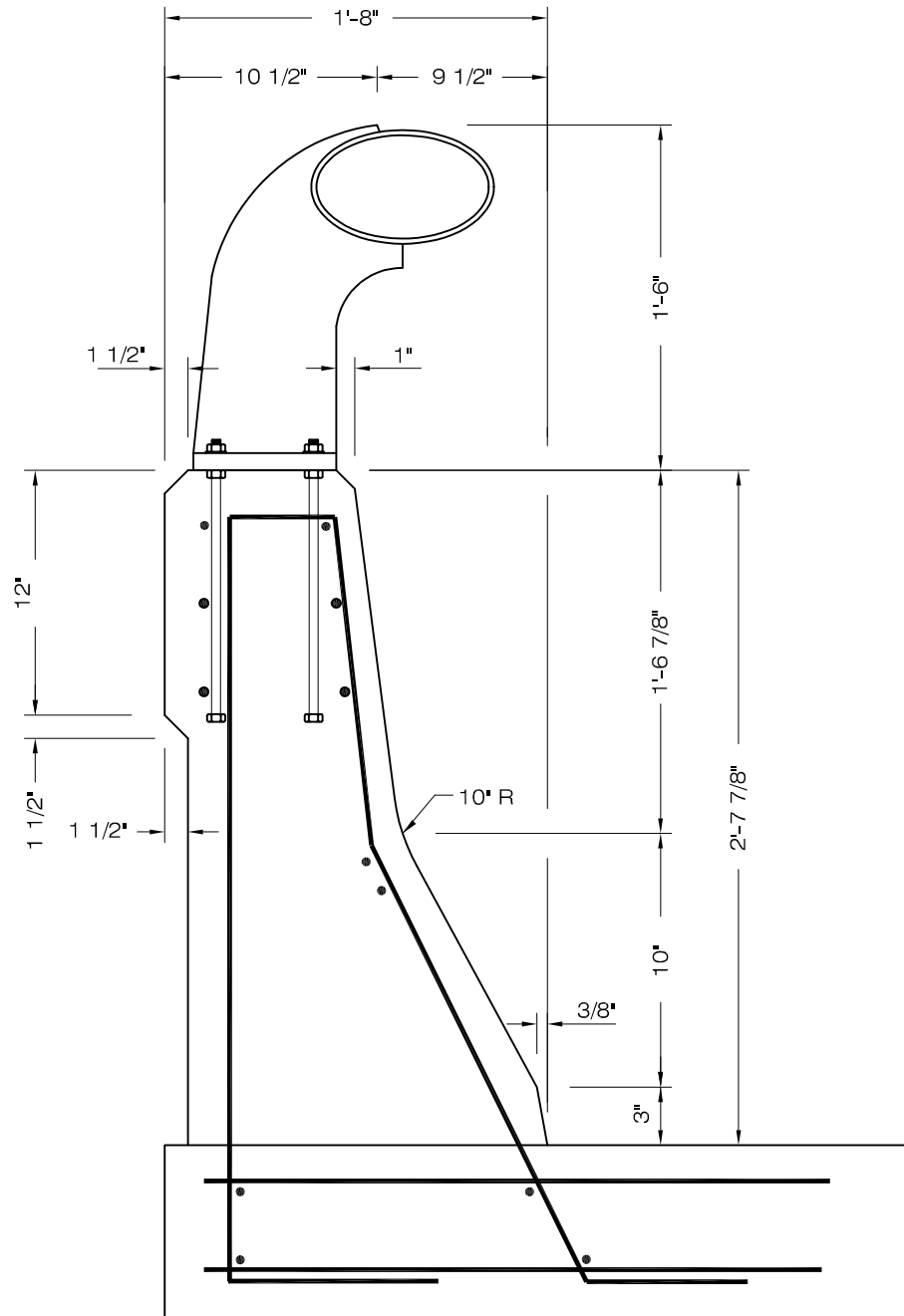
REVISION NO:

DATE: 08/07/00

DRAWING

1104L

LOVELAND ONLY



SECTION

Rail Height (in.)	50
Test Vehicle (lb.)	80,150- Truck
Impact Speed (mph)	48
Impact Angle (degrees)	14.5

FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

TEXAS TYPE HT

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

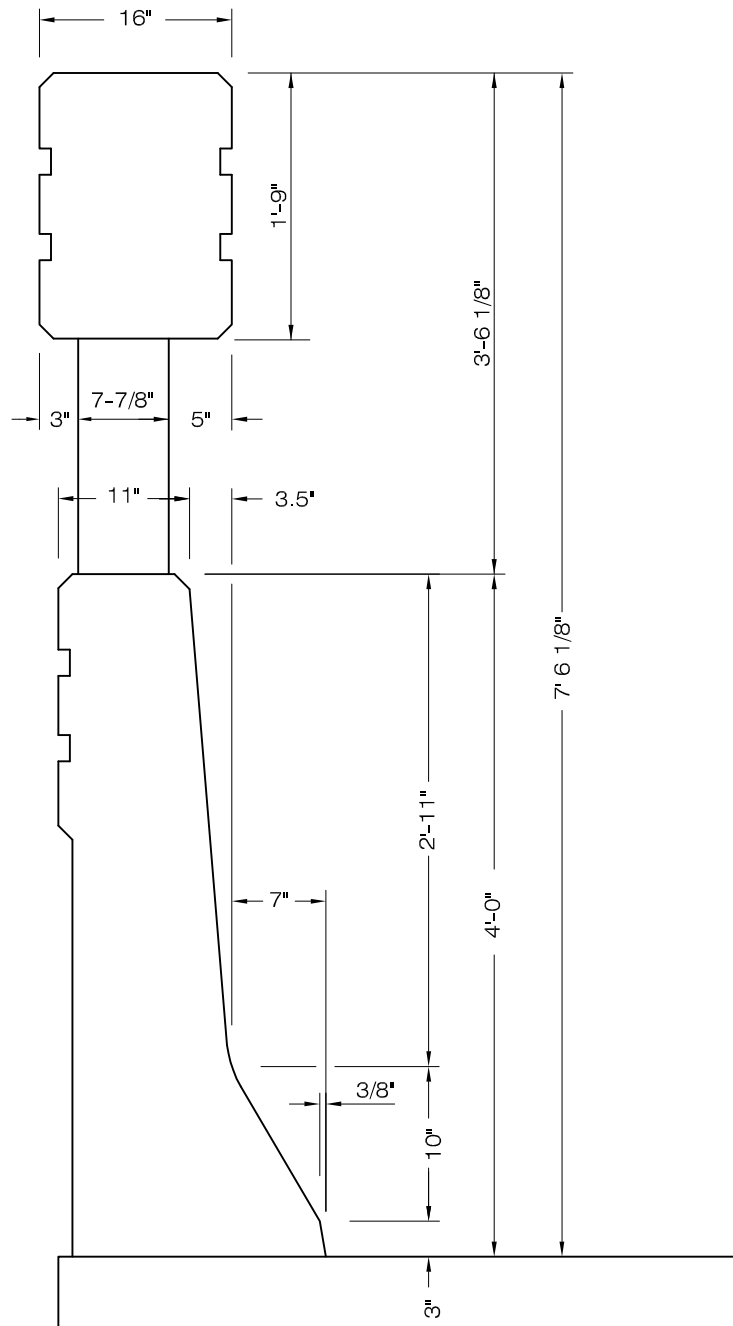
REVISION NO:

DATE: 08/07/00

DRAWING

1105L

LOVELAND ONLY



Rail Height (in.)	98
Test Vehicle (lb.)	80,190 -Tank Type Tractor-Trailer
Impact Speed (mph)	52
Impact Angle (degrees)	15.0

FROM AASHTO ROADWAY GUIDELINE

NOTE: This drawing has been converted from metric to English units.

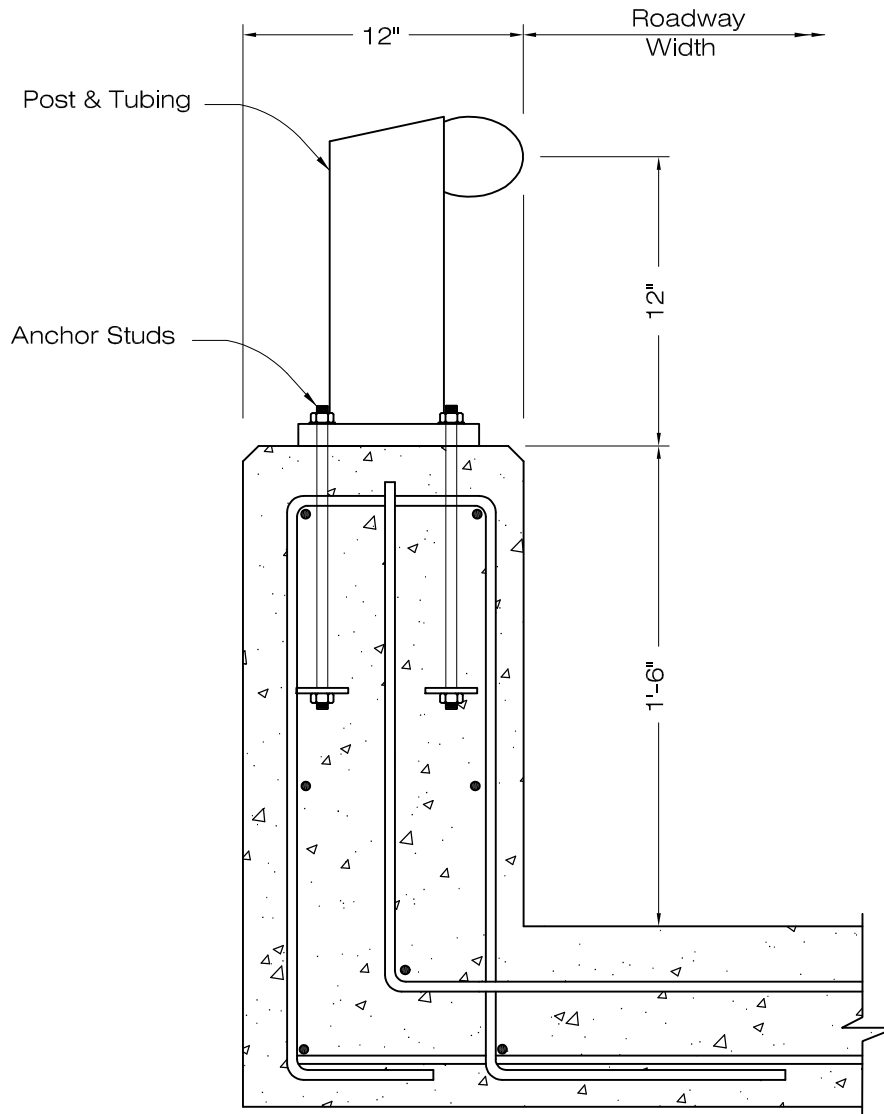
TEXAS TYPE TT

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:
DATE: 08/07/00

DRAWING
1106L



Section Through Parapet & Rail

Rail Height (in.)	32"		
Test Vehicle (lb.)	1990- Car	4660- Car	20,000- Bus
Impact Speed (mph)	60	60	57
Impact Angle (degrees)	18.8	25.0	14.8

FROM AASHTO ROADWAY GUIDELINE

TYPE C ALUMINUM BRIDGE RAILING

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/07/00

DRAWING

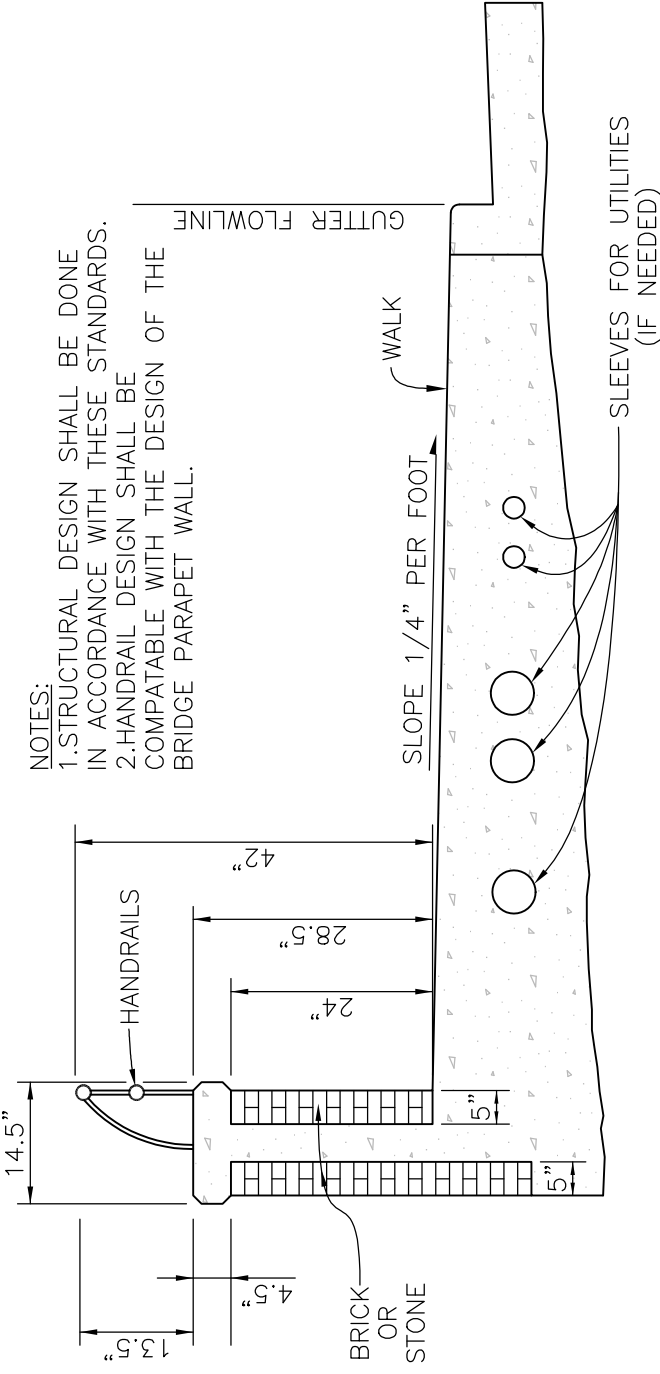
1107

FORT COLLINS ONLY

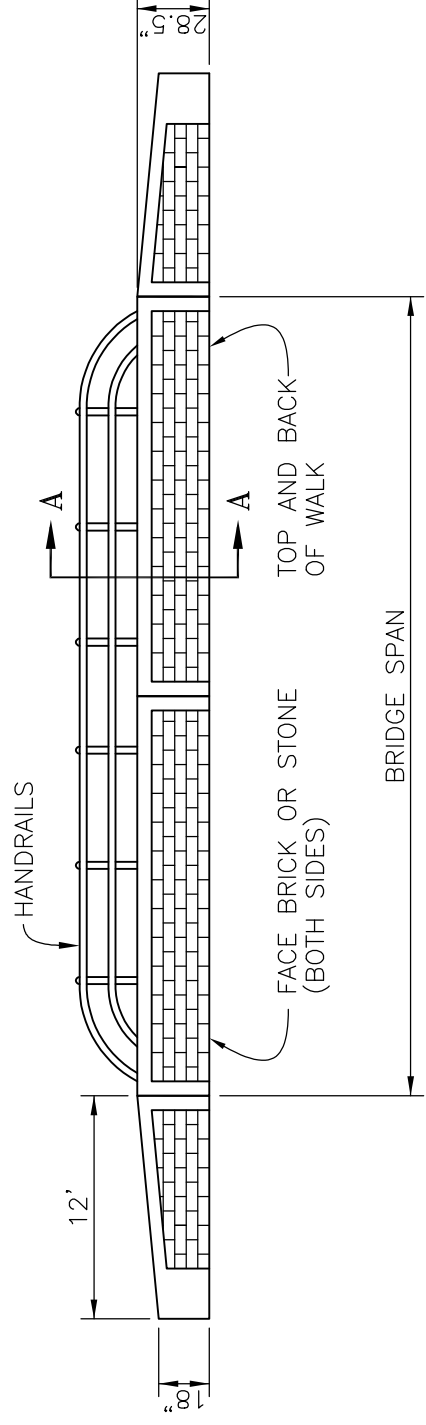
HEADWALL NOTES:

- 1. PROVIDE MASONRY TIES FOR EACH BRICK COURSE.
- 2. ALL EXPOSED CONCRETE SHALL HAVE A RUBBED FINISH.

THIS PLAN SPECIFIES APPEARANCE ONLY. THE STRUCTURE MUST BE DESIGNED TO FIT THE SPECIFIC CONDITIONS.



- NOTES:**
- 1. STRUCTURAL DESIGN SHALL BE DONE IN ACCORDANCE WITH THESE STANDARDS.
 - 2. HANDRAIL DESIGN SHALL BE COMPATIBLE WITH THE DESIGN OF THE BRIDGE PARAPET WALL.



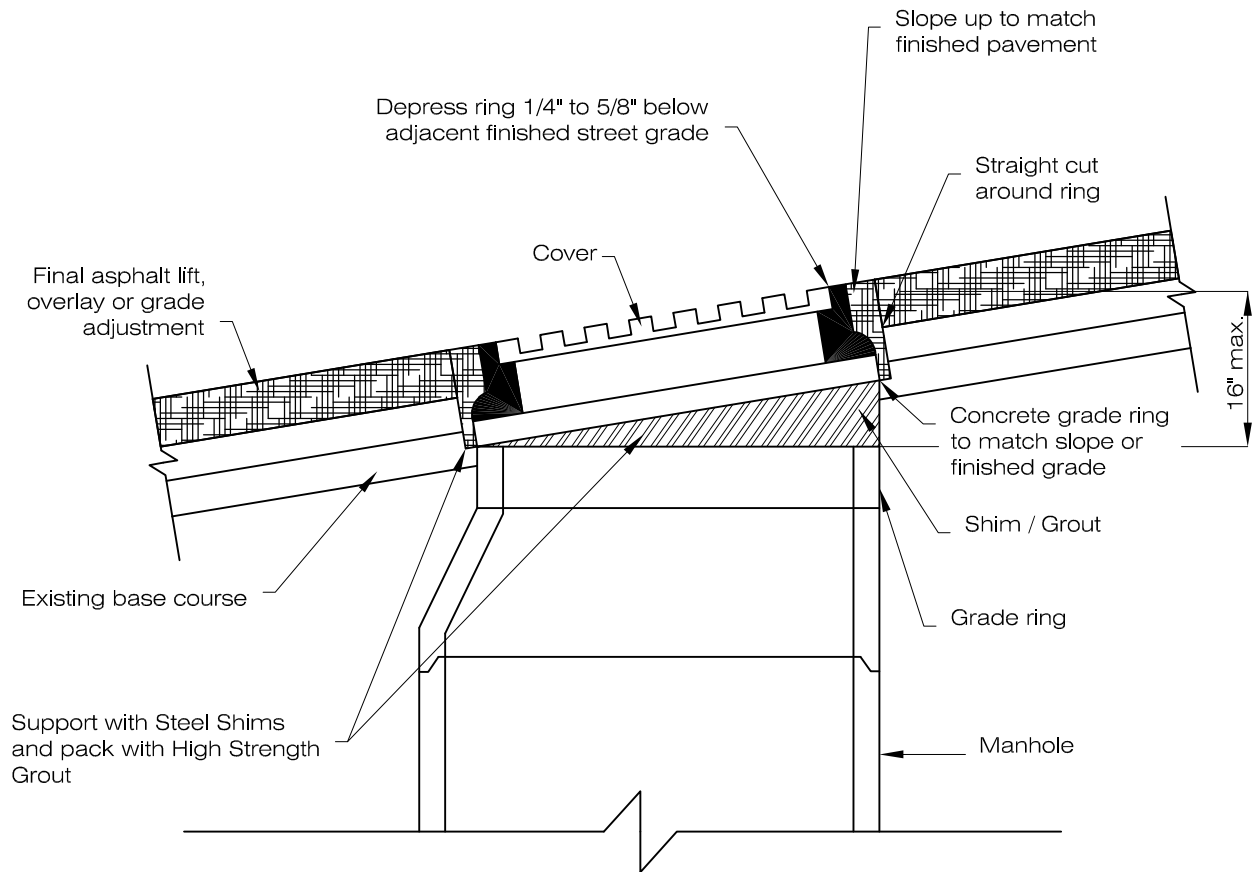
BRIDGE RAILING/PARAPET WALL CONFIGURATION DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 11/16/00

FIGURE
1108



NOTE:

1. Grout shall be a mixture of 100 lbs Grout mix, 26 lbs water (3.12 Gal), and 100 lbs of sand conforming to ASTM C-35.
2. Manholes shall not be located in crosspans, gutters, or wheel path.
3. Shim and grout to make ring and cover flush with the finished pavement surface.

STANDARD MANHOLE COVER

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

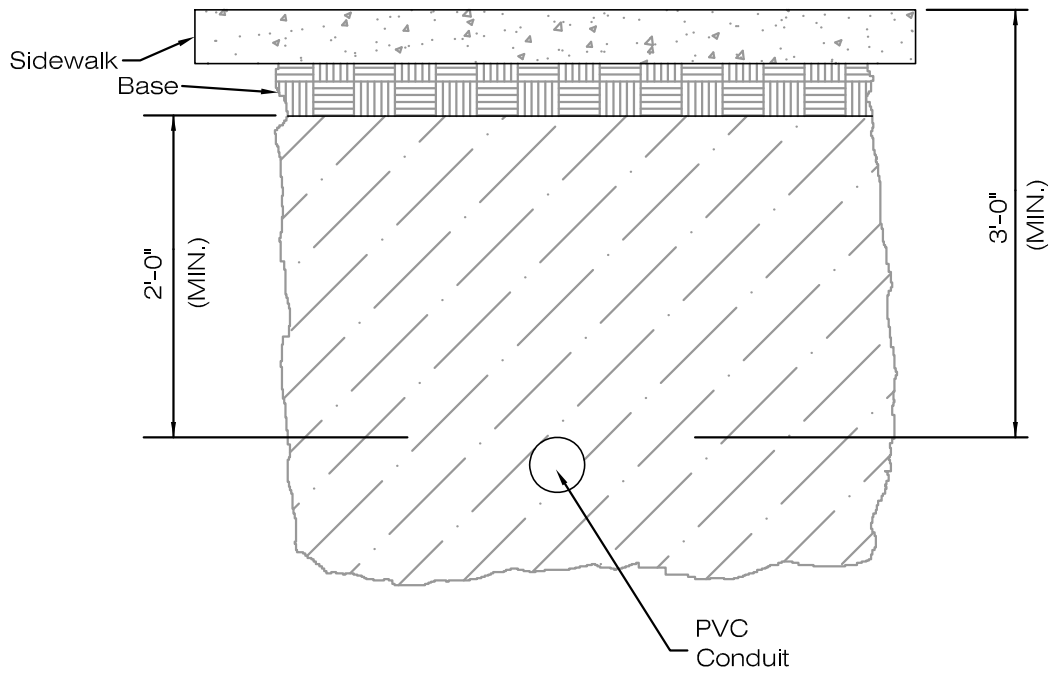
CONSTRUCTION
DRAWINGS

REVISION NO:

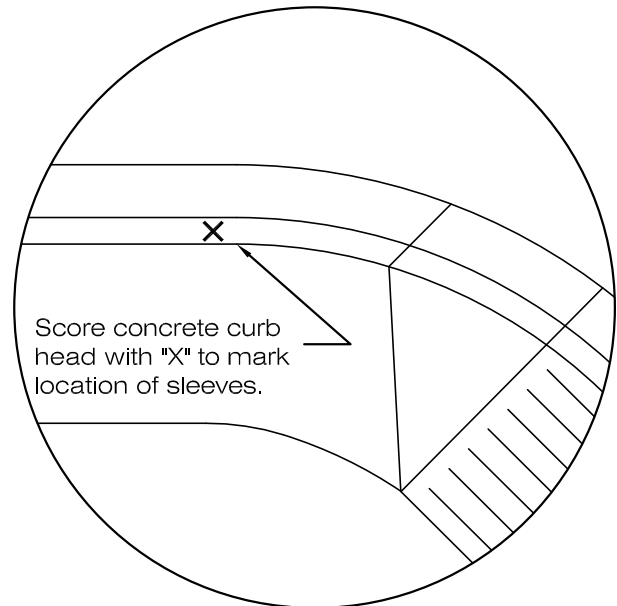
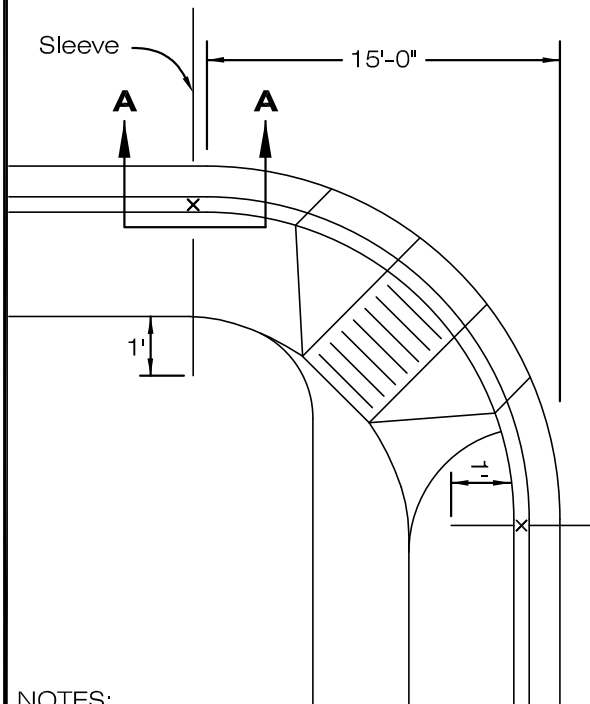
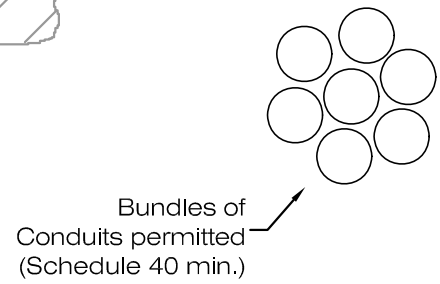
DATE: 08/07/00

DRAWING

1201



SECTION A-A



DETAIL

NOTES:

1. Match location of sleeves on curb head.
2. Depth of sleeve shall be no less than 3'-0" below street grade.
3. Bundles of sleeves are permitted.
4. Sleeves shall be installed with "Pull Wires".

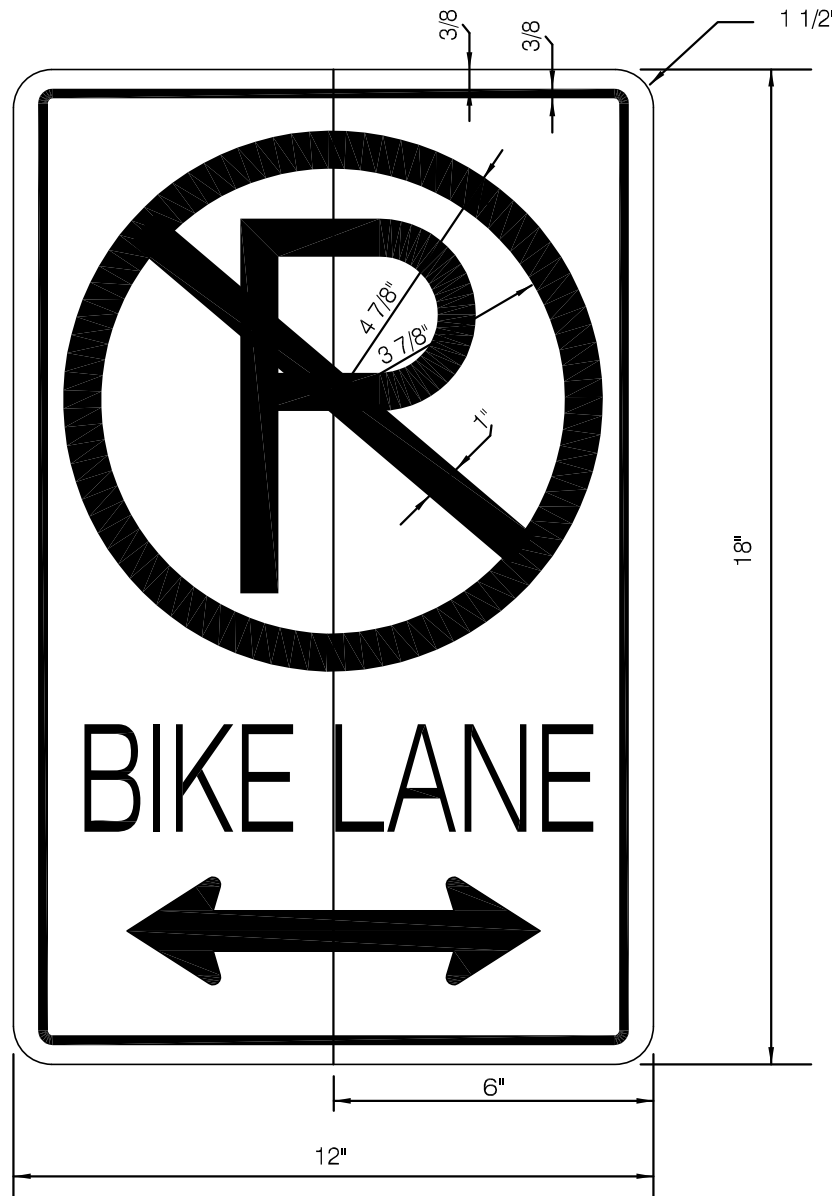
SLEEVE LOCATIONS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 04/01/07

DRAWING
1202



R7-9a

MUTCD Designation

COLOR SCHEDULE	
LEGEND, CIRCLE DIAGONAL, BORDER, "ARROW", "BIKE LANE"	RED
BACKGROUND	WHITE
"P"	BLACK

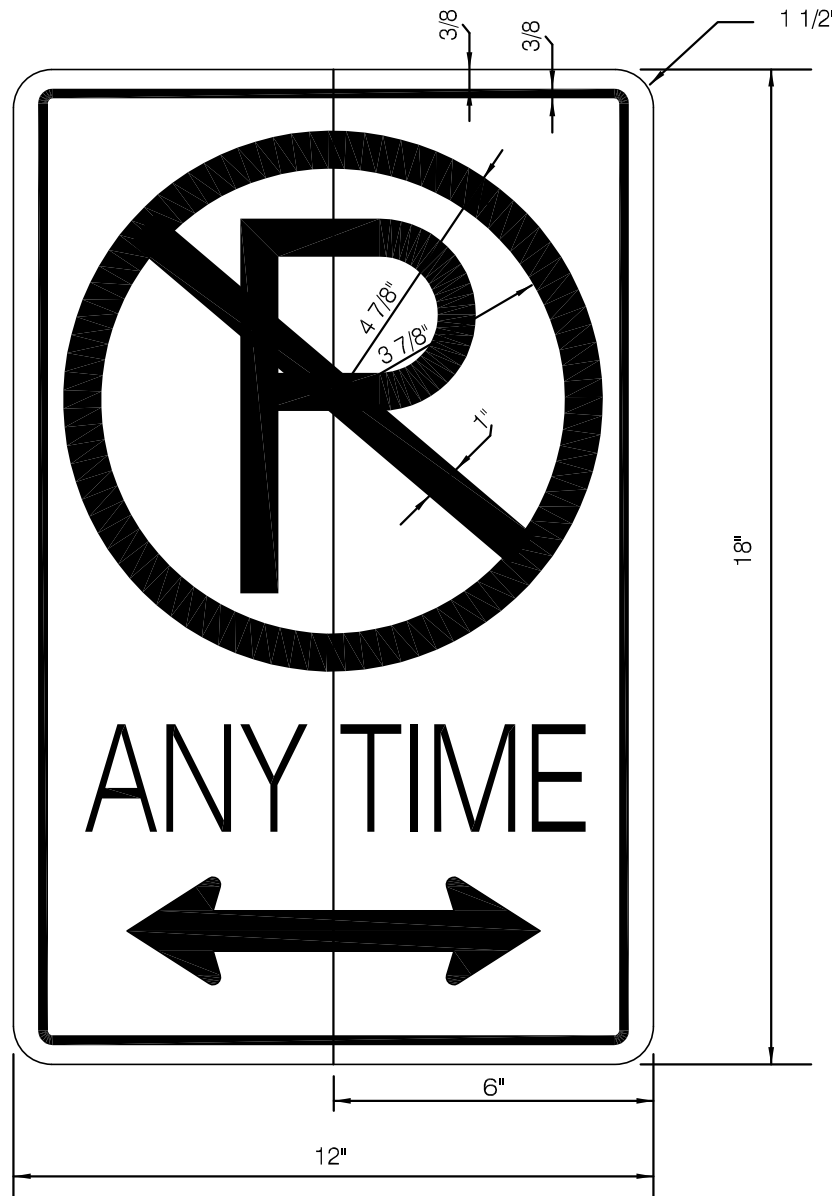
NO PARKING BIKE LANE SIGN DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1402a



R7-9a

MUTCD Designation

COLOR SCHEDULE	
LEGEND, CIRCLE DIAGONAL, BORDER, "ARROW", "ANY TIME"	RED
BACKGROUND	WHITE
"P"	BLACK

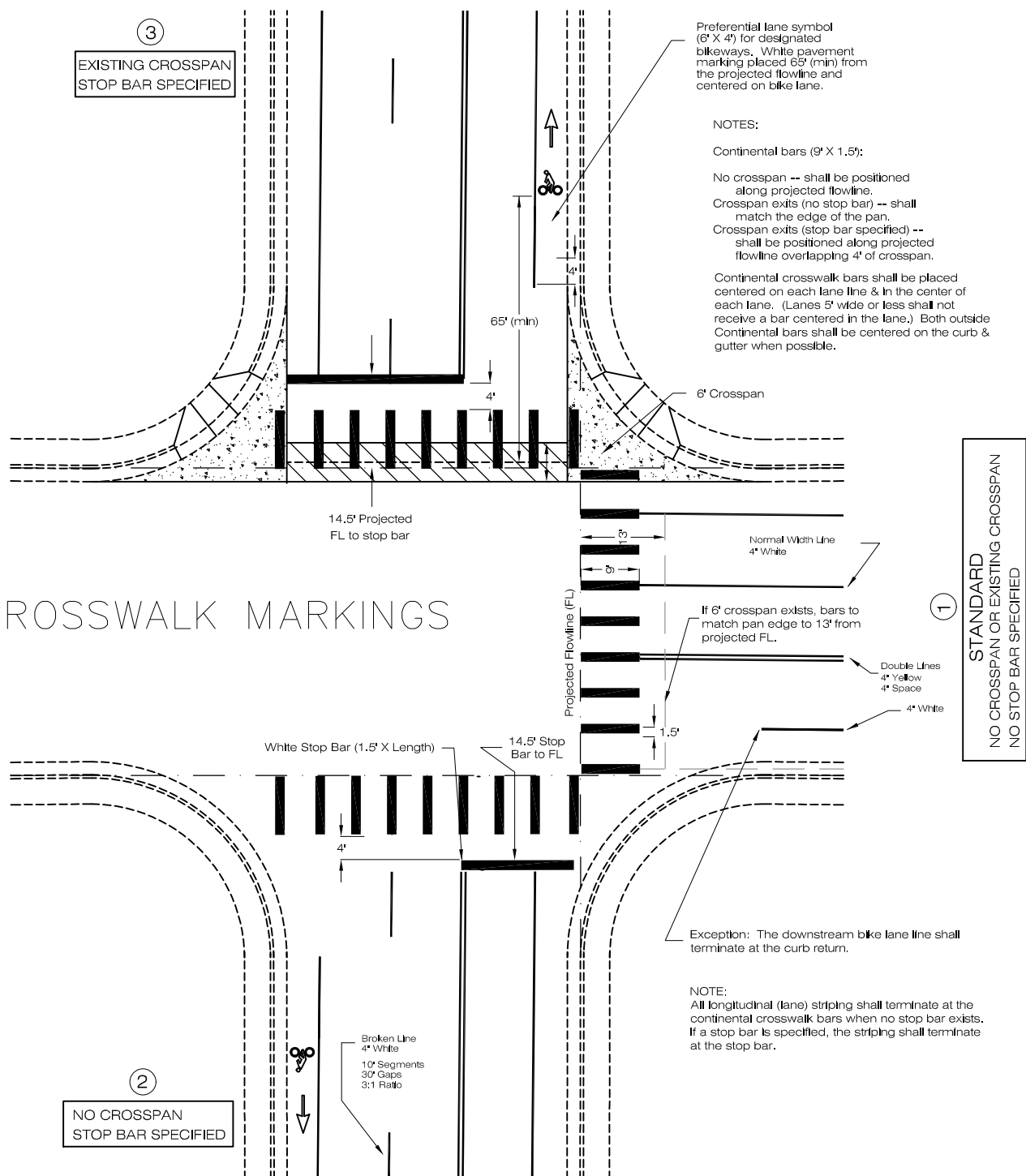
NO PARKING ANY TIME SIGN DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1402b



CROSSWALK MARKINGS

STANDARD PAVEMENT MARKINGS

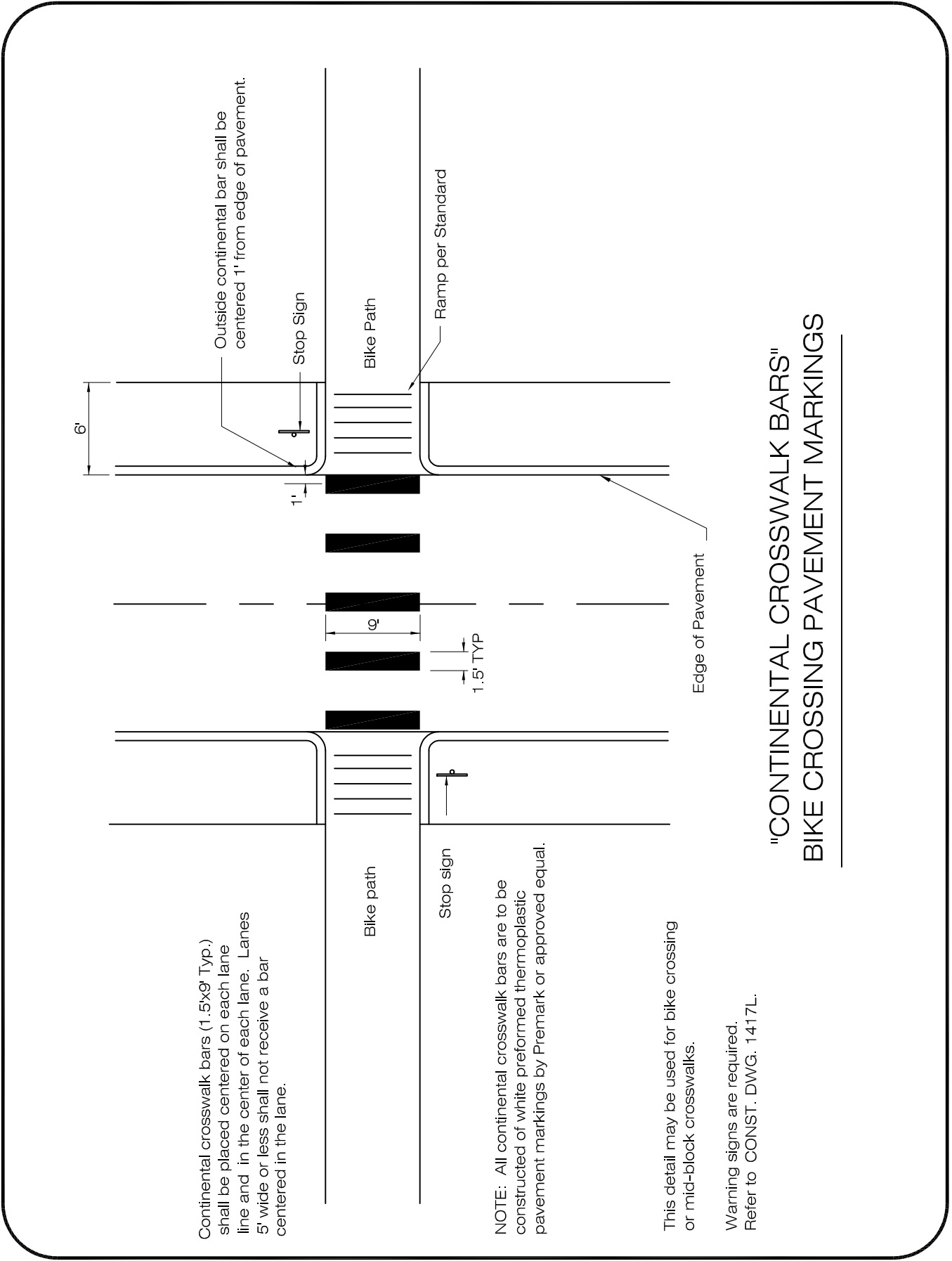
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 03/01/02

DRAWING
1403

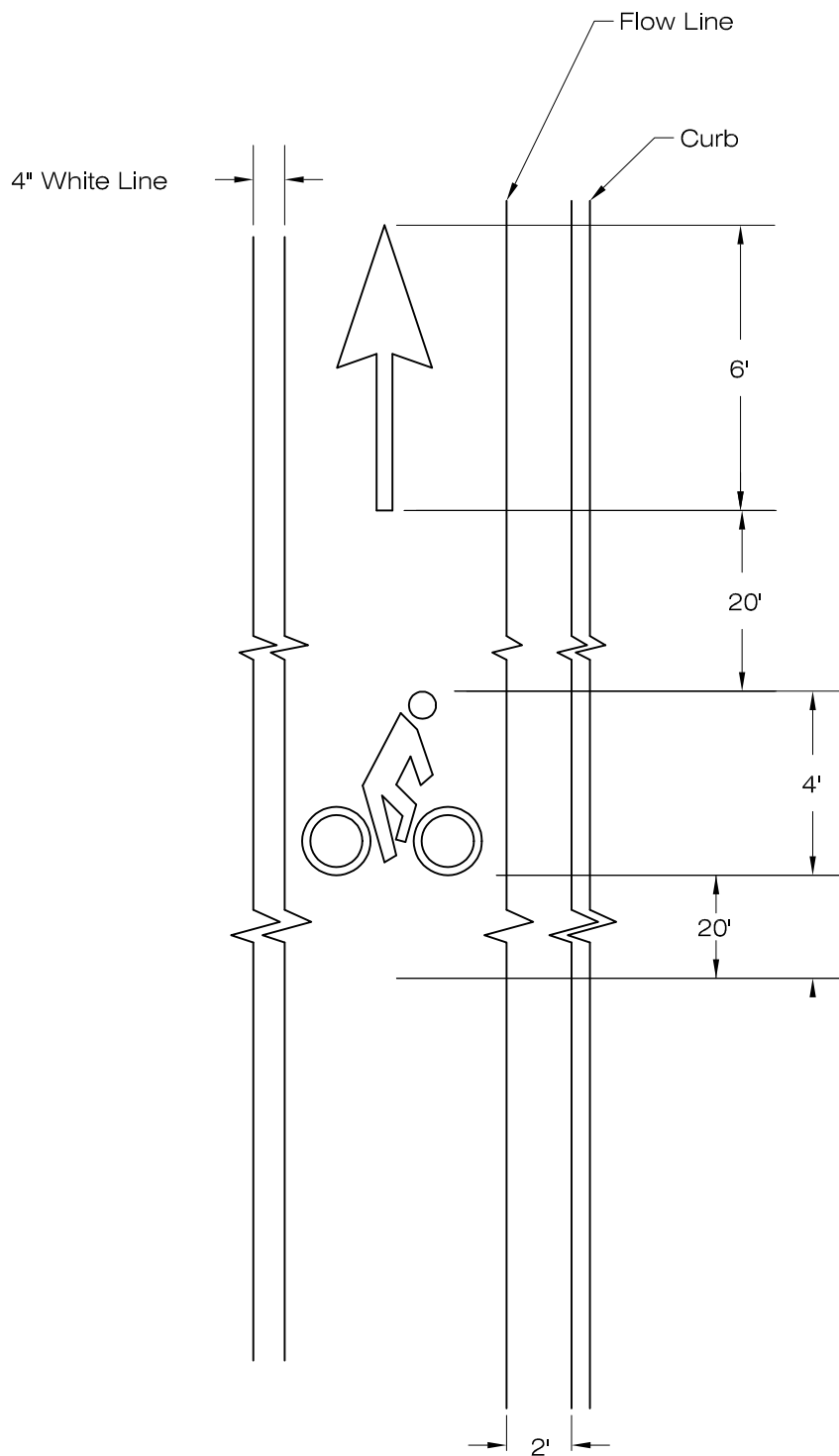
DRAWING
1404



"CONTINENTAL CROSSWALK BARS"
BIKE CROSSING PAVEMENT MARKINGS

PAVEMENT MARKINGS FOR BIKE CROSSING

LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION NO:	DRAWING 1405
		DATE: 08/07/00	



TYPICAL BICYCLE LANE PAVEMENT MARKINGS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 03/01/02

DRAWING
1406

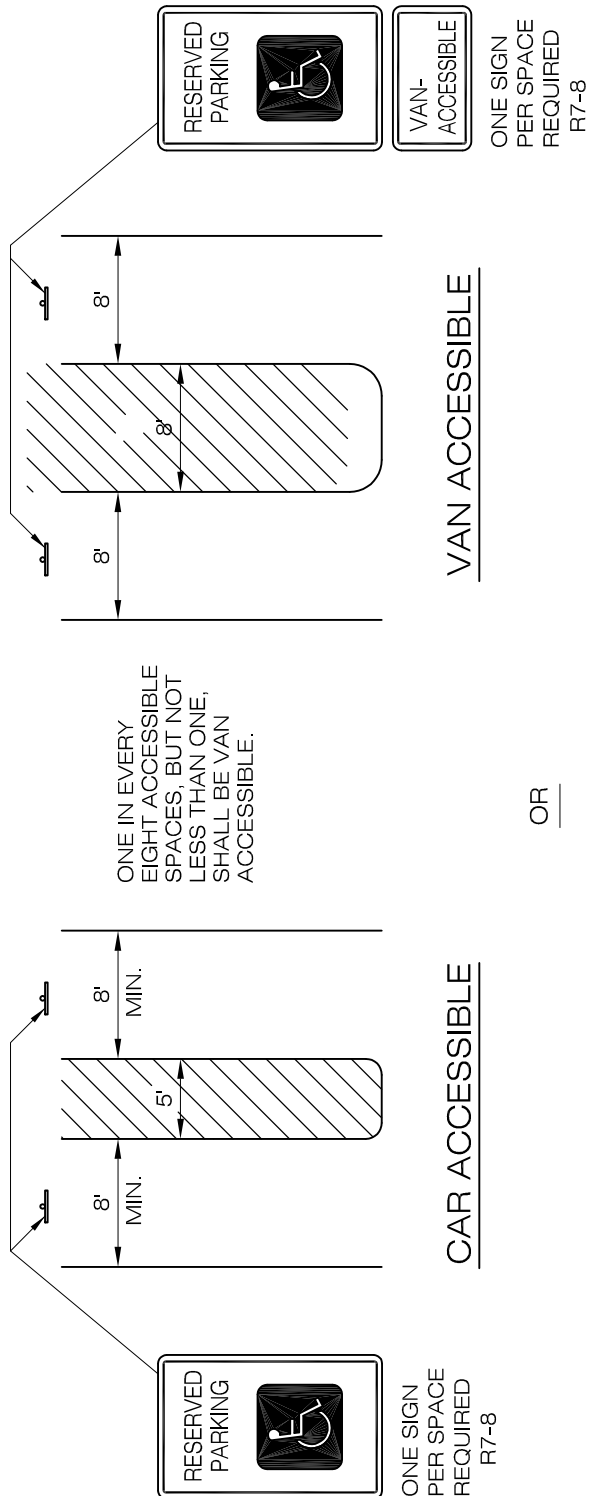
HANDICAP PARKING REQUIREMENTS (AS PER "ADA")

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

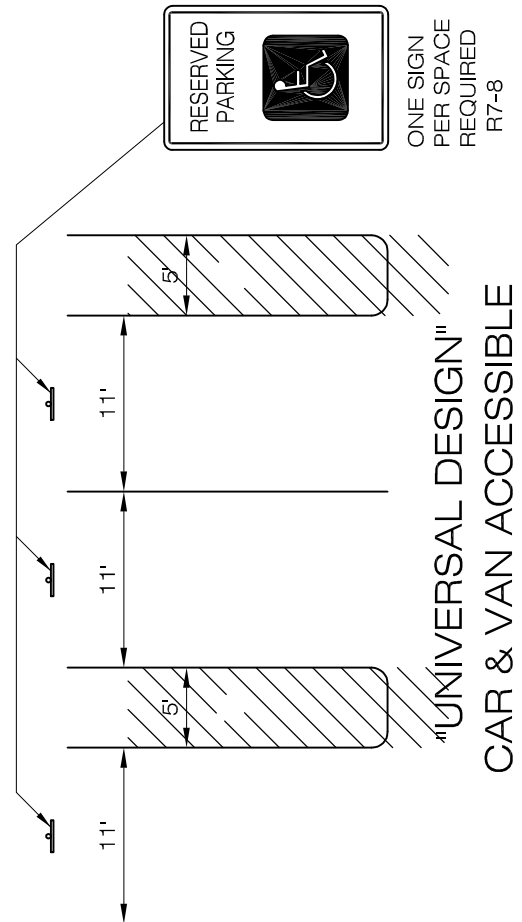
REVISION NO: 1
DATE: 03/01/02

DRAWING
1407



OR

A "UNIVERSAL" PARKING SPACE DESIGN MAY BE USED. THIS DESIGN IS USED TO ACCOMMODATE CAR & VAN ACCESSIBLE PARKING SPACES, WHICH ELIMINATES THE NEED FOR TWO SIGN TYPES.

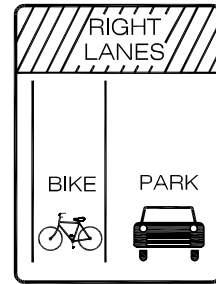
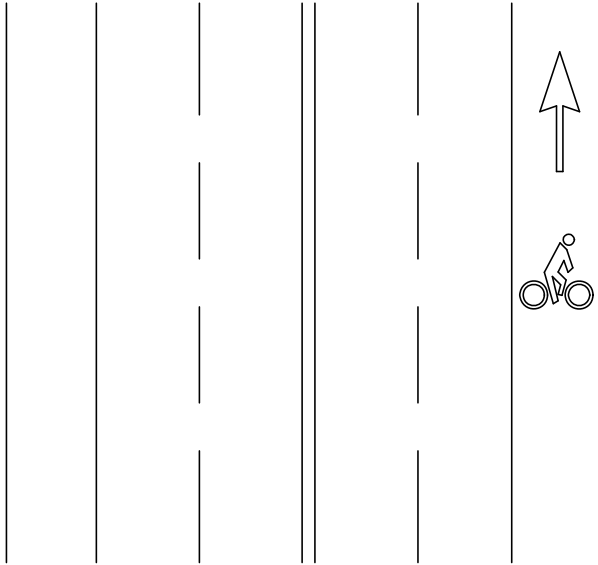


LOVELAND ONLY

The bike and parking only sign may be used in two separate applications:

- *1. Where there is enough lane width for the painted line with a five foot wide bicycle lane and seven feet of undesignated parking lane.
- *2. Where the bicycle lane is designated by two painted lines and eight feet of parking lane.

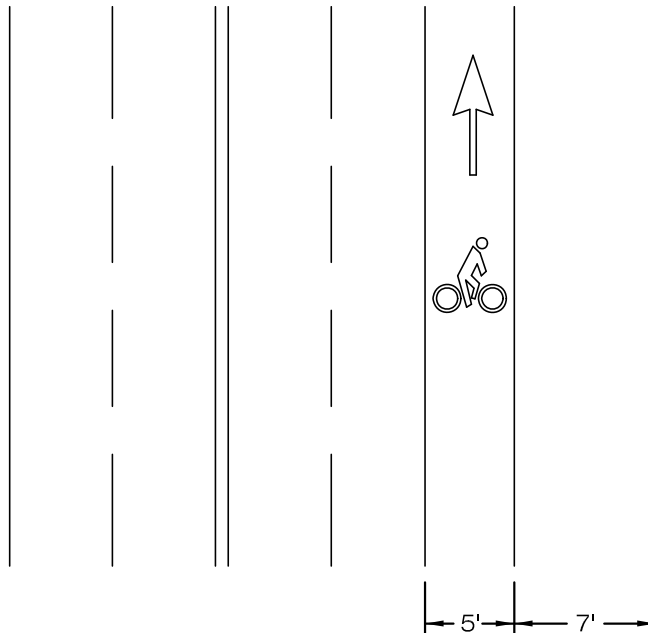
*1



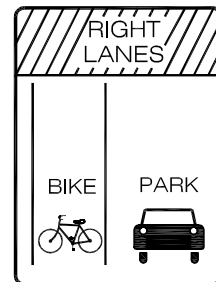
R3-17a Modified
12" x 18"
(Black on White)

See **CONST. DWG. 1409L** for detail.

*2



Curb



R3-17a Modified
12" x 18"
(Black on White)

BICYCLE AND PARKING PAVEMENT MARKINGS

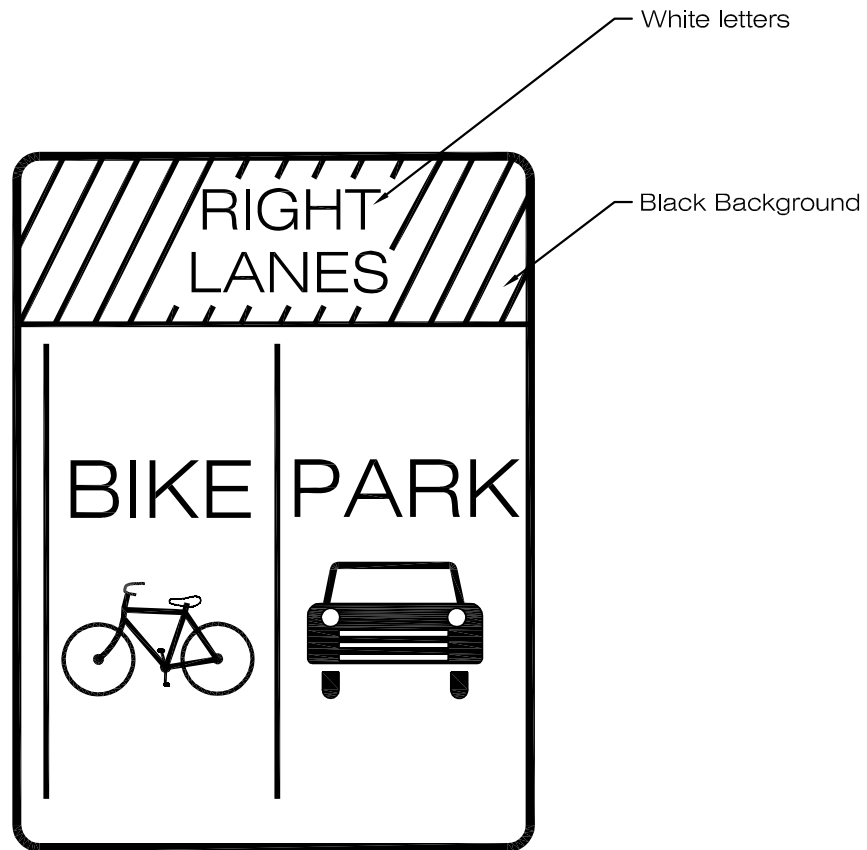
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1408L

LOVELAND ONLY



R 3-17a Modified
12" x 18"
(Black on White)

BICYCLE / PARKING SIGN

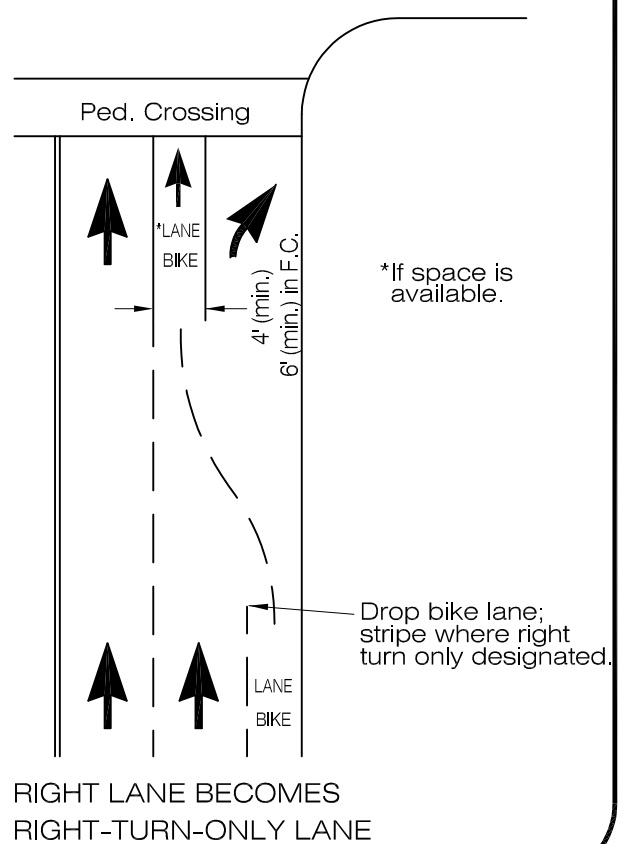
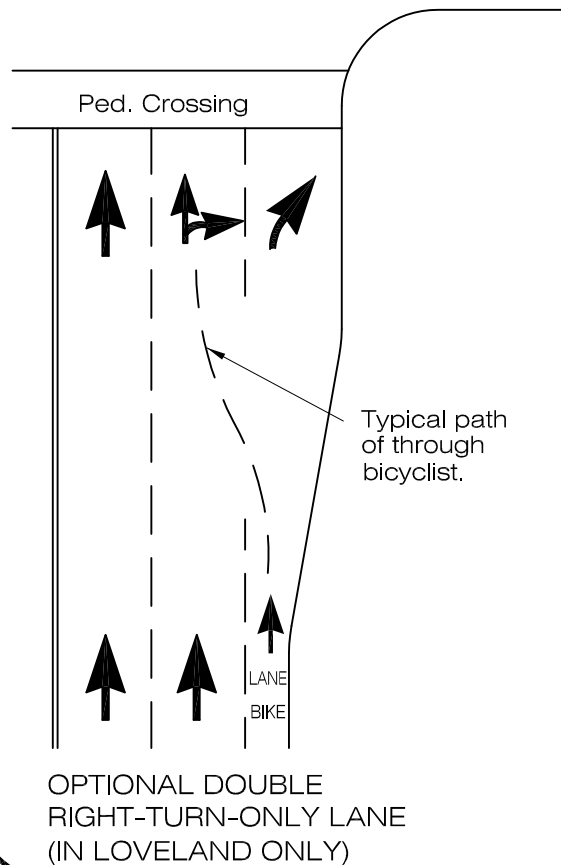
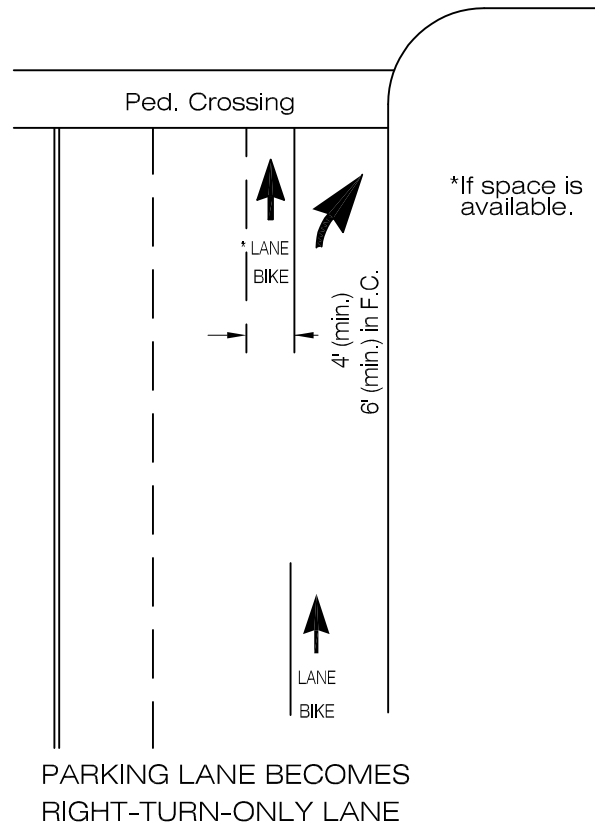
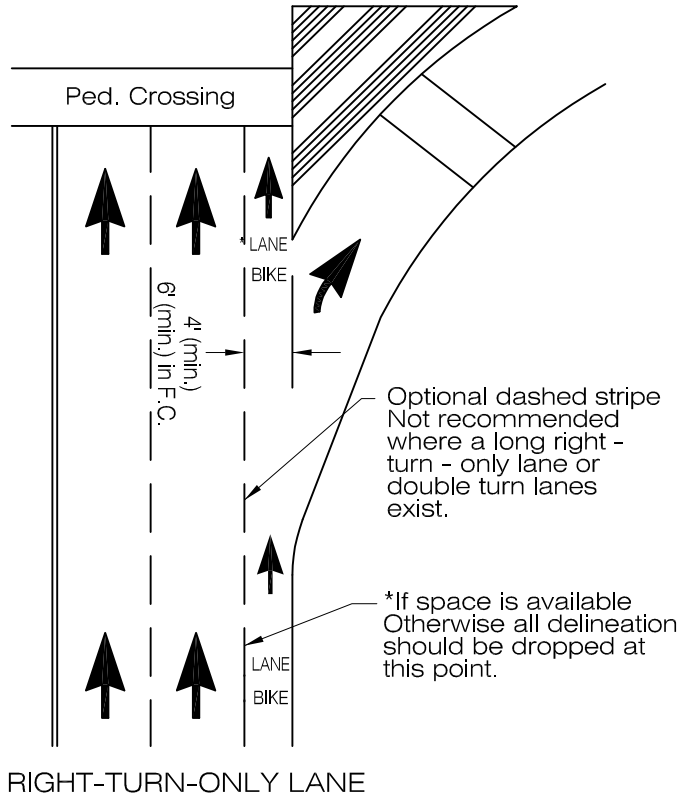
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:	1
DATE:	04/01/07

DRAWING
1409L

(Metric Conversion: 1 ft. = 0.3 m.)



BICYCLE LANE APPROACHING VEHICLE RIGHT TURN LANE

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:

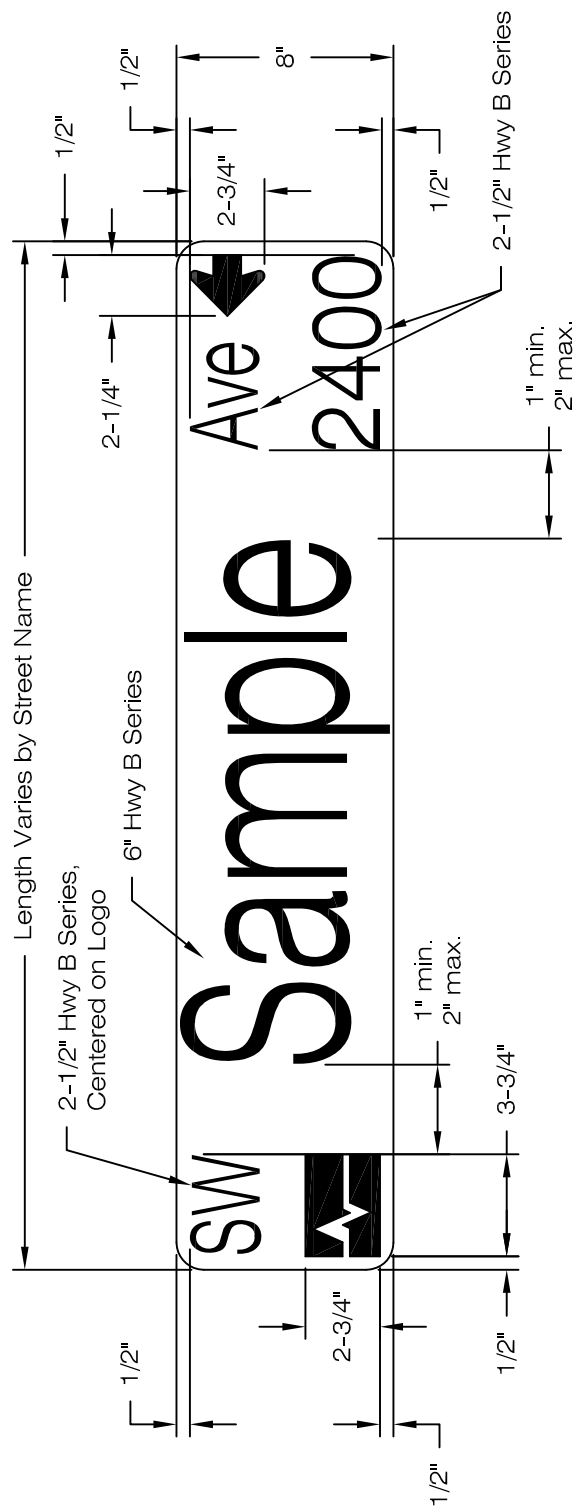
DATE: 08/07/00

DRAWING

1410

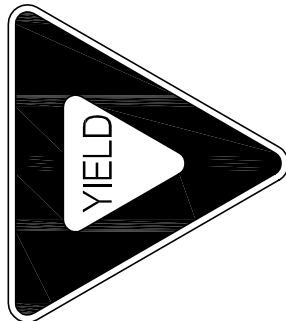
LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION NO: 3	DRAWING 1411
		DATE: 08/01/21	

STREET NAME SIGN

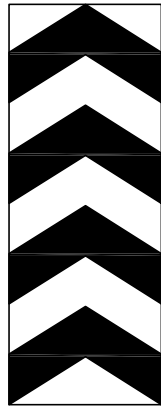


NOTES:

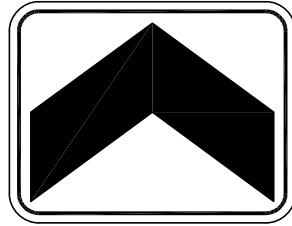
1. Street name must be 6" (min.) mixed case white letters, FHWA Series "B".
2. Prefix must be 2" letters, FHWA Series "B" and placed on the upper left.
3. Suffix must be 2" (min.) letters and block number must be 2" (min.) numbers, FHWA Series "B".
4. Overall sign length dimension varies according to length of street name.
5. All sign lettering and green background material must be at least Diamond Grade sheeting per FHWA; No silk screened signs will be permitted.
6. Street numbers shall always point to higher block number.
7. Aluminum sign blank shall be 0.10 thickness with 3/4" radius corners.
8. Loveland only, signalized intersection signs shall be 18" (min.) in height.
9. All street name signs shall be retroreflective.



RI-2
36" x 36" x 36"
(Red on White)



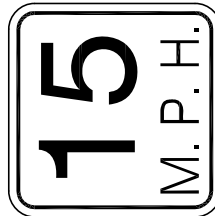
W1-8a
54" x 24" (min.)
(Black on White)



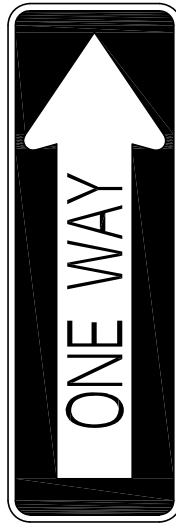
W1-8
18" x 24"



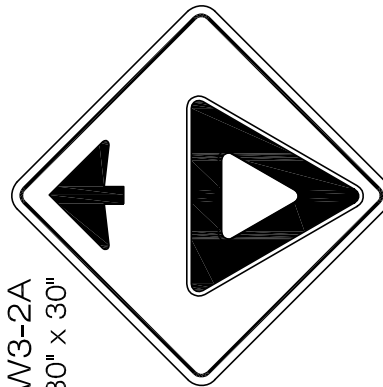
W11-2a
30" x 30"



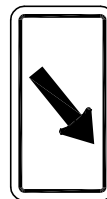
W13-1
18" x 18"



R6-1
54" x 18"
*This sign should only be used on major/larger roundabouts.



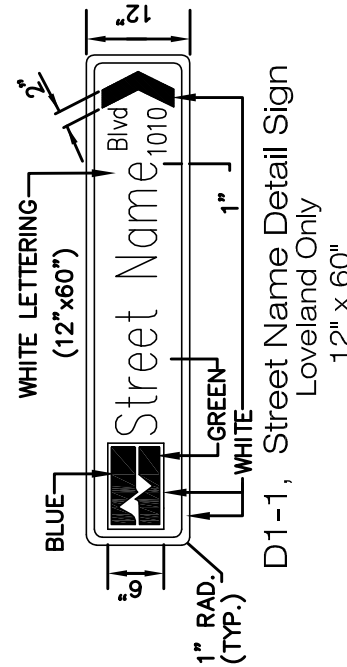
W3-2A
30" x 30"



W16-7P
24" x 18"



W2-6
30" x 30"
(Black on Yellow)



D1-1, Street Name Detail Sign
Loveland Only
12" x 60"

*This street name sign should only be used on Urban Roundabouts, mounted directly to sign post with rivets and nylon washers; 4 each per installation. (Use 8" blank for Mini-Roundabouts)



24" x 18"

See the FHWA Roundabout Guidelines for additional signing details.

URBAN ROUNDABOUT SIGN DETAILS

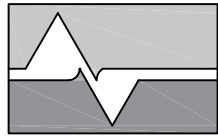
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1412

LOVELAND ONLY



NOTICE

THIS ROAD WILL BE
EXTENDED WITH
FUTURE DEVELOPMENT
FOR MORE INFO CONTACT
CITY OF LOVELAND
PUBLIC WORKS DEPARTMENT
970-962-2501

Notes:

1. Sign dimensions 30"x30"
2. White Lettering on Green Background
3. For Sign Mounting, see LCUASS Drawing 1401

FUTURE ROAD EXTENSION SIGN

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

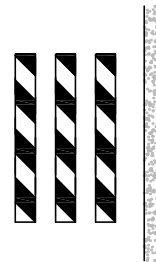
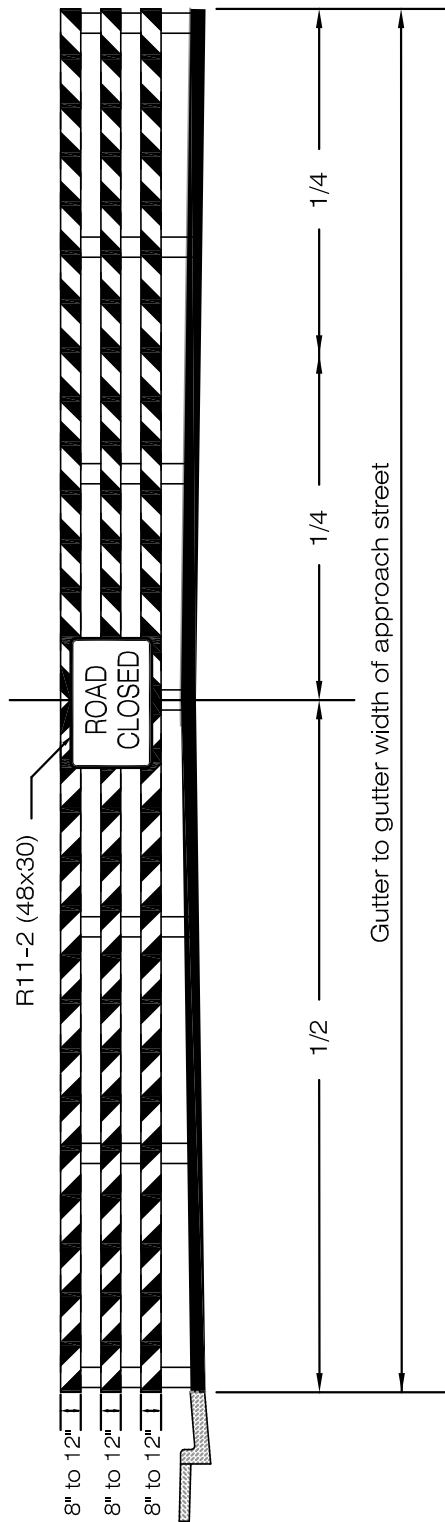
CONSTRUCTION
DRAWINGS

REVISION NO:

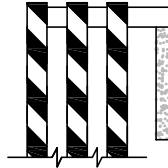
DATE: 08/01/21

DRAWING

1412L



DETACHED OR SIDEWALK
DOES NOT END AT BARRICADE



ATTACHED / SIDEWALK
ENDS AT BARRICADE

NOTES:

1. Rails shall be nominal lumber dimension.
2. Posts shall be 6" x 6" pressure treated, rot-resistant lumber.
3. Use 6" wide reflectorized orange stripes on reflectorized white background, front side only, paint back and edges white.
4. Other options may be used as approved by Local Entity Engineer.

These signs and barricades must be installed by the Developer at the end of all new streets that dead end on a temporary basis, and must be maintained by the Developer until the street is extended by future development.

STANDARD TEMPORARY DEAD END BARRICADES

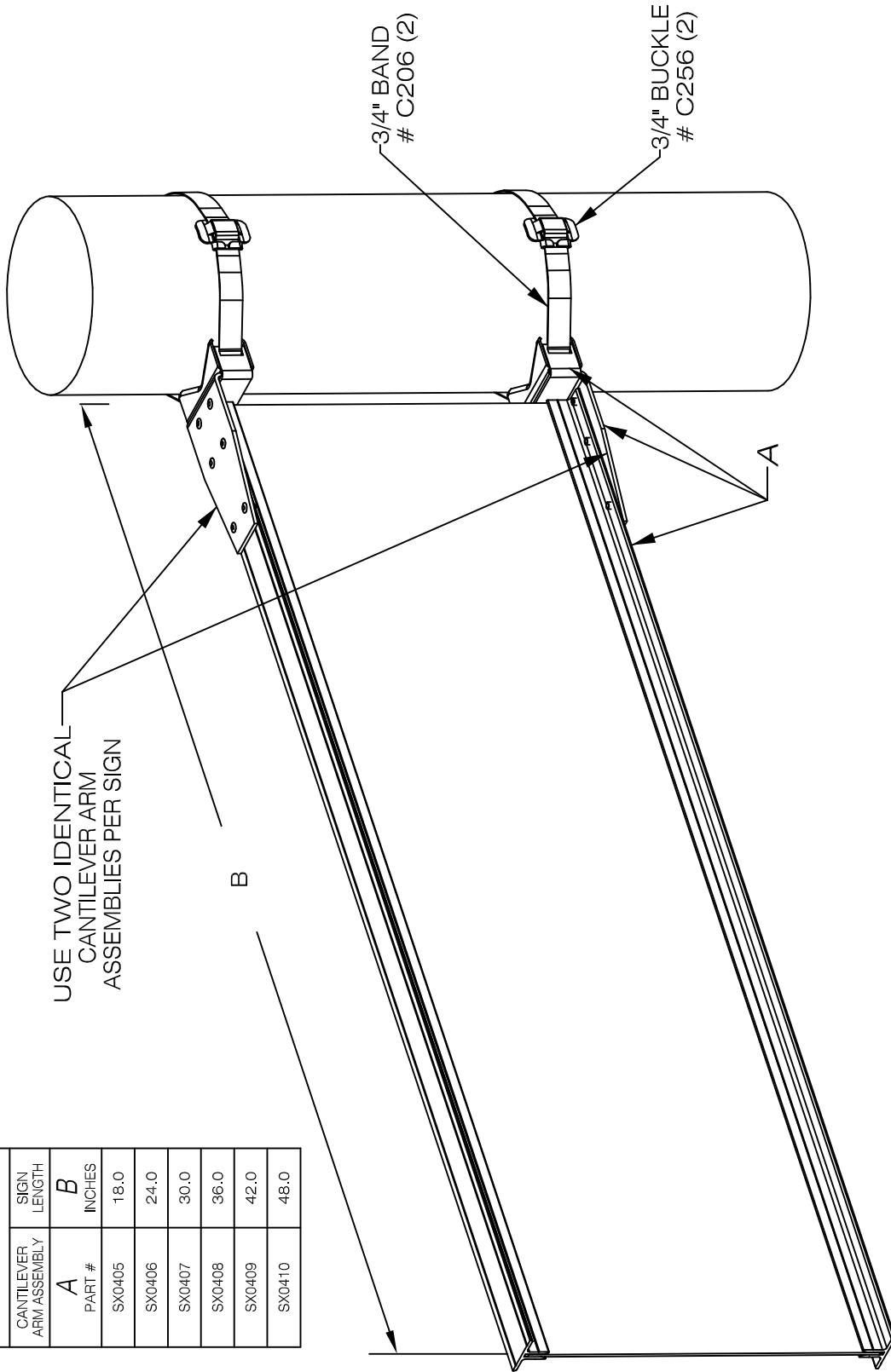
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1413

BAND-IT		SIGN LENGTH
CANTILEVER ARM ASSEMBLY	A	B
PART #		INCHES
SX0405		18.0
SX0406		24.0
SX0407		30.0
SX0408		36.0
SX0409		42.0
SX0410		48.0



NOTES:

1. Standard drilling (5/16" x 18" x 1/2" set screw).
2. Bolt Thru drilling (1/4" x 20" x 1/2" socket head bold).
3. BAND-IT is a unit of the IDEX Corporation.

CANTILEVER ARM BRACKET FOR FLAT OR EXTRUDED BLADES

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

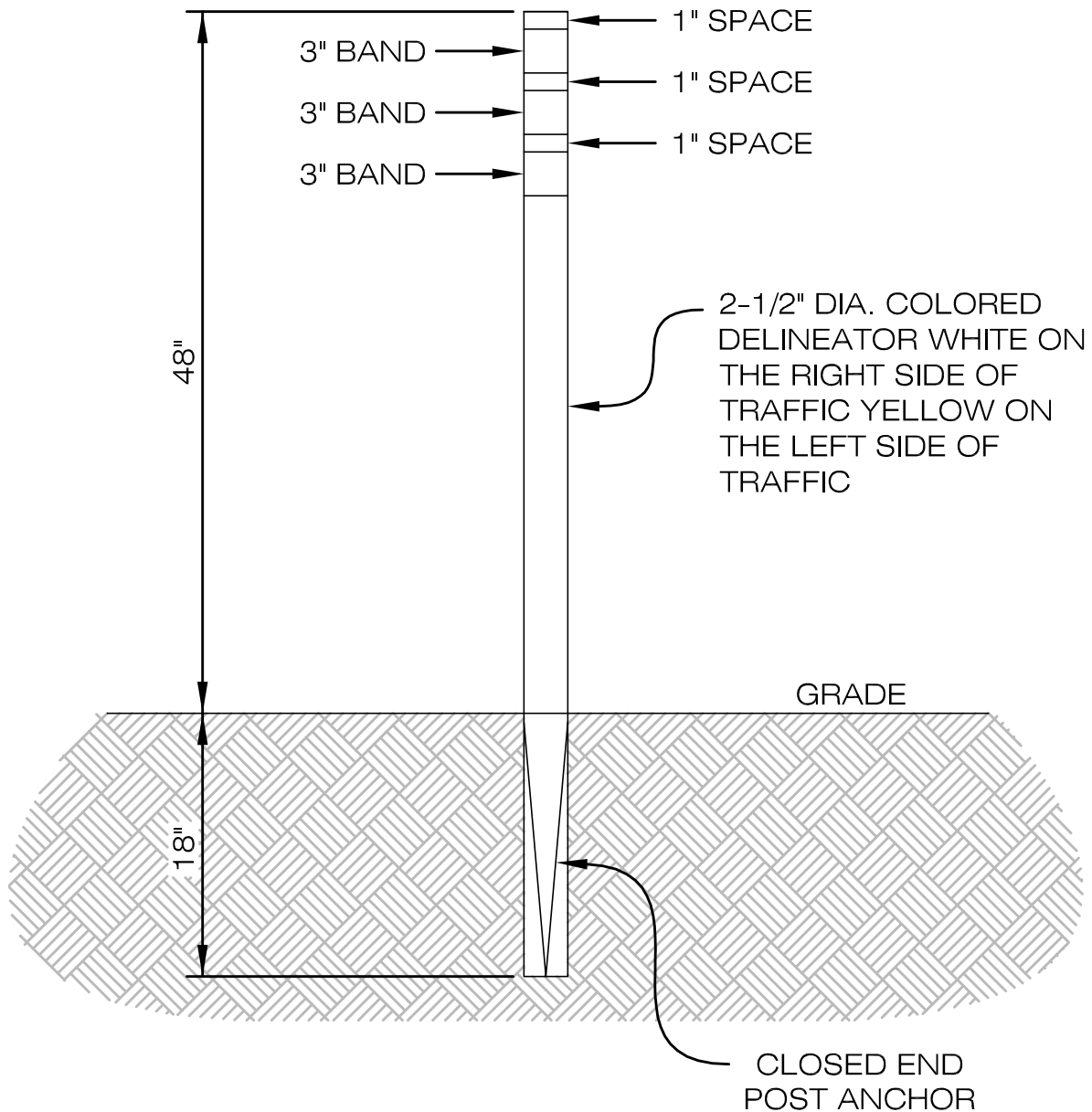
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/07/00

DRAWING

1414



NOTES:

DELINEATORS ARE ROUND W/ YELLOW OR WHITE REFLECTIVE MATERIAL WRAPPED AROUND WITH THE **SAME COLOR REFLECTIVE MATERIAL (BAND)** AS THE POST (YELLOW OR WHITE). THE REFLECTIVE MATERIAL IS WRAPPED ALL THE WAY AROUND THE DELINEATORS SO THAT THEY ARE VISIBLE FROM ALL DIRECTIONS.

THE NUMBER OF REFLECTIVE BANDS ON THE DELINEATOR SHALL BE THREE.

IF ANCHOR IS LOCATED IN AN ISLAND OR PAVED MEDIAN, A 4" DIA. PVC SLEEVE SHALL BE EXTENDED THROUGH THE PAVEMENT FOR POST ANCHOR (STUB).

DELINEATOR DETAIL (SAFE HIT)

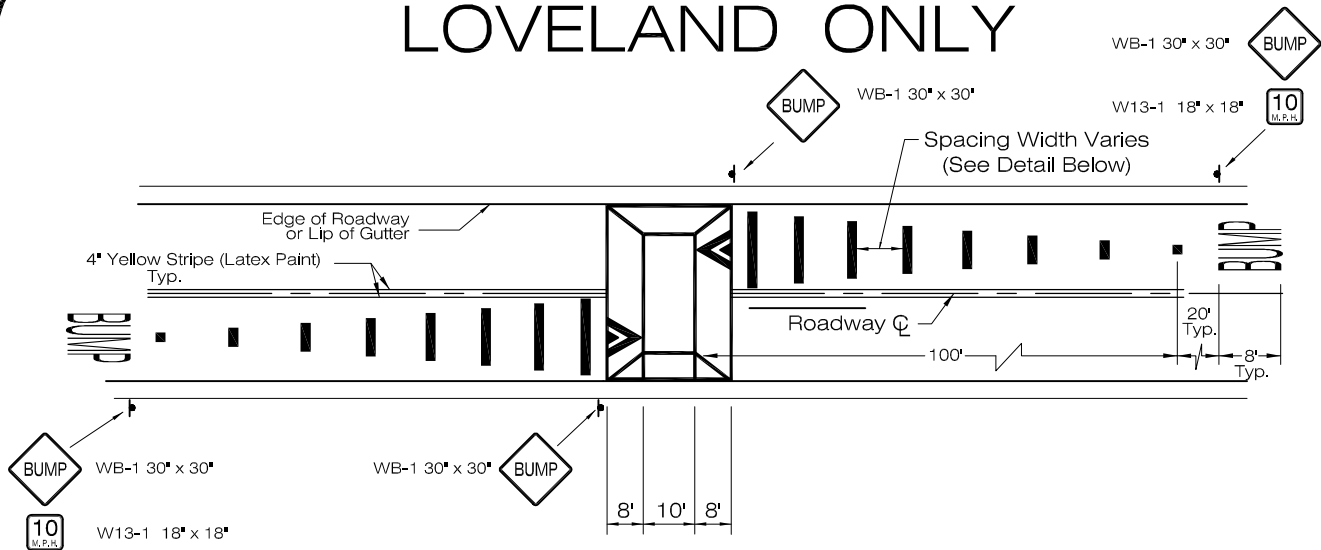
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

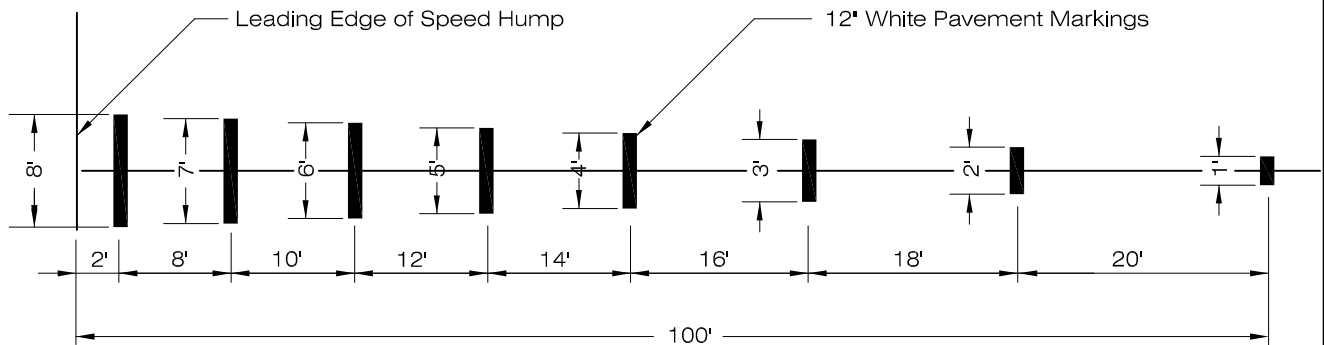
REVISION NO: 2
DATE: 04/01/07

DRAWING
1415

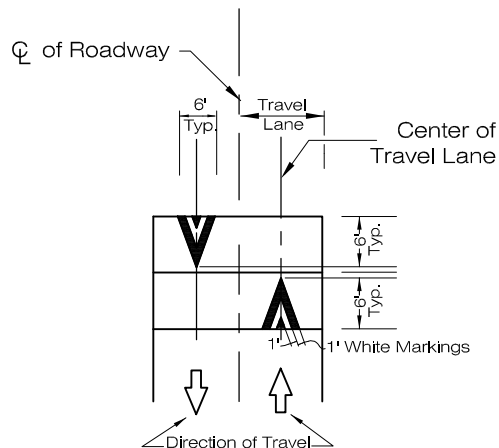
LOVELAND ONLY



PLAN VIEW



GRADUATED BAR DETAIL



CHEVRON DETAIL

NOTES:

1. Graduated bars, chevron and "Bump" markings are centered in the travel lanes.
2. All pavement markings (except the centerline striping) are to be pre-formed thermoplastic (PREMARK by Flint Trading, or equal)

SIGNS & PAVEMENT MARKINGS FOR SPEED TABLES

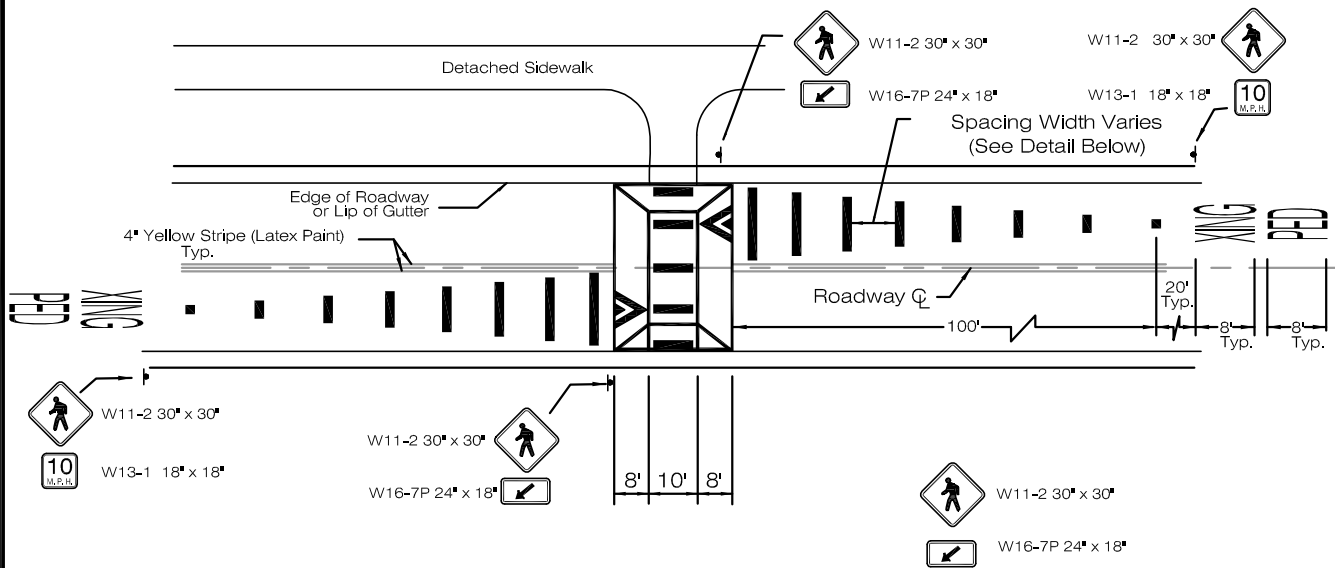
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

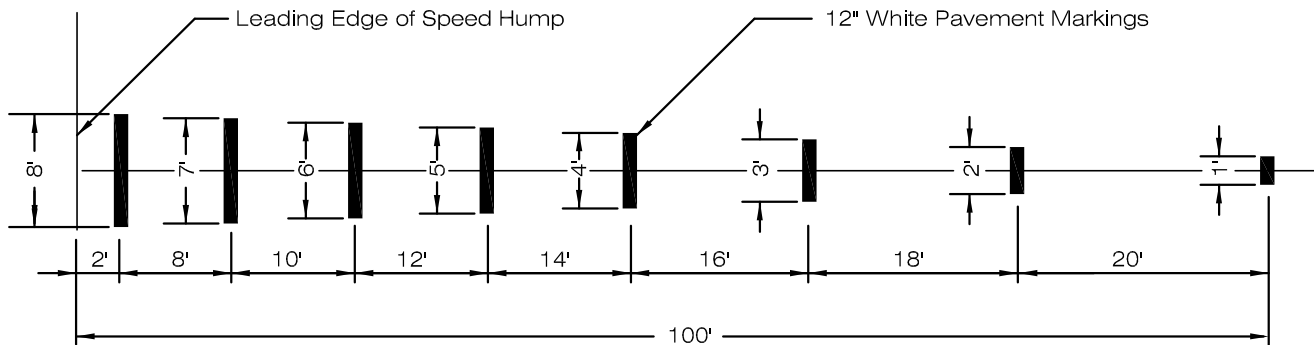
REVISION NO: 1
DATE: 03/01/02

DRAWING
1416L

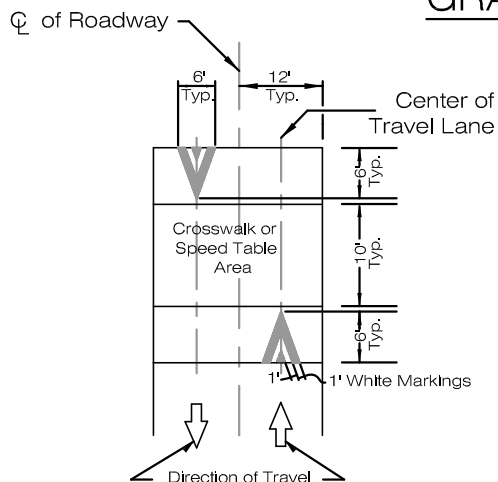
LOVELAND ONLY



PLAN VIEW



GRADUATED BAR DETAIL



CHEVRON DETAIL

NOTES:

1. Graduated bars, chevron and "PED XING" markings are centered in the travel lanes.
2. All pavement markings (except the centerline striping) are to be pre-formed thermoplastic (PREMARK by Flint Trading, or equal).

SIGNS & PAVEMENT MARKINGS FOR RAISED CROSSINGS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1417L



STANDARD
FIRE LANE SIGN DETAIL
(FORT COLLINS ONLY)

UNIVERSAL
FIRE LANE SIGN DETAIL

COLOR SCHEDULE	
LEGEND, CIRCLE DIAGONAL, BORDER, "ARROW", "FIRE LANE"	RED
BACKGROUND	WHITE
"P"	BLACK

NOTES:

1. THE SIGN PLATE SHALL BE A MINIMUM OF 12"X18" WITH A THICKNESS OF .080 ALUMINUM CONSTRUCTION.
2. THE SIGN FACE SHALL HAVE A WHITE REFLECTIVE BACKGROUND WITH A RED LEGEND. USE THE STANDARD 3M SCOTCHLITE SIGN FACE NUMBER R7-32 OR EQUIVALENT, WITH RED LETTERING AS SHOWN ABOVE.
3. ARROWS MAY BE NEEDED (LEFT, RIGHT OR DOUBLE), TO DESIGNATE BEGIN AND END OF NO PARKING AREA.

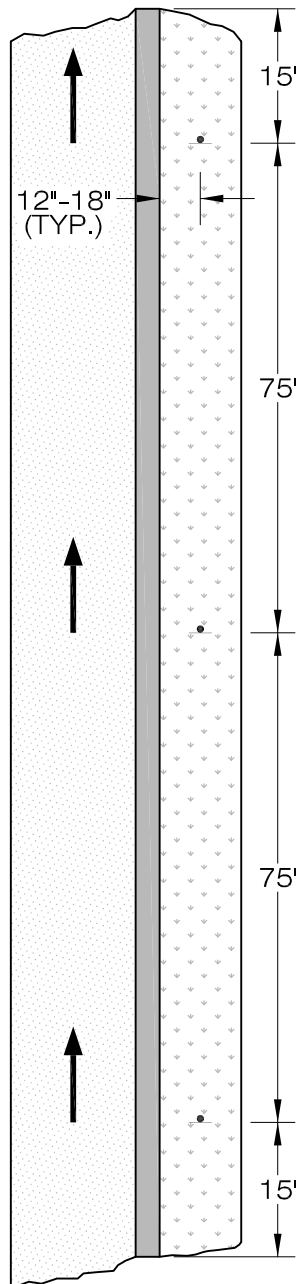
FIRE ACCESS ROAD SIGNS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
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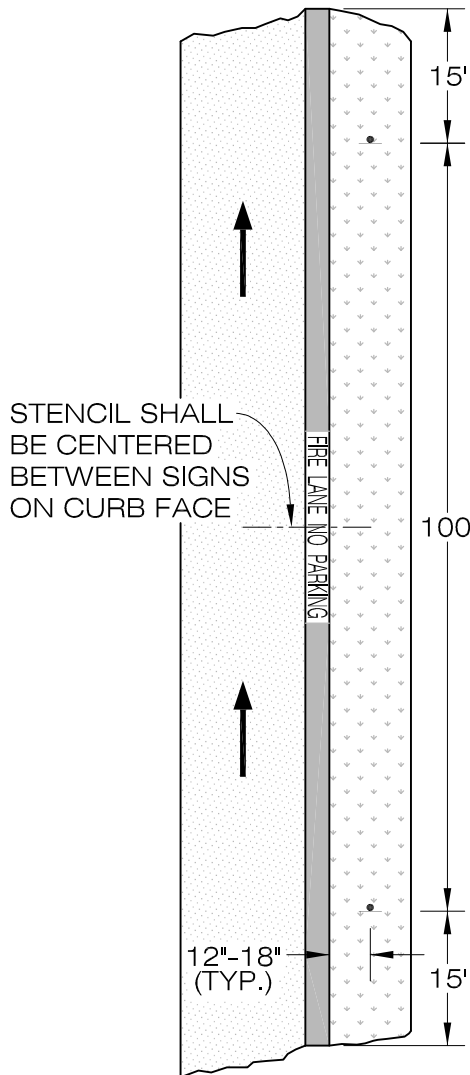
DRAWING
1418



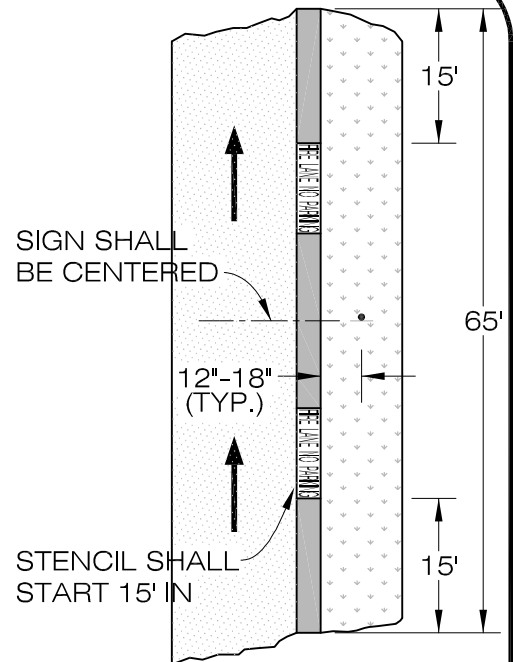
**STANDARD DETAIL 1
(WITHOUT STENCIL)**

NOTE:

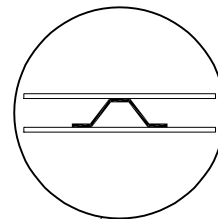
1. APPROVED FIRE LANE SIGNS SHALL BE INSTALLED 12' TO 18" FROM BACK OF CURB OR BACK OF SIDEWALK.
2. SIGN MUST FACE THE ONCOMING TRAFFIC.
3. STENCILS SHALL BE IN WHITE LETTERING (3" HT. 1/2" STROKE) ON RED PAINTED CURB.
4. STENCIL SHALL READ "FIRE LANE NO PARKING"



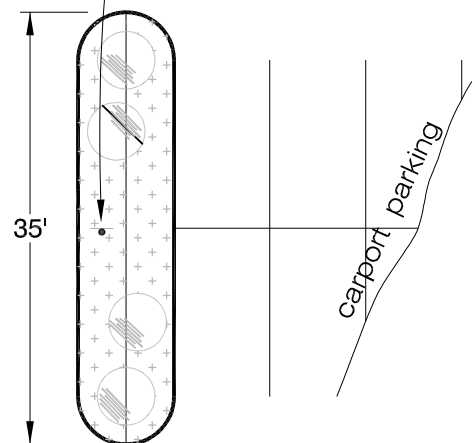
**STANDARD DETAIL 1
(WITH STENCIL)**
ACCESS OFFICER MUST
PRE-APPROVE THIS
APPLICATION



**DETAIL 3
(65' OR LESS)**
MUST BE PRE-APPROVED



2 APPROVED
FIRE LANE
SIGNS-BACK
TO BACK



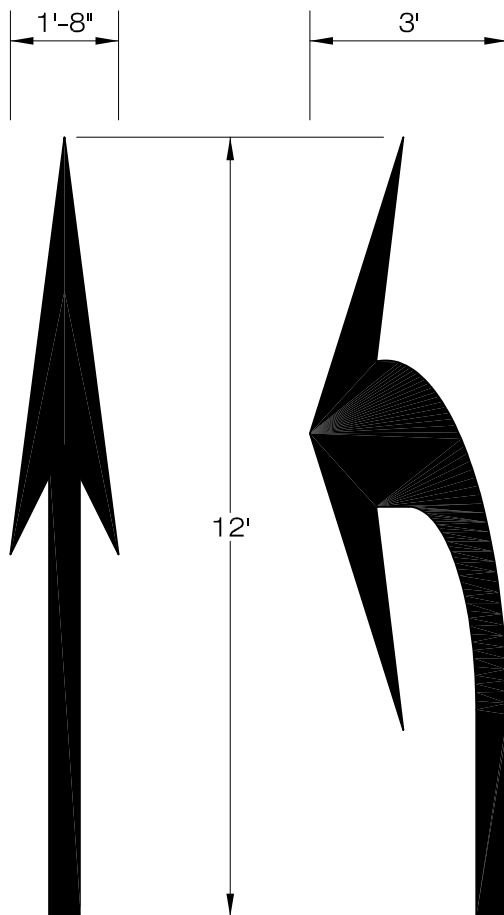
FIRE APPARATUS ACCESS ROAD STENCILING & FIRE LANE SIGN INSTALLATION

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

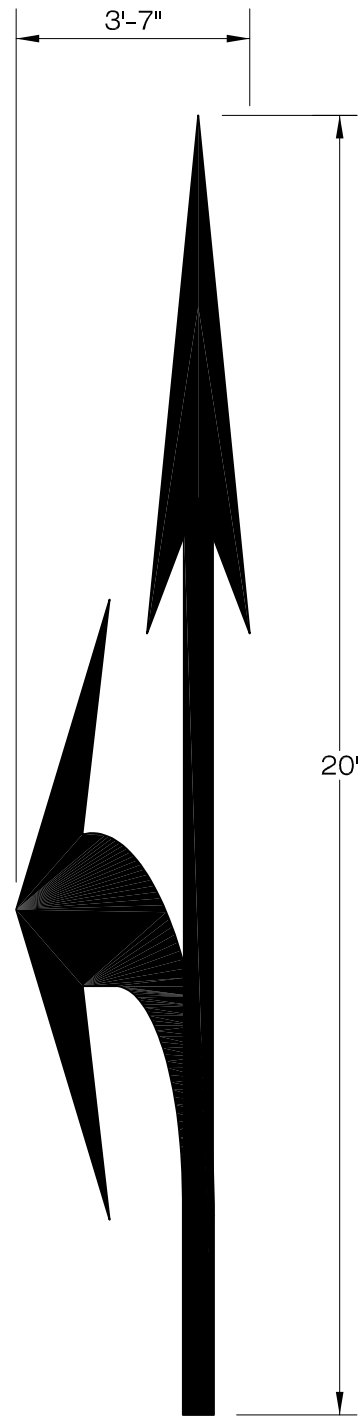
REVISION NO: 1
DATE: 02/27/02

DRAWING
1419



#330248

#330247



#330149

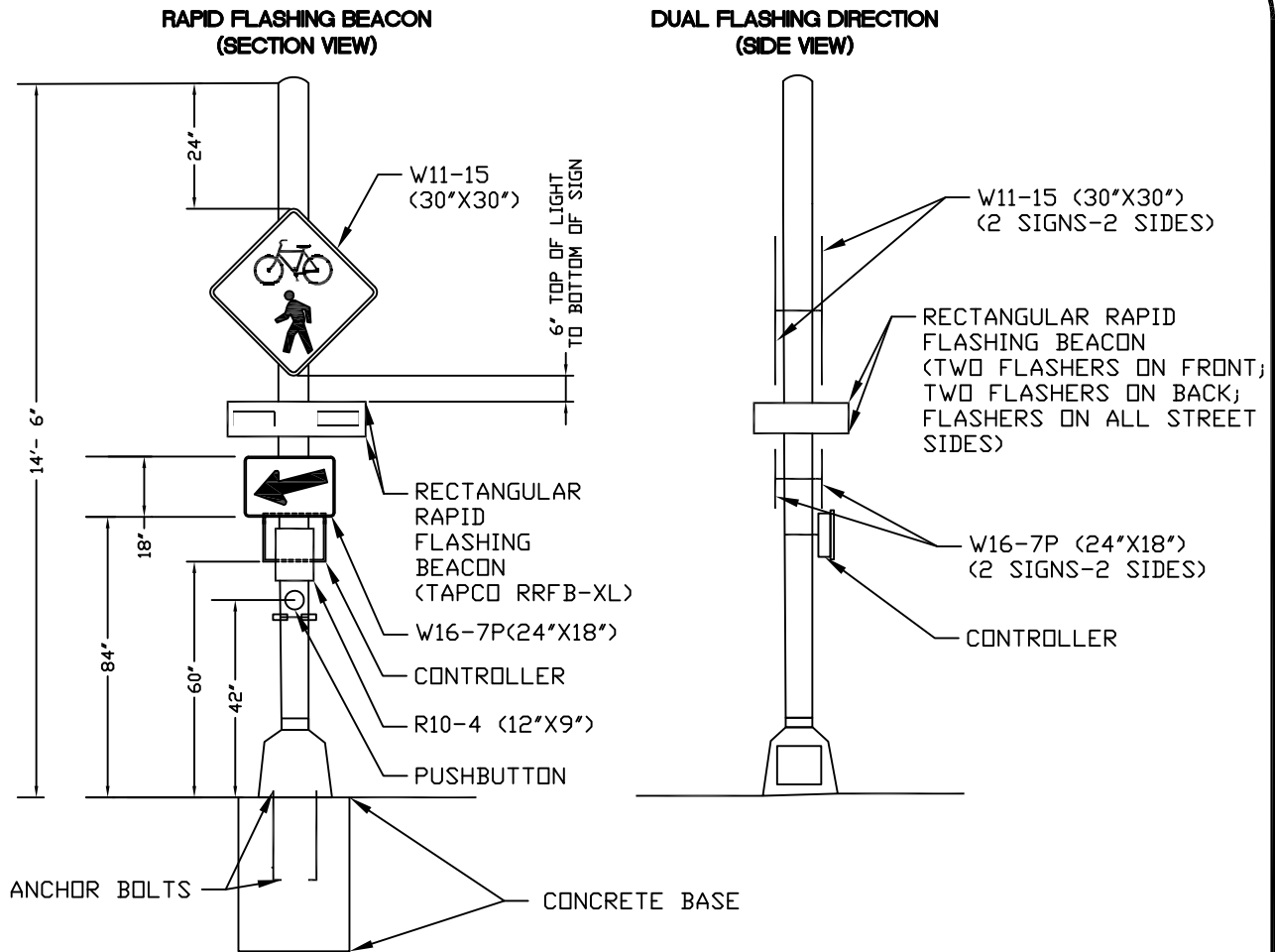
NEW FHWA ARROWS (ELONGATED)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 02/28/02

DRAWING
1420



RECTANGULAR RAPID FLASHING BEACON SPECIFICATIONS (RRFB):

1. MANUFACTURER: TAPCO RRFB XL (AS APPROVED BY CITY OF LOVELAND)
2. POWER IS TO BE PROVIDED FROM THE CLOSEST CITY OF LOVELAND STREET LIGHT POLE. COORDINATE WITH LOVELAND POWER DEPARTMENT FOR INSTALLATION.

SIGNS:

1. ALL SIGNS MUST BE STANDARD BLACK LETTERING ON FLUORESCENT YELLOW GREEN BACKGROUND.
2. SIGN ORIENTATION IS REVERSED FOR PLACEMENT ON LEFT SIDE OF ROAD.

POLE SPECIFICATIONS:

1. PEDESTAL POLE W/DOME POLE CAP 14' X4.5" ROUND SCHEDULE 80 (.438 INCHES SPUN ALUMINUM)
2. PEDESTAL POLE ALUMINUM SQUARE BASE WITH ALUMINUM DOOR
3. PELCO BRAND PEDESTRIAN POLE COLLARS PART # PB5325
4. PELCO PEDESTRIAN POLE CAP, ALUMINUM PART # PB S402
5. PEDESTRIAN PUSH BUTTON - BLACK POLARA PART # PBF5X7-B
6. PEDESTRIAN PUSH BUTTON SIGN POLARA PART NUMBER PN5X7A REVERSIBLE OR EQUAL
7. PEDESTRIAN PEDESTAL POLE CONCRETE FOUNDATION PER CDOT STANDARDS (S-614-14)
8. PROVIDE 2 - 2INCH CONDUITS (1 FOR POWER AND 1 FOR COMMUNICATIONS)

NOT TO SCALE

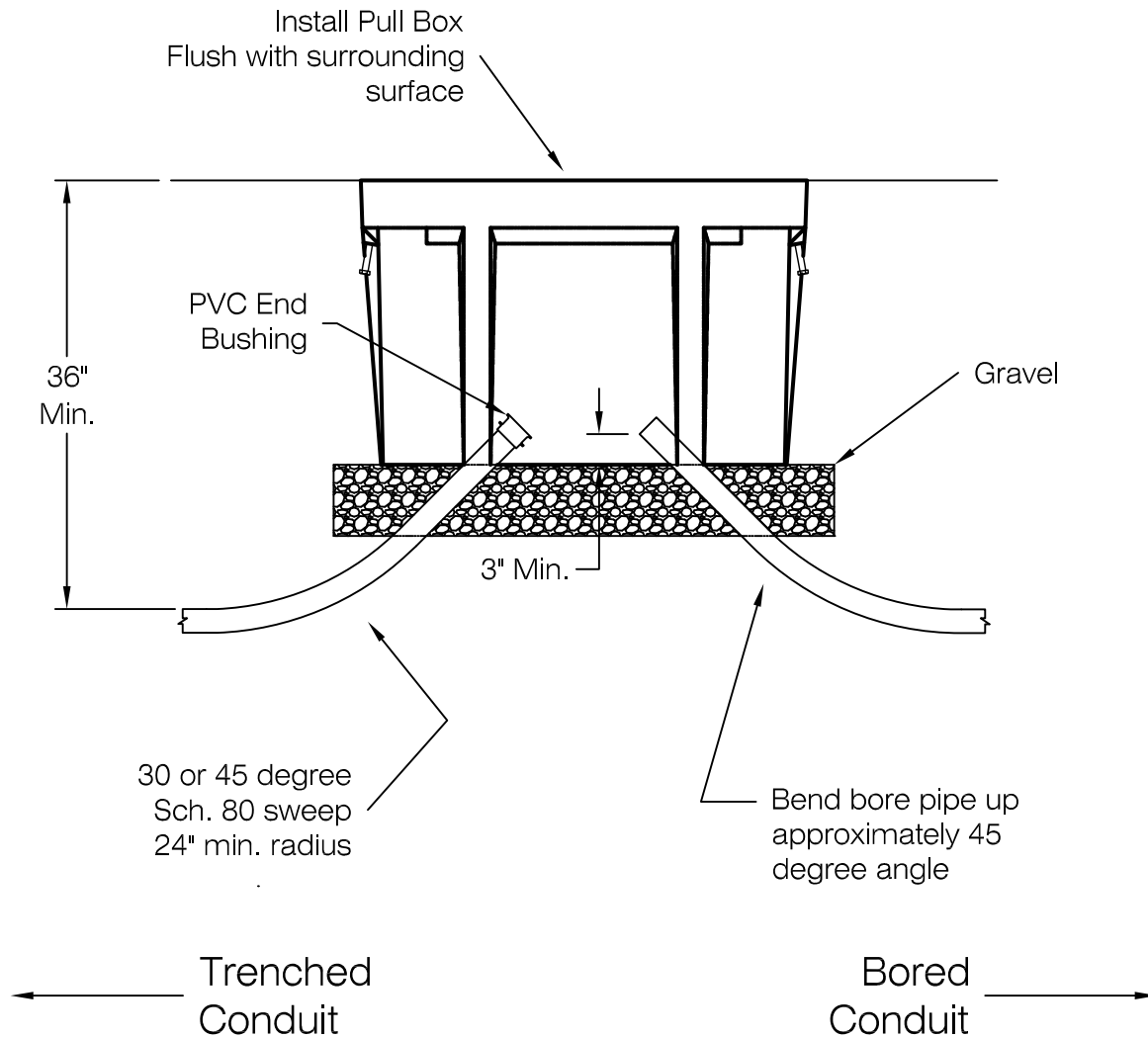
RECTANGULAR RAPID FLASHING BEACON (RRFB)

**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

**CONSTRUCTION
DRAWINGS**

**REVISION NO: 4
DATE: 08/01/21**

**DRAWING
1421**



Notes:

1. Number, size, orientation, and installation method of conduits as per plans.
2. All pull boxes shall be Tier 22.
3. Pull boxes at designated fiber optic splice points shall be 30x48x24. All other fiber optic pull boxes shall be 24x36x24.
4. Bored conduit shall be continuous UL Listed HDPE smooth wall conduit designed for directional boring.
5. Trenched conduit shall be UL Listed Schedule 80 PVC with glued joints.
6. All fittings on PVC conduit shall be glued.
7. All conduit shall be provided with 1250 lbs polyester pull tape and #14 AWG THHN Stranded Copper locating wire (Green). Provide additional cabling as per plans.
8. Lids for polymer concrete pull boxes shall be 2 piece and have the word "TRAFFIC" cast into the surface.
9. Plastic pull boxes approved by Pulse are acceptable when fitted with "Traffic" labels.
10. Install ground rods in all pull boxes in accordance with current NEC.

NOT TO SCALE

CONDUIT AND PULL BOXES FOR FIBER OPTIC LINES

**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

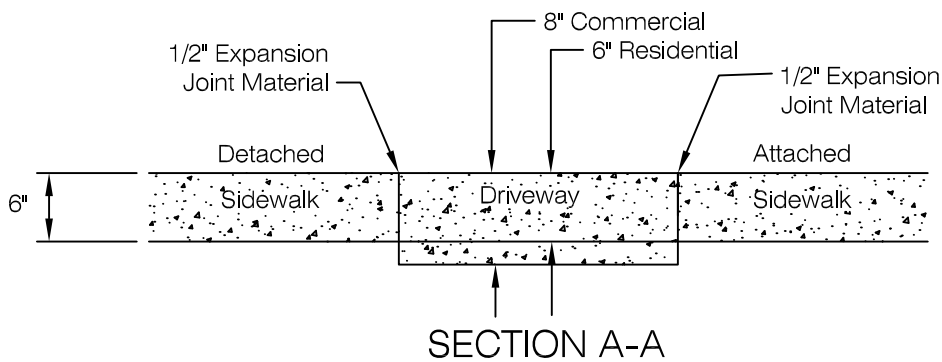
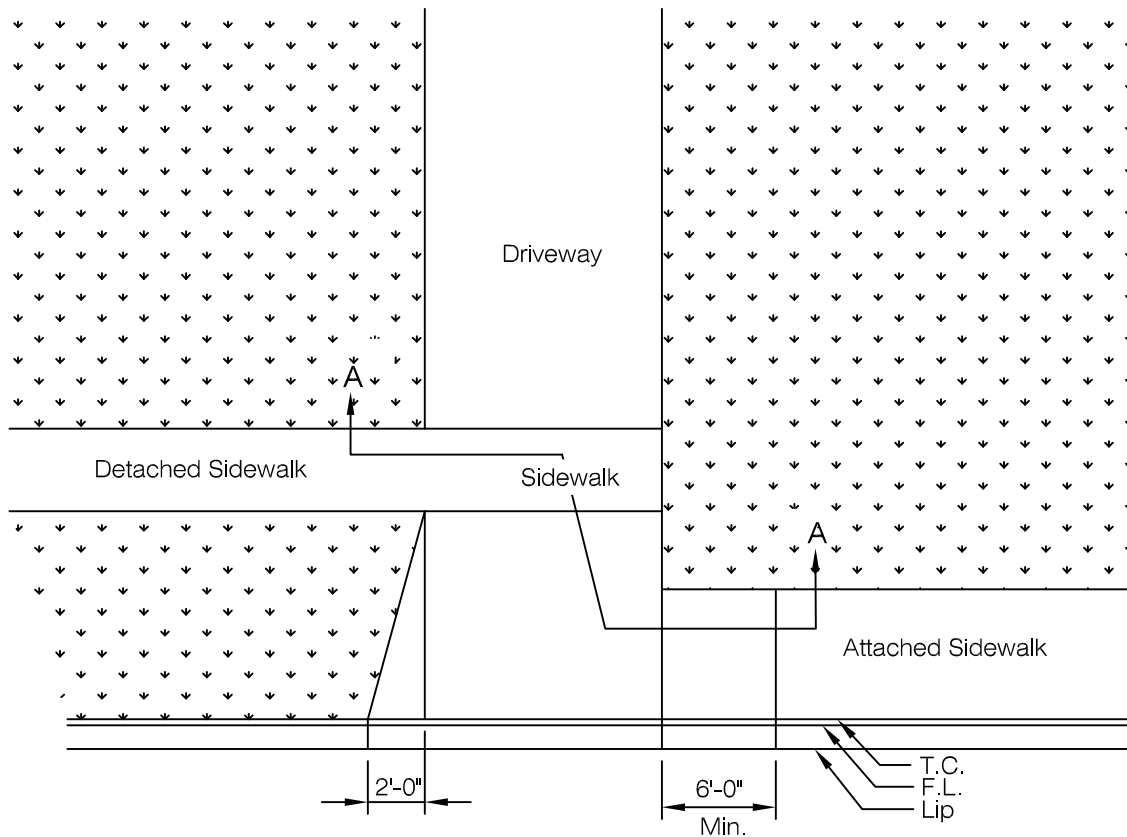
**CONSTRUCTION
DRAWINGS**

REVISION NO:

DATE: 08/01/21

DRAWING

1422



All Sidewalk Thickness Shall Be 6" minimum.

NOTE:

1. Sidewalk grade shall remain consistent across driveway
2. For driveway design requirements, see CONST. DWG. Series 706 & 707
3. This detail applies to Residential & Commercial driveways.

NOT TO SCALE

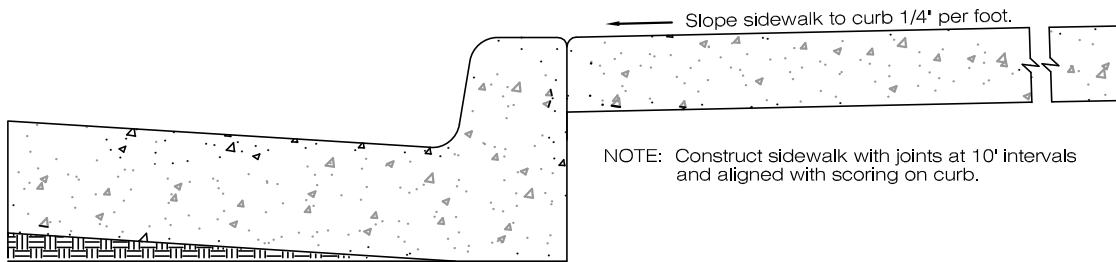
STANDARD SIDEWALK

**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

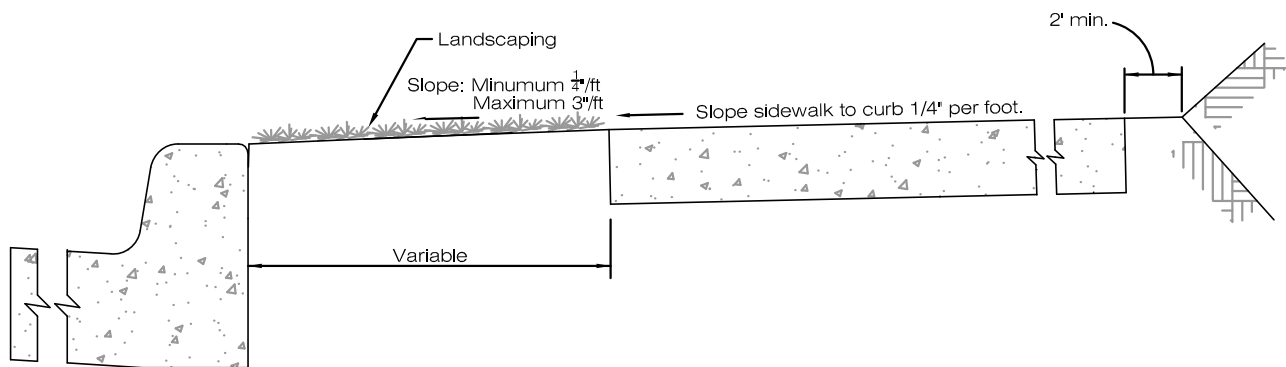
**CONSTRUCTION
DRAWINGS**

REVISION NO: 4
DATE: 02/17/15

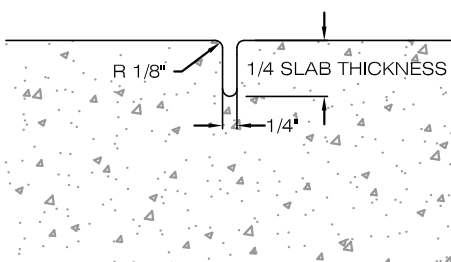
**DRAWING
1601**



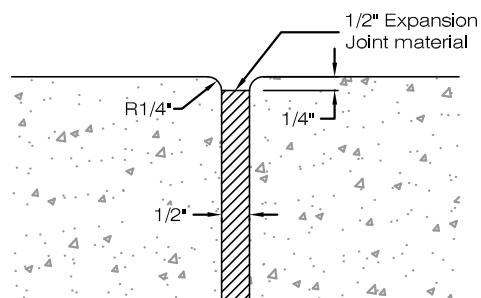
ATTACHED SIDEWALK DETAIL



DETACHED SIDEWALK DETAIL



WEAKENED PLANE JOINT



INSTALL IN LOCATIONS SPECIFIED
IN CHAPTER 22

EXPANSION JOINT

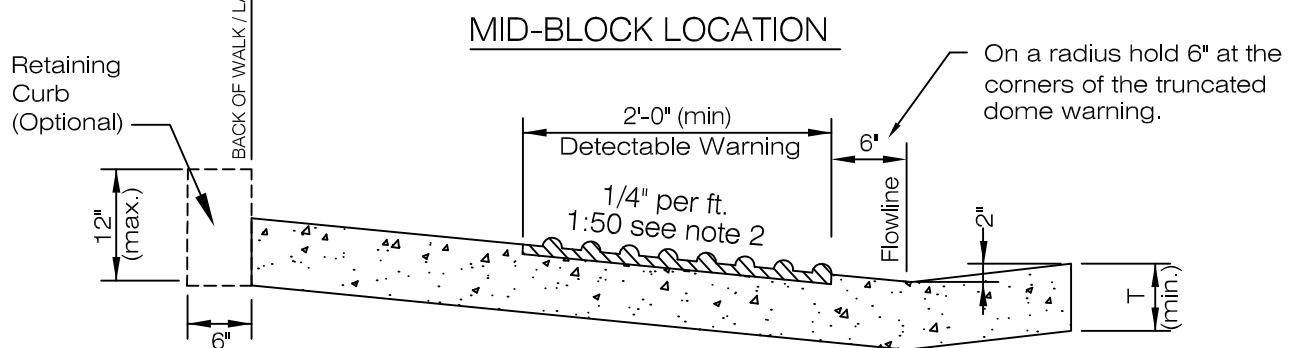
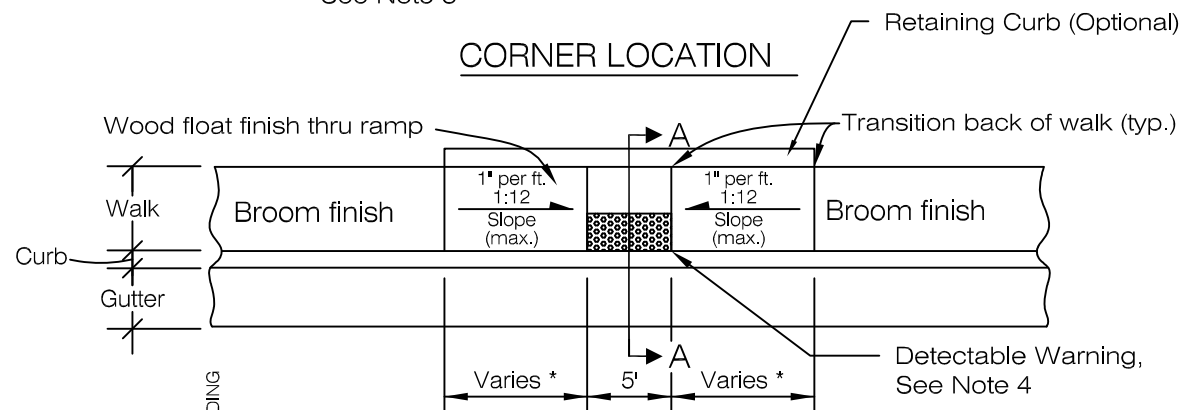
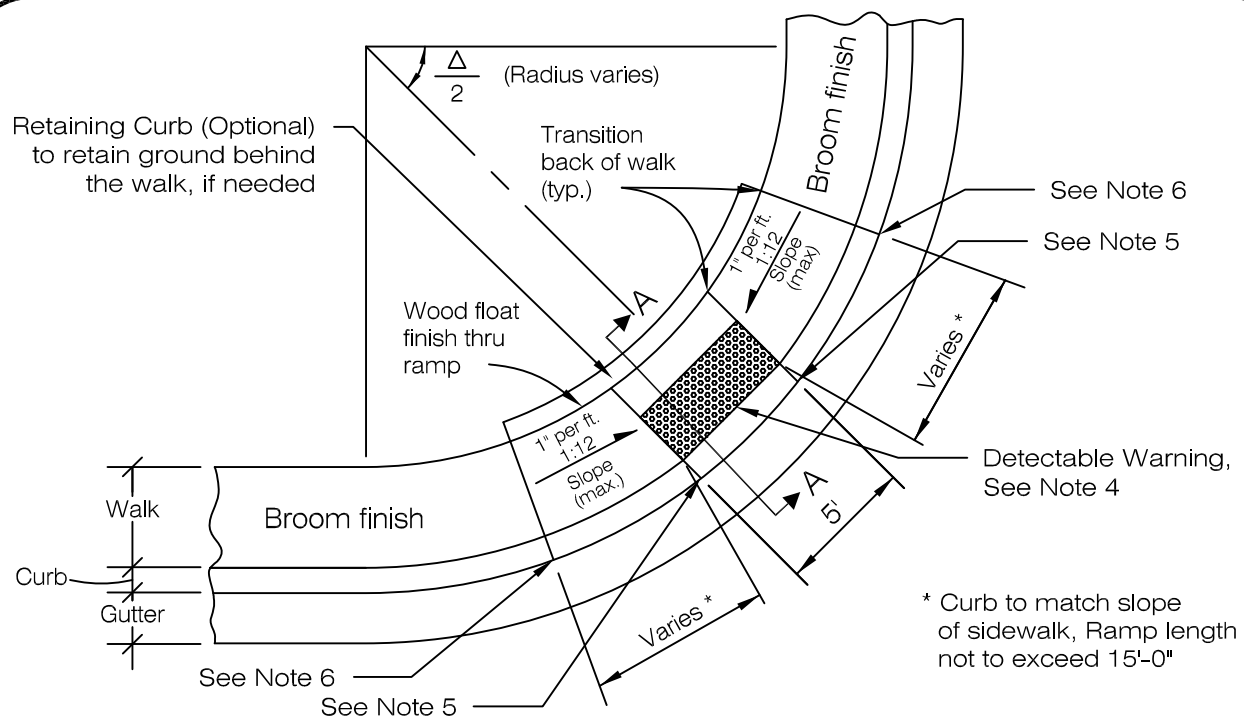
SIDEWALK DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1602



NOTES:

1. T = Concrete thickness, 6" minimum for entire ramp area.
2. 1:50 Max unless a landing behind ramp (then ramp can be 1:12 with 1:20 on the detectable warning).
3. See **CONST. DWG. 1606(a) and 1607** for Fort Collins.
4. Detectable Warning to extend the full width of the ramp. Material to be approved by Local Engineer.
5. 0" Curb height, See Section A-A.
6. Standard Curb and Gutter Section, See Standard Drawing 701.

NOT TO SCALE

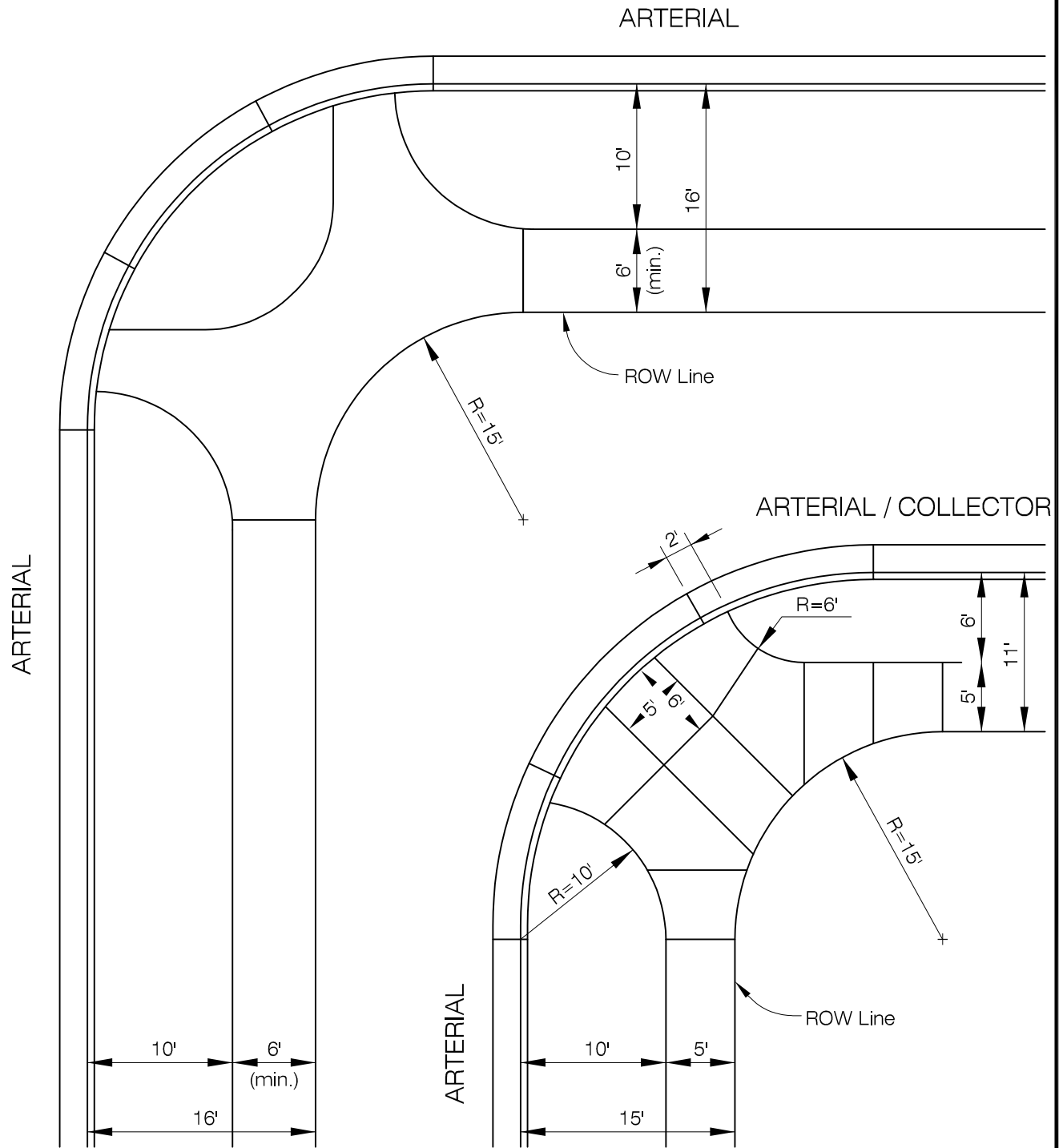
ACCESS RAMP DETAILS

**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

**CONSTRUCTION
DRAWINGS**

REVISION NO: 2
DATE: 02/17/15

**DRAWING
1603**



ARTERIAL / ARTERIAL
For Corner Radius $\geq 35'$

ARTERIAL / COLLECTOR

DETACHED WALK / INTERSECTION DETAIL

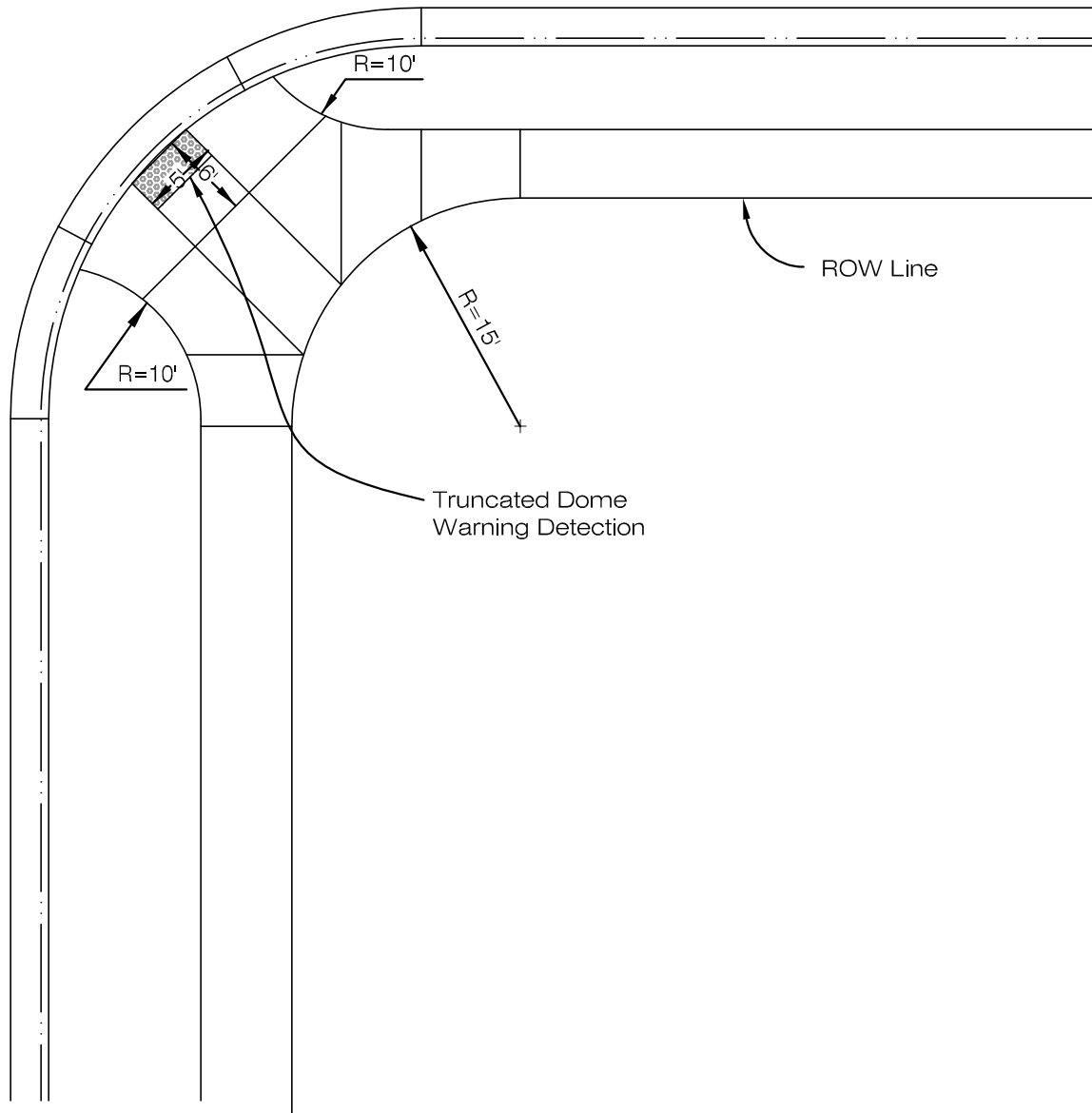
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/07/00

DRAWING
1604



Note:
Use of this detail requires special approval in
Fort Collins by the Local Entity Engineer.

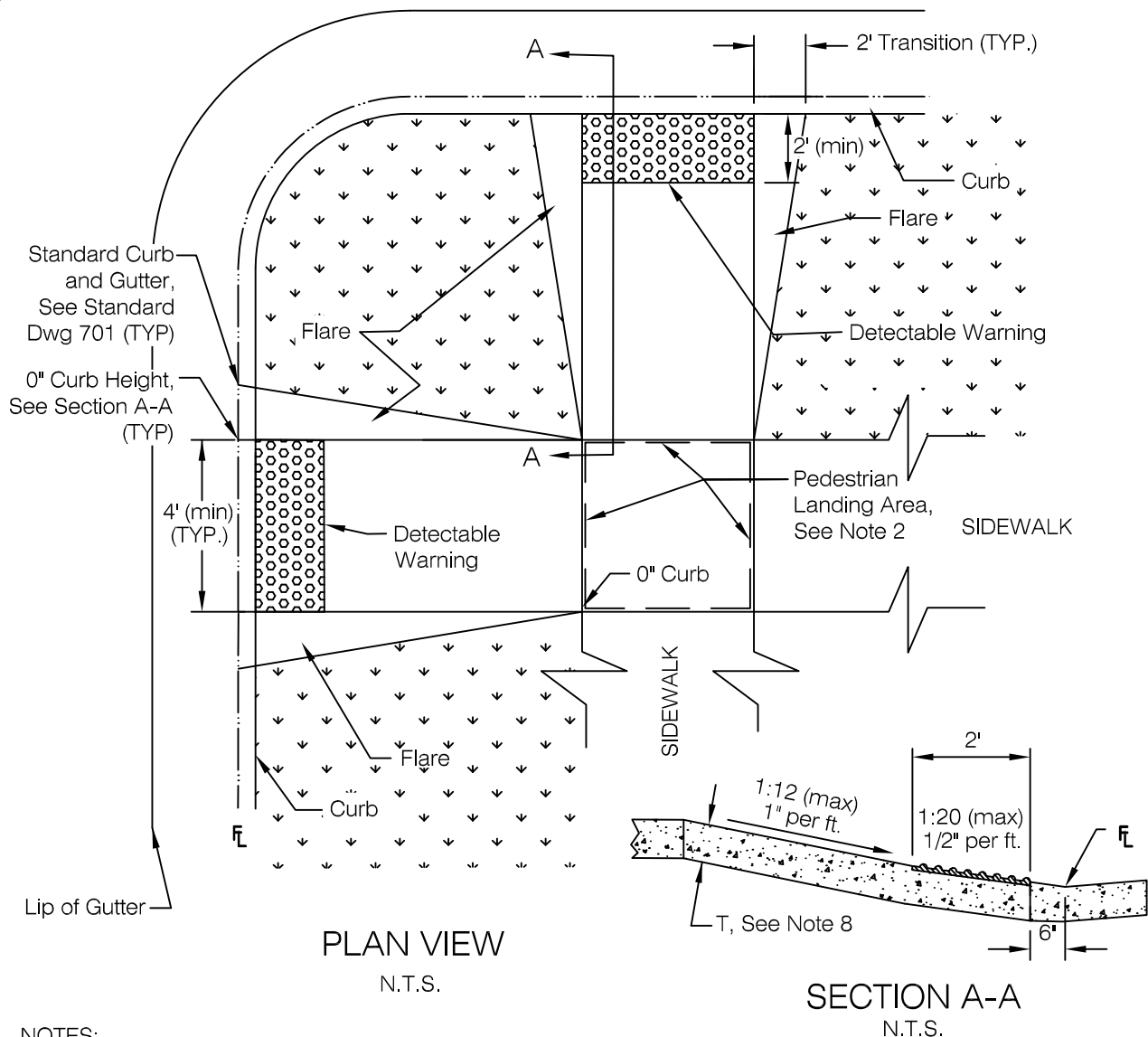
DETACHED WALK / INTERSECTION DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 2
DATE: 04/01/07

DRAWING
1605



NOTES:

1. No joints are allowed in the flowline. Six inch wide curb or "dummy joint" may be tooled no closer than 6 inches from flow line as shown.
2. Pedestrian landing area required 4 ft length x 4 ft width, max slope in any direction is 1:50 or $\frac{1}{4}$ " per foot.
3. Joint pattern to be according to intersection gutter detail or as determined by the local entity.
4. Wood float finish is required over the sloped surface of ramp and flares.
5. Minimum ramp width shall be four feet, or the same as the widest adjacent sidewalk, whichever is greater, up to a maximum width of 8 feet.
6. Detectable warning is to extend full width of the ramp and be a minimum of 2.0' in the direction of travel. Material to be approved by local engineer
7. T = Concrete thickness, 6" minimum for entire ramp area.

NOT TO SCALE

DIRECTIONAL ACCESS RAMP DETAIL & DETACHED SIDEWALK

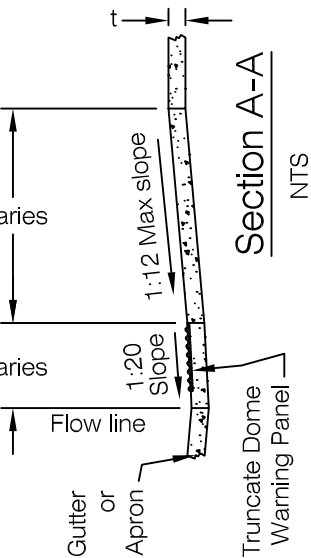
**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

**CONSTRUCTION
DRAWINGS**

REVISION NO: 2
DATE: 08/01/21

**DRAWING
1606**

Truncated Dome Warning Detection Plan Locations

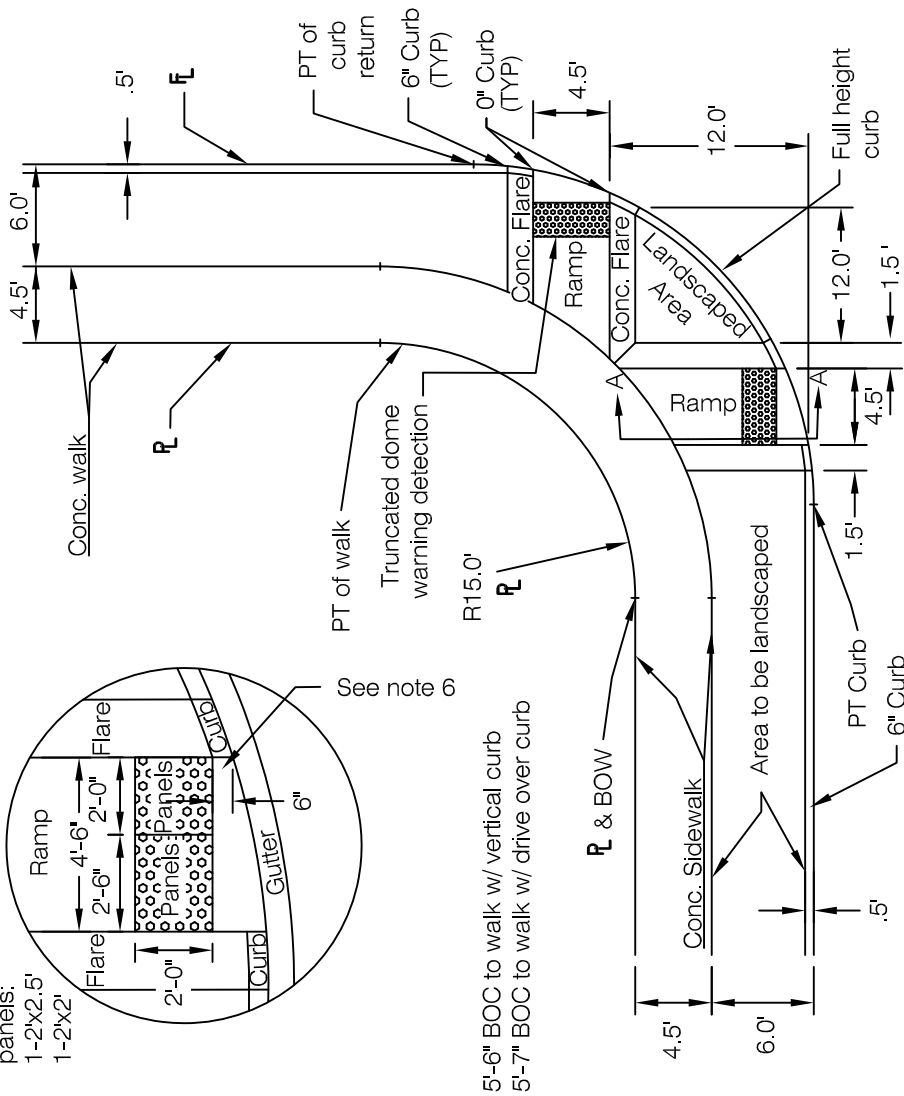


Notes:

1. Set ramp slopes using the center of the ramp.
2. Truncated dome warning panel: Install panels along with the concrete pour for ramp. Specifications for the panel material will be provided upon request.
3. Each ramp shall align perpendicular to the street in which the ramp is provided to cross.
4. Refer to standard drawing 1606 in the Laimier County urban area street standards for other necessary criteria needed to construct these ramps that is not specified on this drawing.
5. Construct the ramps and walk so the concrete area all drains to the street.
6. If curb and gutter are poured monolithic ramp, place dome edge at back of curb as shown. If not poured monolithic, place dome edge 6" from back of curb.

NOT TO SCALE

FORT COLLINS ONLY



PLAN VIEW

NTS

LEGEND:

BOC- Back of curb

P_L Property Line

PT - Point of Tangency

RESIDENTIAL LOCAL STREET ACCESS RAMPS

LARIMER COUNTY URBAN AREA STREET STANDARDS

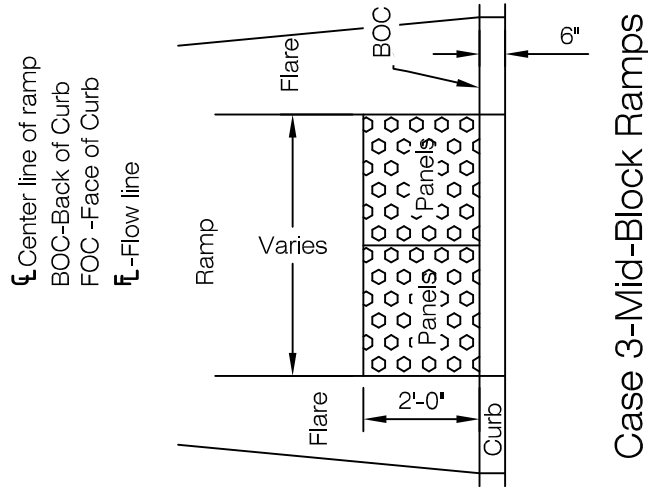
CONSTRUCTION DRAWINGS

REVISION NO: 3

DATE: 02/17/15

DRAWING
1606a

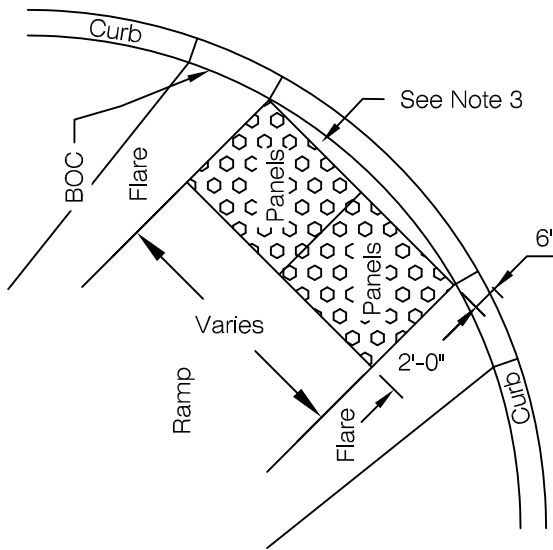
FORT COLLINS ONLY



Case 3-Mid-Block Ramps

Ramp Width	Panel Width
4.5'	2'+2.5'
5.0'	2.5'+2.5'
6.0'	2'+2'+2'
7.0'	2.5'+2'+2.5'
8.0'	2'+2'+2'+2'

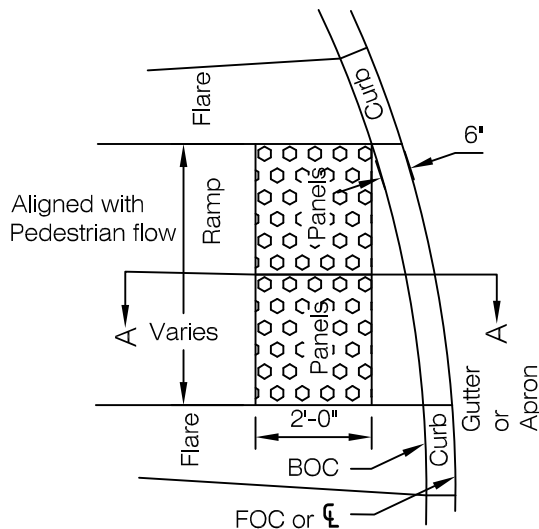
Note:
Truncated dome panels are available in 2'x2' squares and 2'x2.5' rectangles. Combine the widths to fit the ramp. Panels may be cut to no less than a 2'x1.5' size.



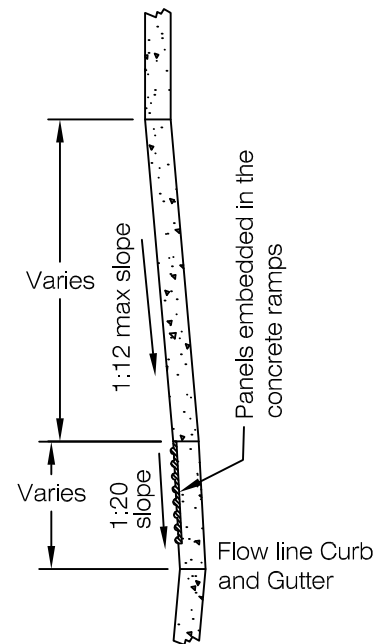
Case 2-Non-Directional Ramps

Notes:

1. Truncated dome warning panel: Install panels along with the concrete pour for the ramp. Specifications for the panel and installation instructions will be provided upon request.
2. This drawing shows vertical curb. For Drive Over Curb the warning detection location shall be placed in the same position 6" back from the back of curb.
3. If curb and gutter are poured monolithic with ramp, place dome edge at back of curb as shown. If not poured monolithic, place dome edge 6" from back of curb.



Case 1-Directional Ramps



Section A-A (Center line of ramp)

NOT TO SCALE

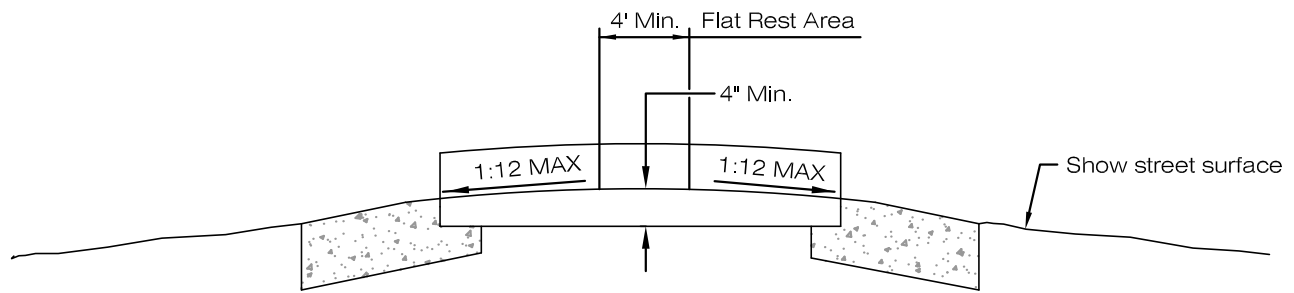
TRUNCATED DOME WARNING FOR ACCESS RAMPS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

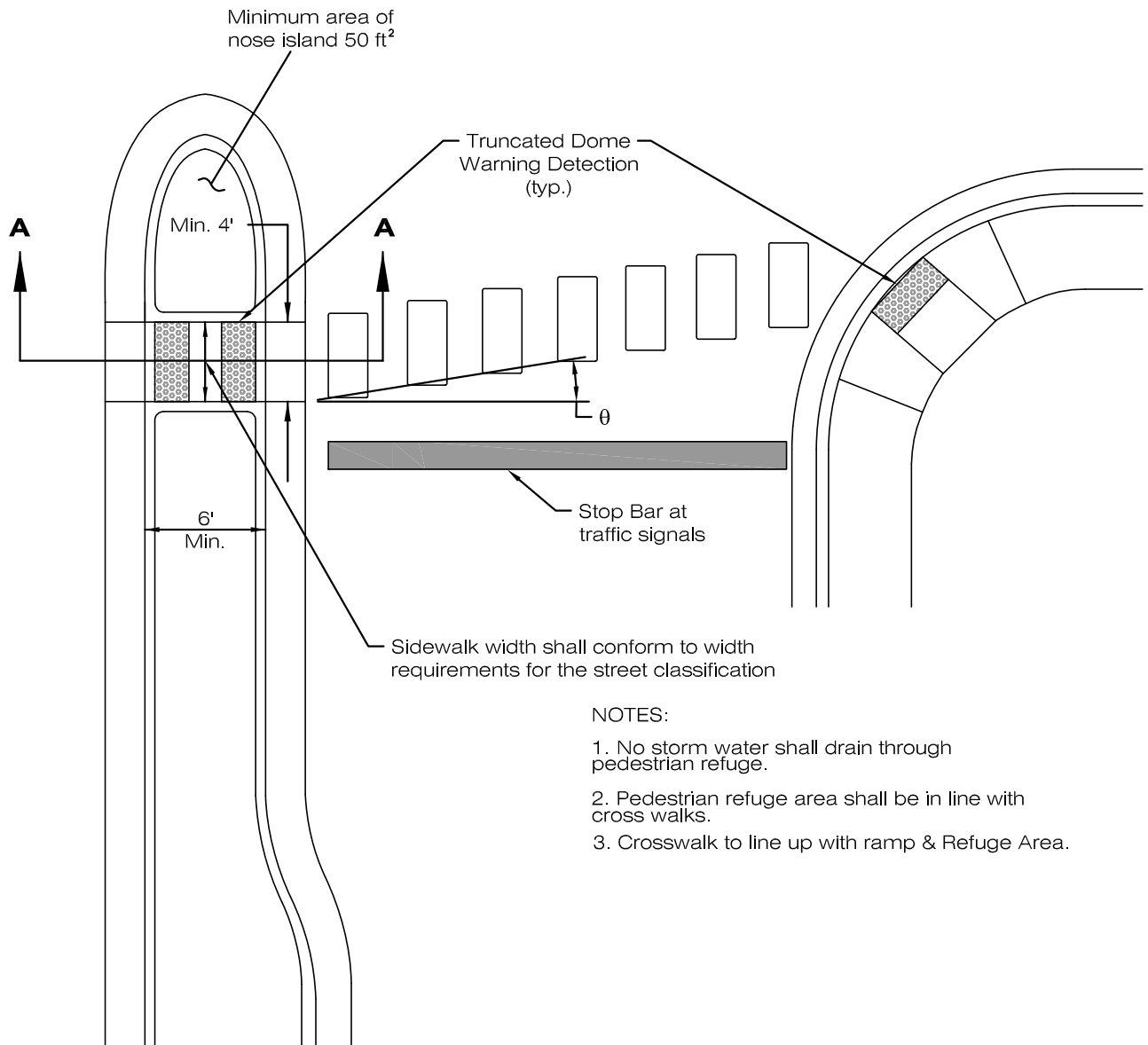
CONSTRUCTION
DRAWINGS

REVISION NO: 3
DATE: 02/17/15

DRAWING
1607



SECTION A-A



NOTES:

1. No storm water shall drain through pedestrian refuge.
2. Pedestrian refuge area shall be in line with cross walks.
3. Crosswalk to line up with ramp & Refuge Area.

MEDIAN ISLANDS & PEDESTRIAN REFUGE AREA

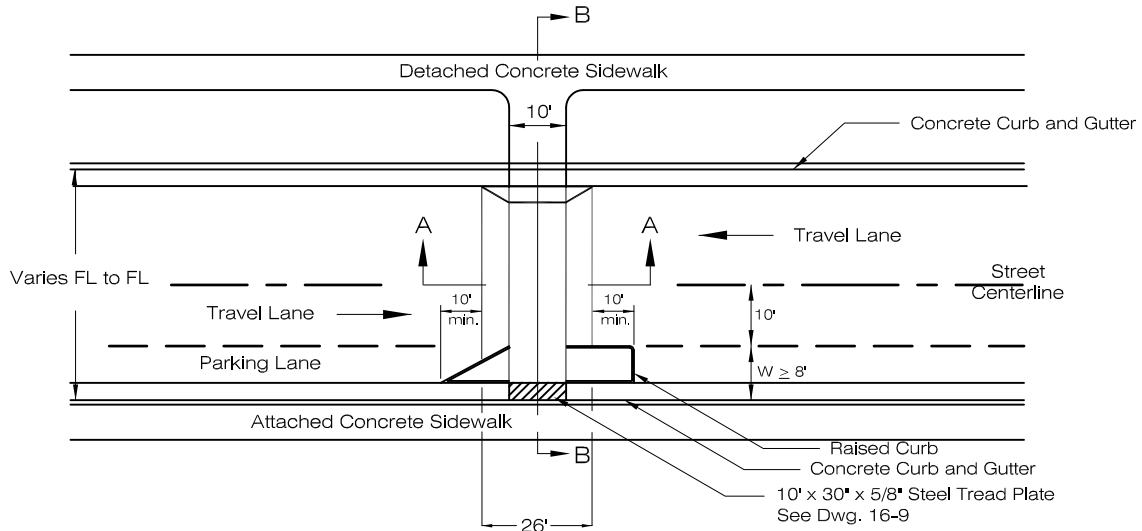
**LARIMER COUNTY
URBAN AREA
STREET STANDARDS**

**CONSTRUCTION
DRAWINGS**

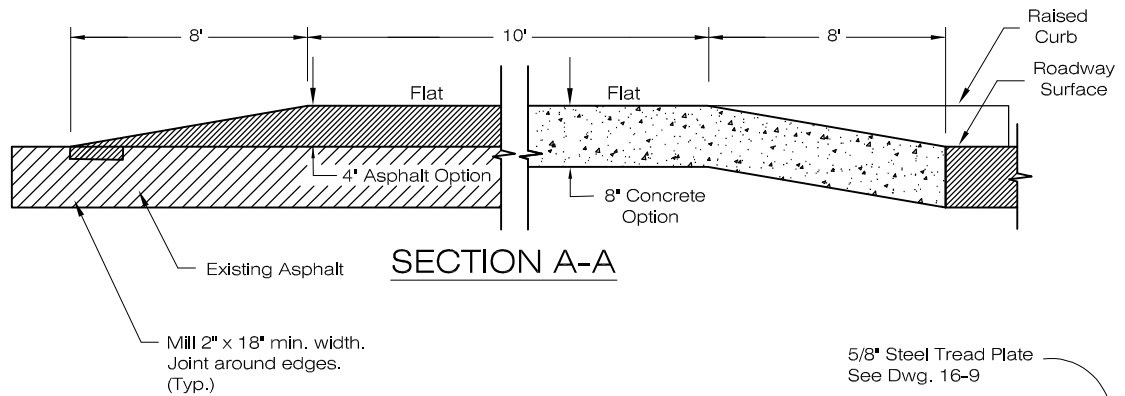
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DATE: 04/01/07

**DRAWING
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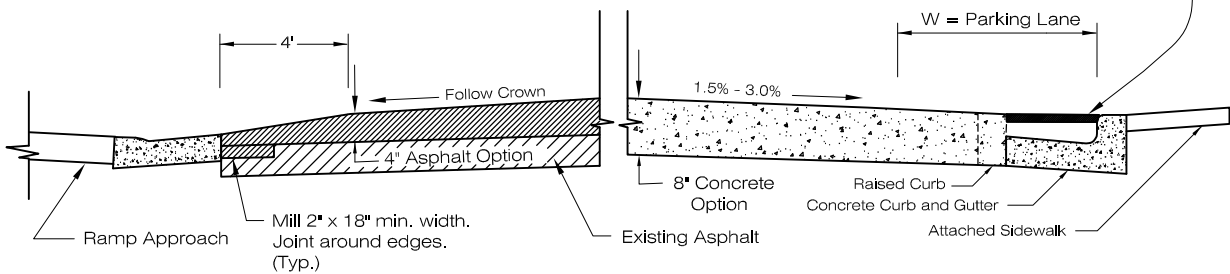
LOVELAND ONLY



PLAN VIEW



SECTION A-A



SECTION B-B
Curb Options

NOTES:

1. Contractor to use tack coat on all contact surfaces.
2. Speed Hump shall follow crown of road with constant thickness of 4".
3. Ramp or elevated approaches may be used.

4. Speed Humps are not allowed on major collector or arterial roadways.

5. See Dwgs 14-19 and 14-16 for signing and marking requirements.

6. Asphalt or concrete may be used for raised pedestrian crossings with ramp approach. Concrete only shall be used for elevated approach.

RAISED PEDESTRIAN CROSSING / SPEED TABLE

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

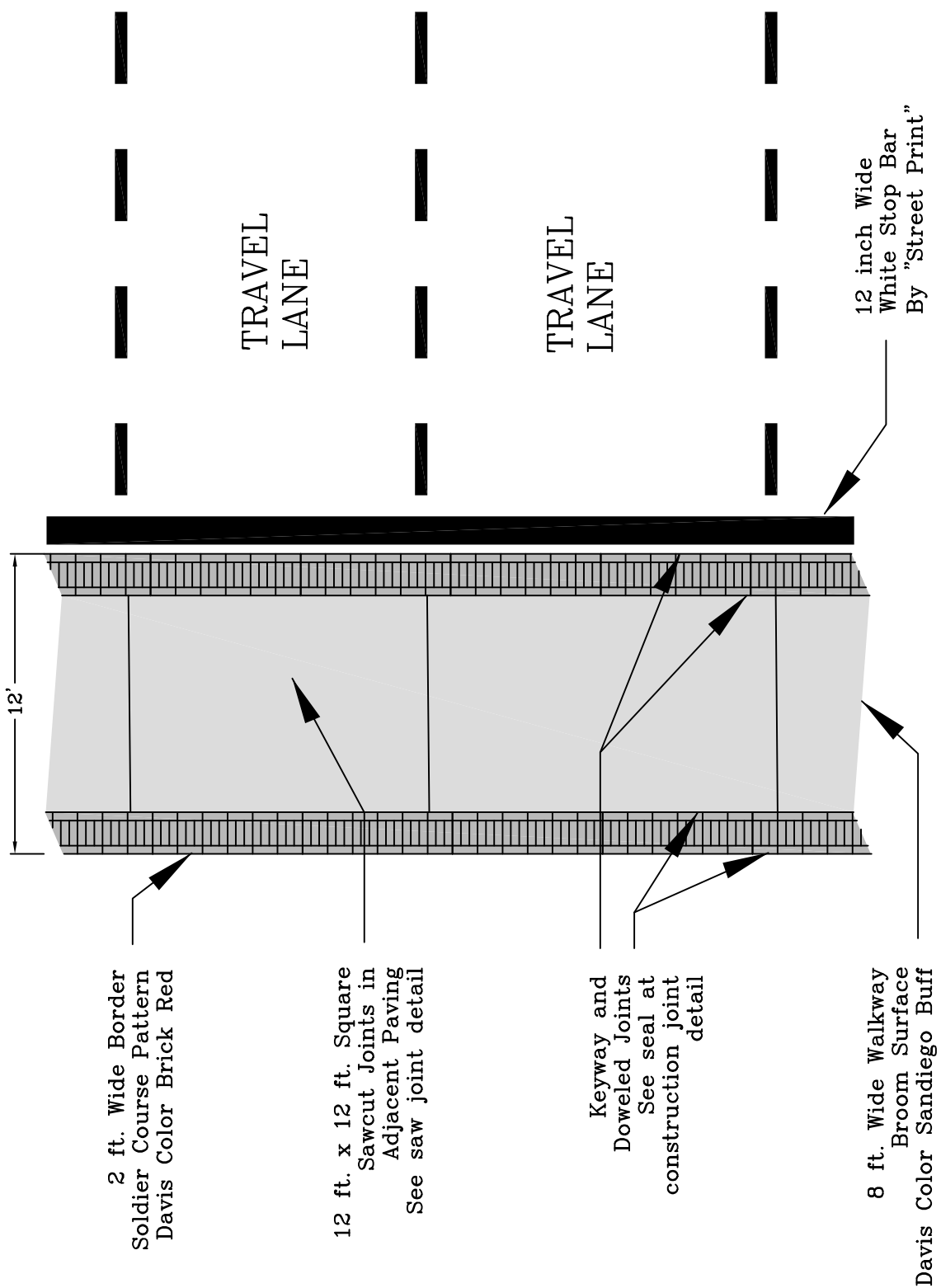
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 01/26/01

DRAWING

1609L



DECORATIVE CONC. CROSSWALK (PATTERNED/COLORED CONC.)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

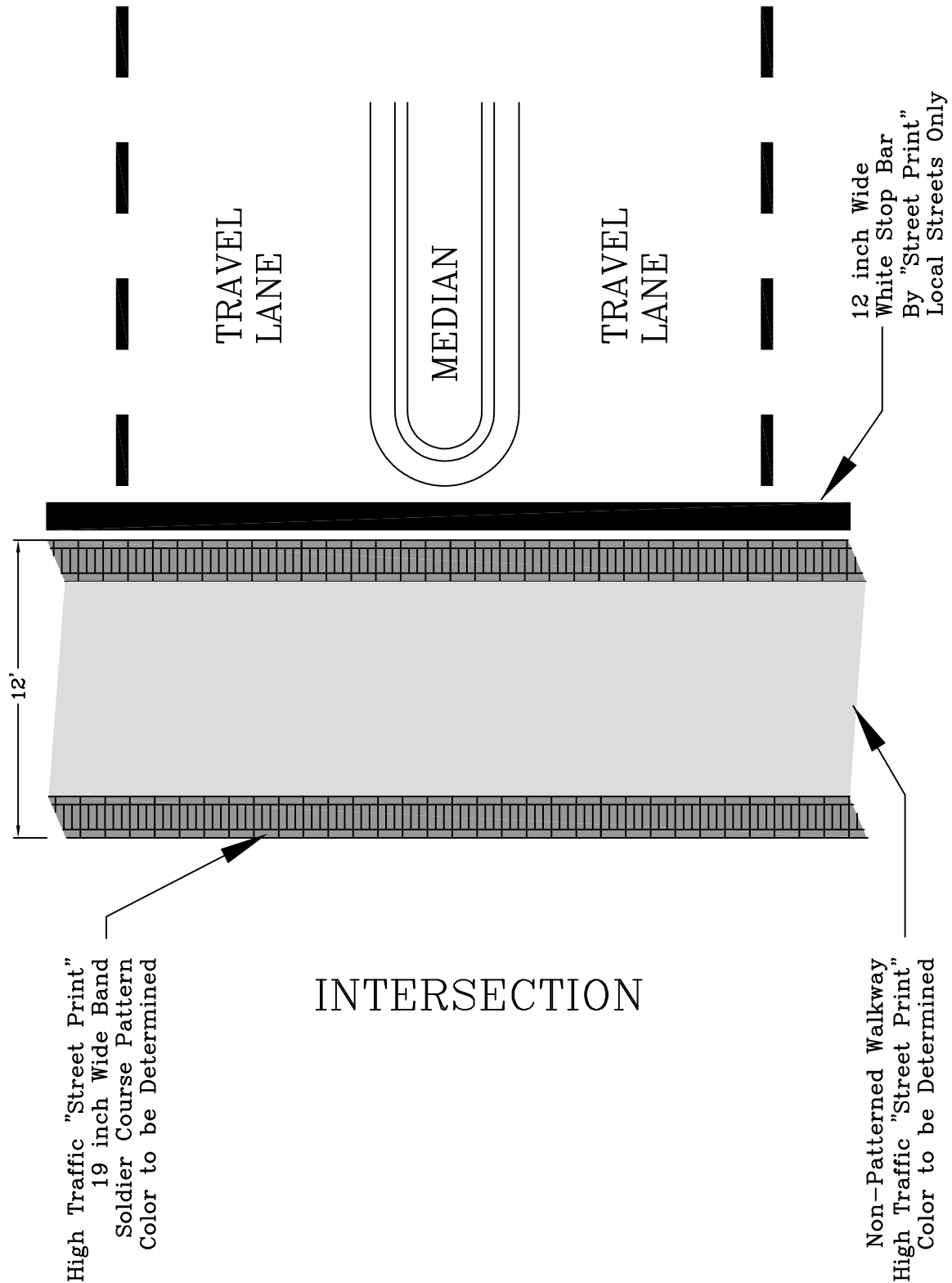
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 11/08/00

DRAWING

1610



ENHANCED ASPH. CROSSWALK (PATTERNED/COLORED ASPH.)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

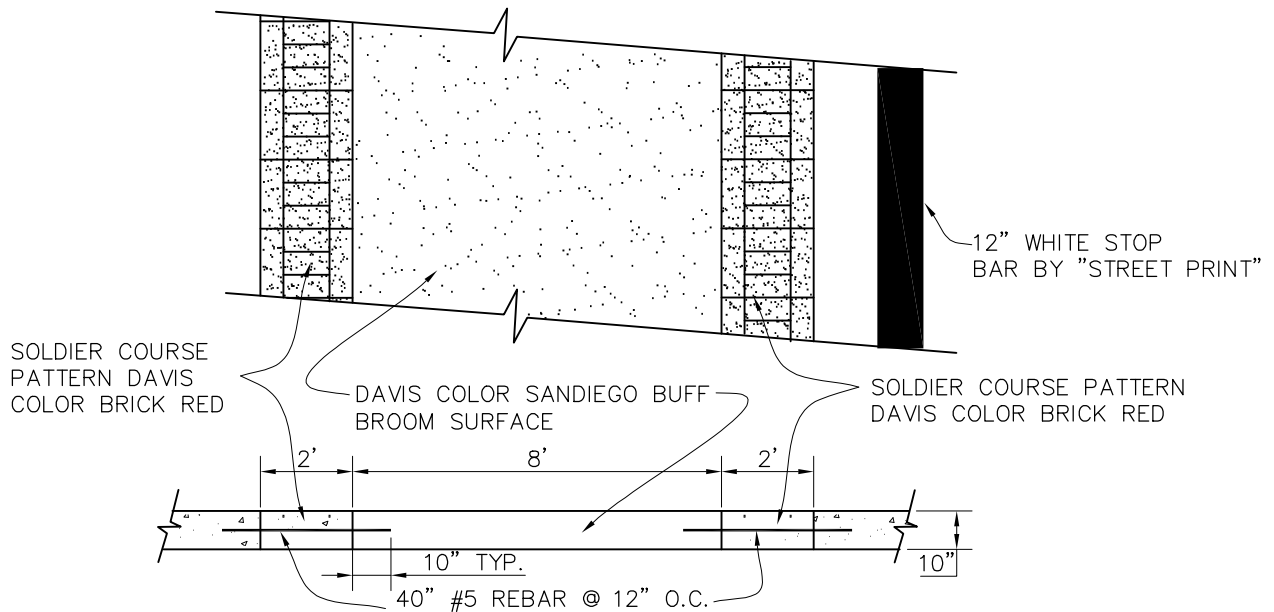
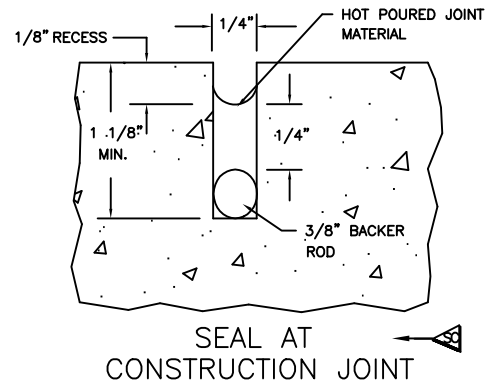
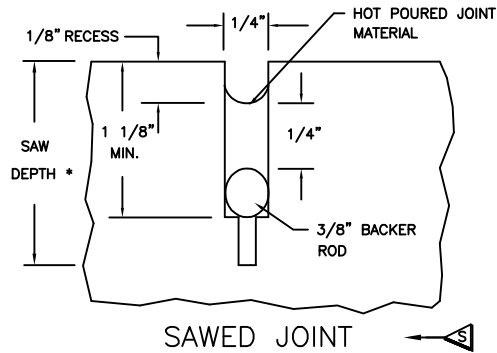
CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 11/07/00

DRAWING

1611



TYPICAL CROSSWALK DETAIL

N.T.S.

ENHANCED CONCRETE CROSSWALK (CONSTRUCTION DETAIL)

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

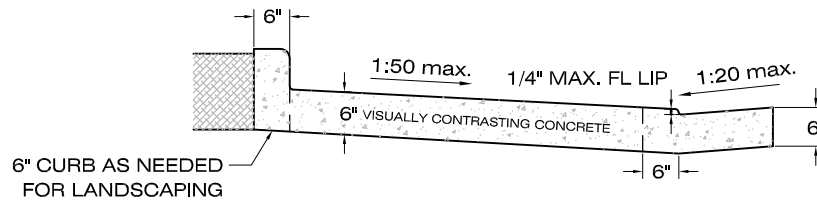
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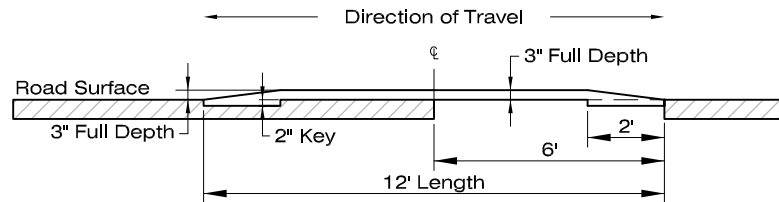
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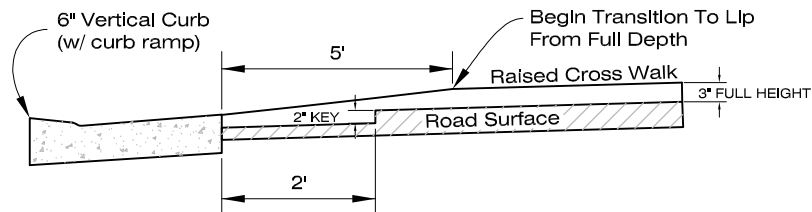
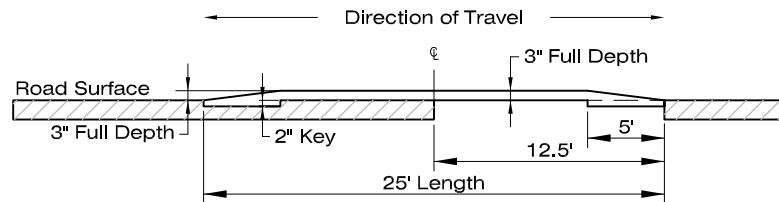
1612



SPEED TABLE CROSS-SECTION
N.T.S.



RAISED CROSS WALK CROSS-SECTION
N.T.S.



EDGE TAPER CROSS-SECTION
N.T.S.

RAISED CROSS WALK

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

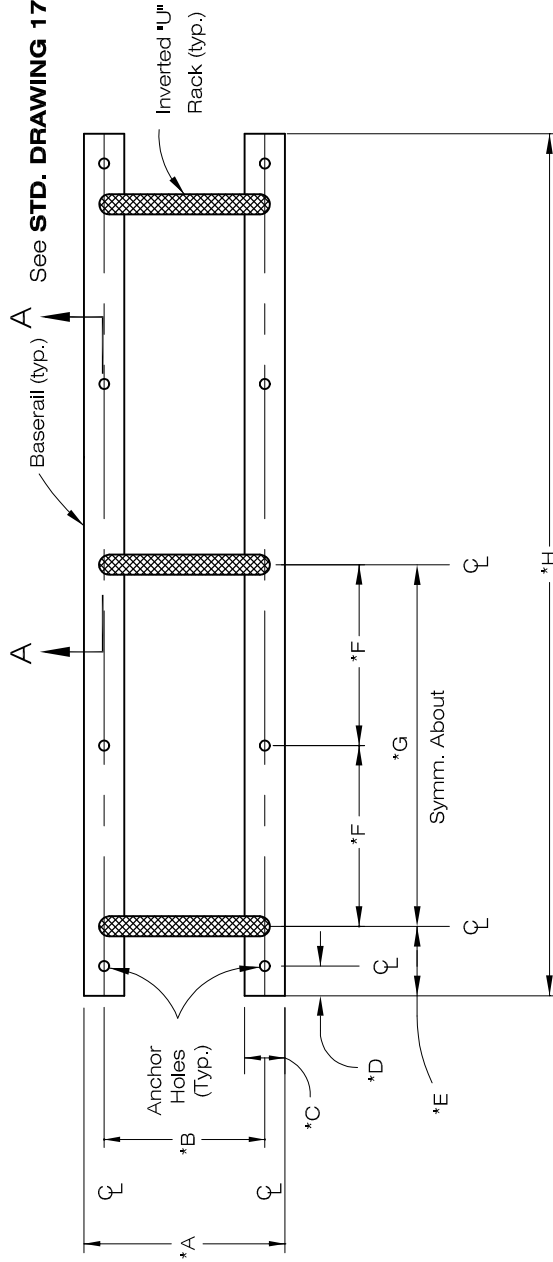
REVISION NO:

DATE: 04/16/02

DRAWING

1613

See **STD. DRAWING 1702** for Section.



PLAN VIEW
BASE RAIL ARRAY

NOTES:

* REFER TO SCHEDULE BELOW

**3X INVERTED "U" ARRAY SHOWN

RACK BASERAIL LENGTH SCHEDULE								
DESCRIPTION OF UNITS REQ'D	BASERAIL							
	A	B	C	D	E	F	G	H
2X ARRAY INVERTED "U" RACKS	(19.1")	(16.1")	(3.0")	(1.50")	(4")	(15")	(30")	(38")
3X ARRAY INVERTED "U" RACKS **	(19.1")	(16.1")	(3.0")	(1.50")	(4")	(15")	(30")	(38")
4X ARRAY INVERTED "U" RACKS	(19.1")	(16.1")	(3.0")	(1.50")	(4")	(15")	(30")	(38")
5X ARRAY INVERTED "U" RACKS	(19.1")	(16.1")	(3.0")	(1.50")	(4")	(15")	(30")	(38")

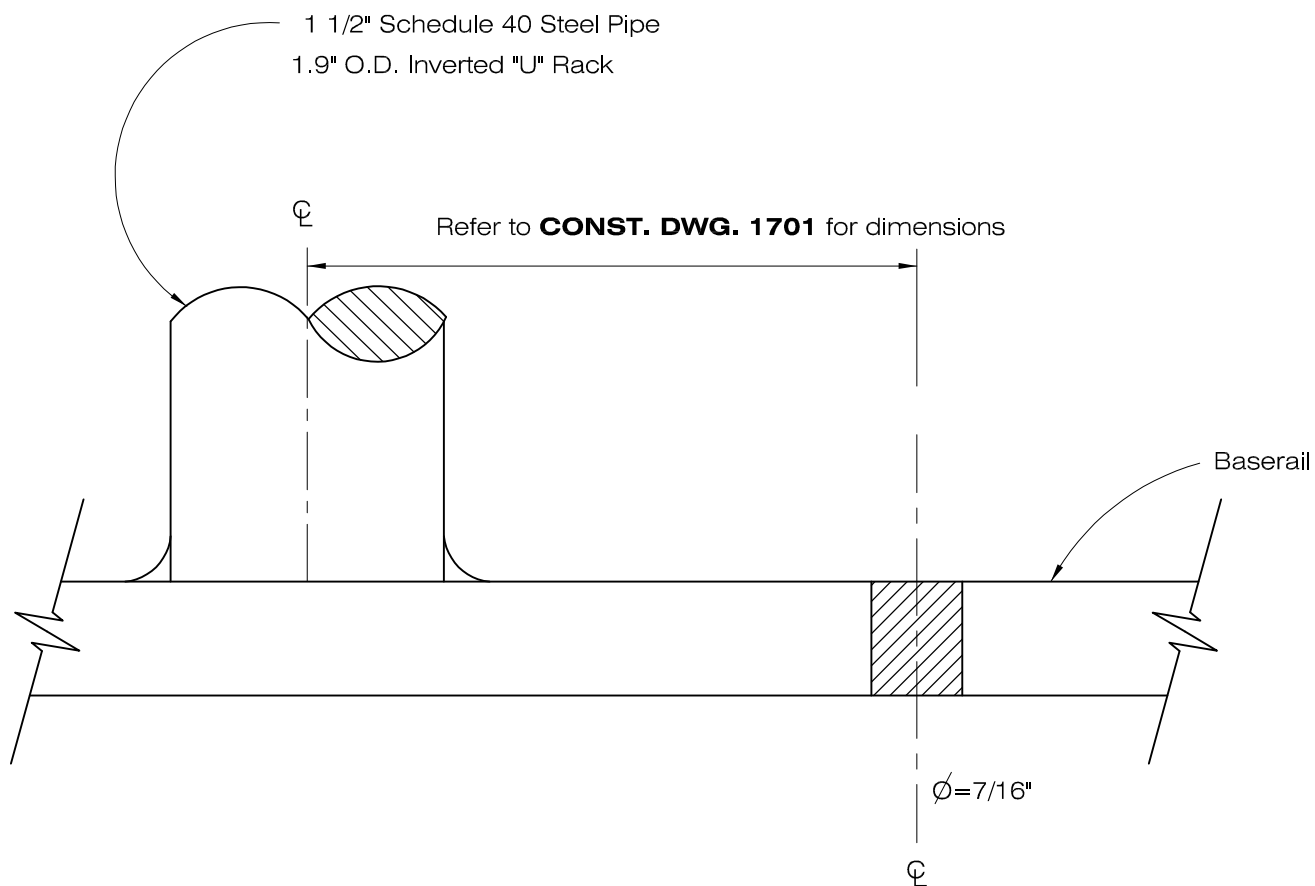
BICYCLE RACK DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:
DATE: 08/07/00

DRAWING
1701



BICYCLE RACK DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

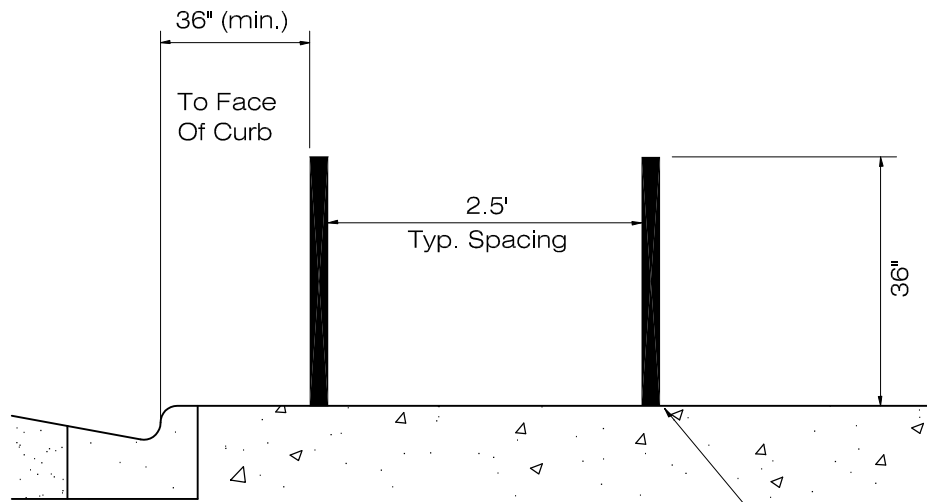
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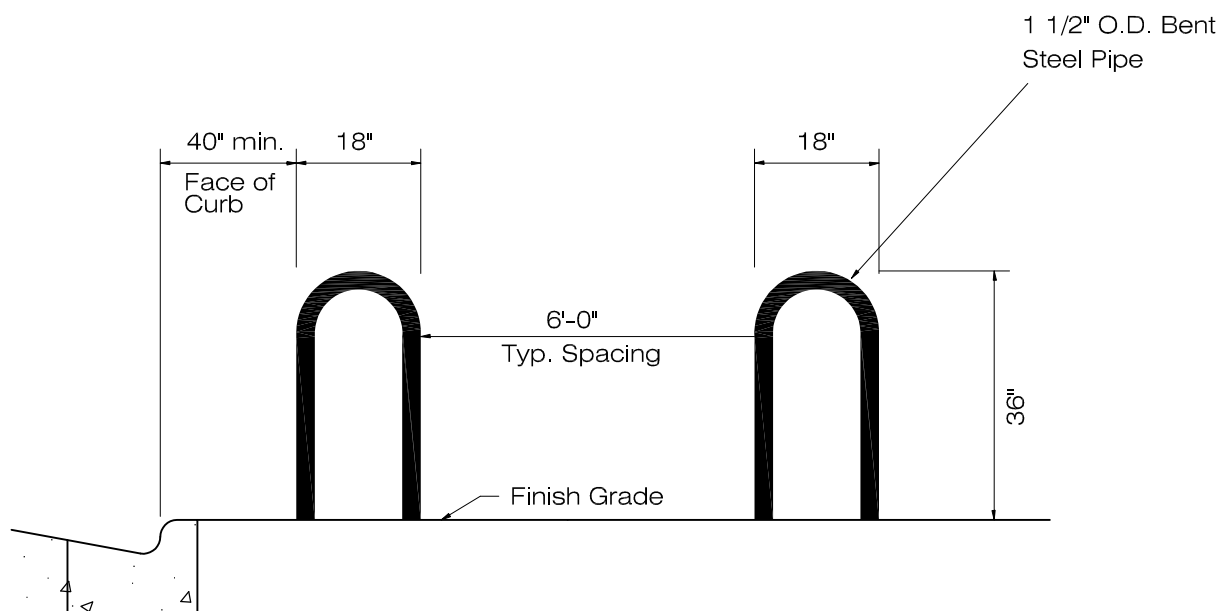
DATE: 08/07/00

DRAWING

1702



"INVERTED U" BICYCLE RACK



SPACE REQUIREMENTS

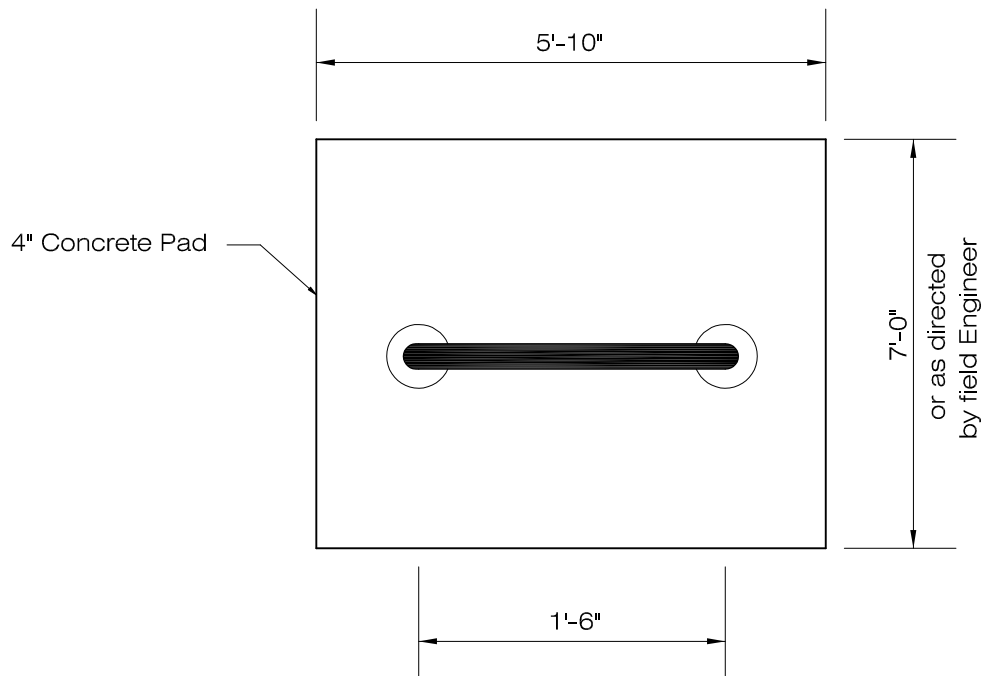
BICYCLE RACK DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

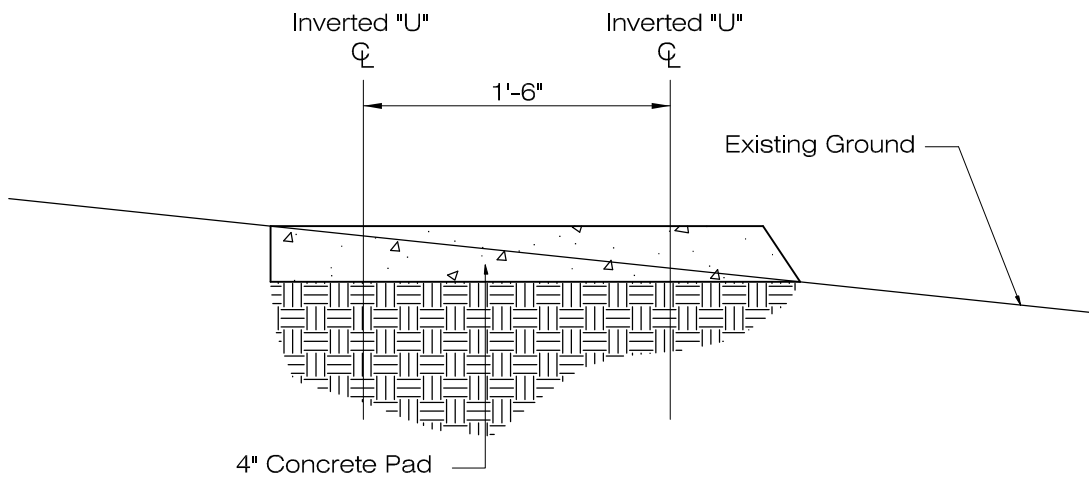
CONSTRUCTION
DRAWINGS

REVISION NO:	1
DATE:	03/01/02

DRAWING
1703



PLAN-CONCRETE PAD



ELEVATION

BICYCLE RACK FOUNDATION DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

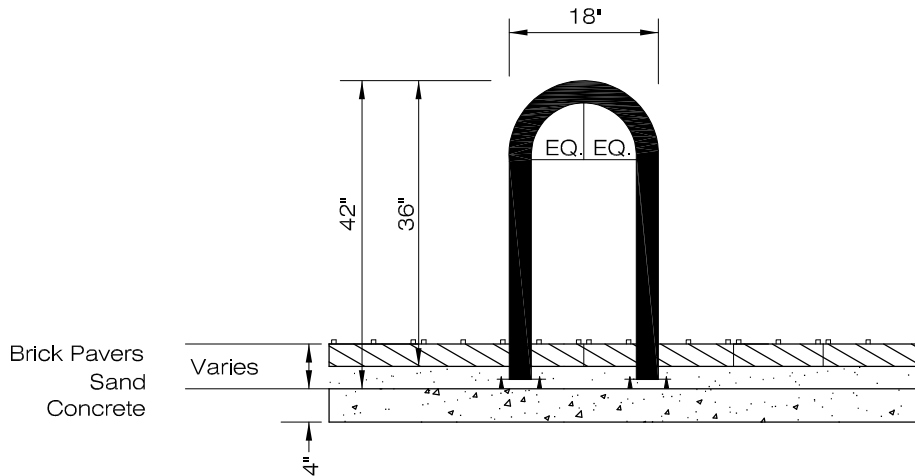
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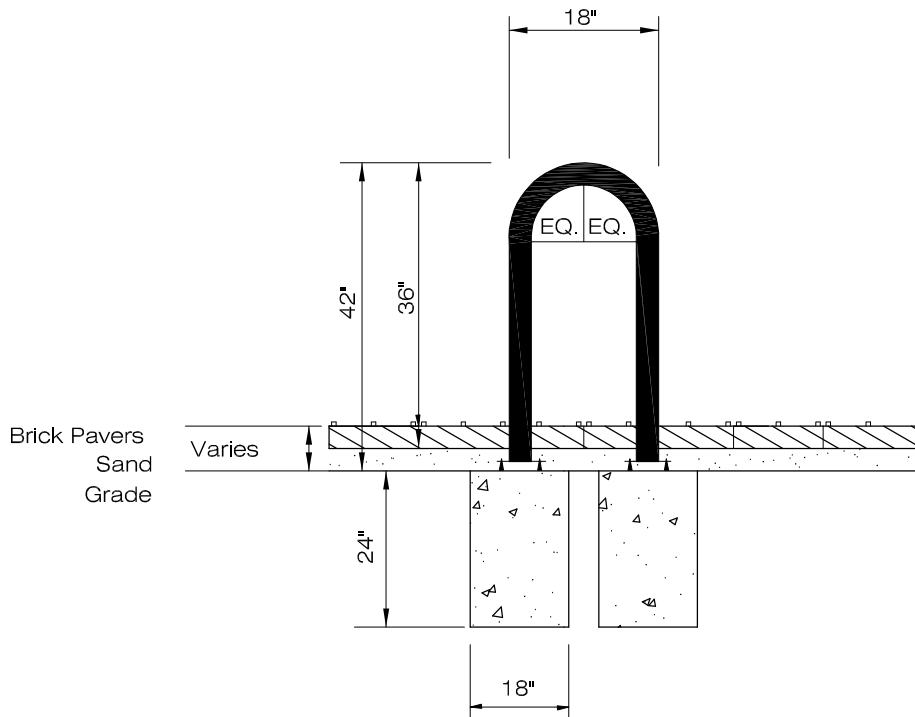
DATE: 08/07/00

DRAWING

1704



42" BICYCLE RACK IN EXISTING BRICK PAVERS
SET IN SAND ON CONCRETE



42" BICYCLE RACK IN EXISTING BRICK PAVERS
SET IN SAND ON GRADE

BICYCLE RACK DETAILS

LARIMER COUNTY
 URBAN AREA
 STREET STANDARDS

CONSTRUCTION
 DRAWINGS

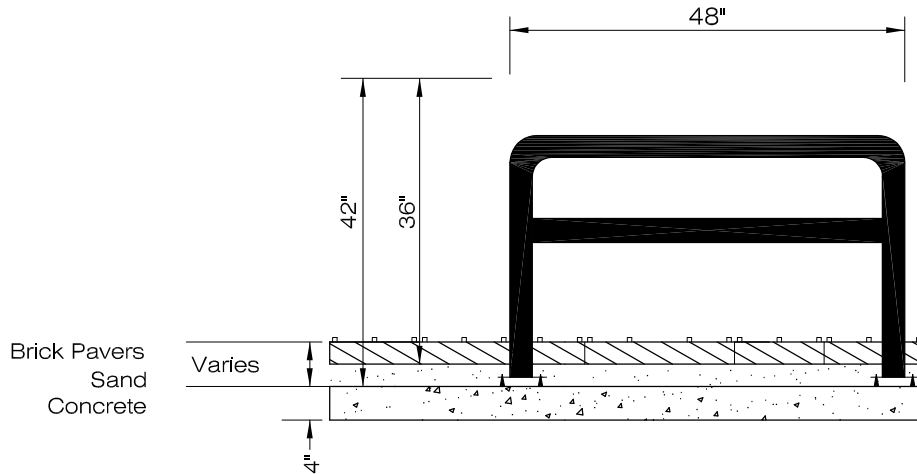
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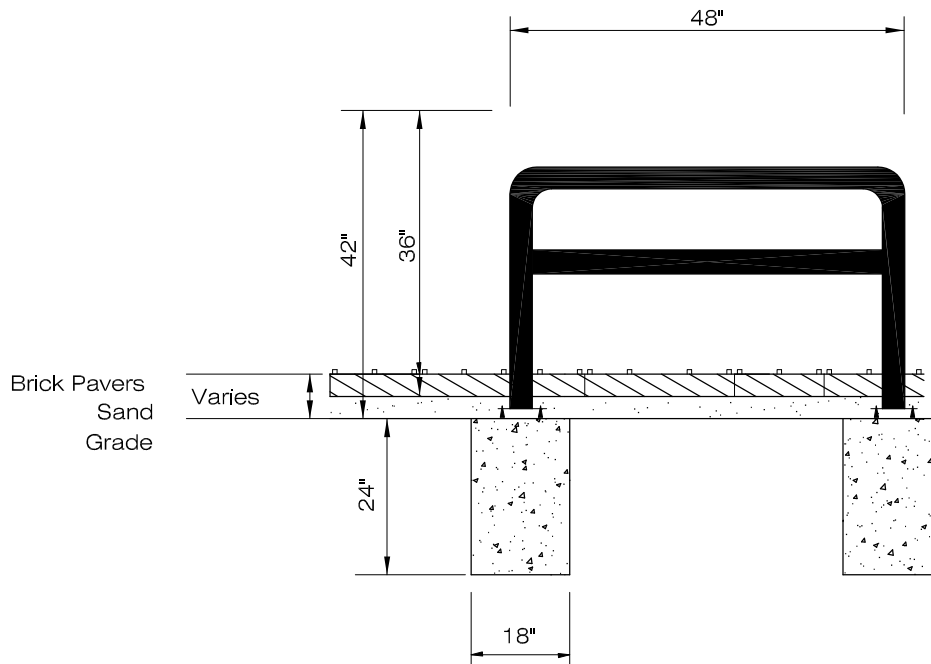
DRAWING

1705

FORT COLLINS ONLY



42" BICYCLE RACK IN EXISTING BRICK PAVERS
SET IN SAND ON CONCRETE



42" BICYCLE RACK IN EXISTING BRICK PAVERS
SET IN SAND ON GRADE

BICYCLE RACK DETAILS

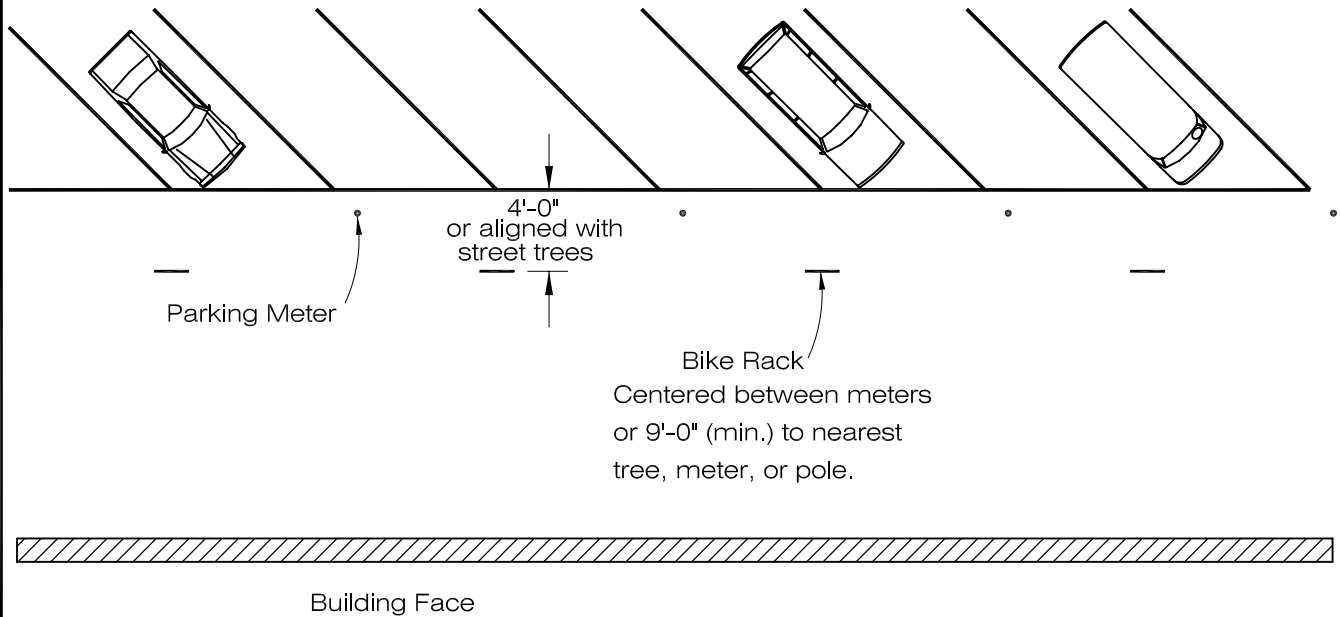
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:

DATE: 08/07/00

DRAWING
1706F



INVERTED U RACKS PLACEMENT
ALONG CURBLINE
WITH DIAGONAL PARKING

BICYCLE RACK DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

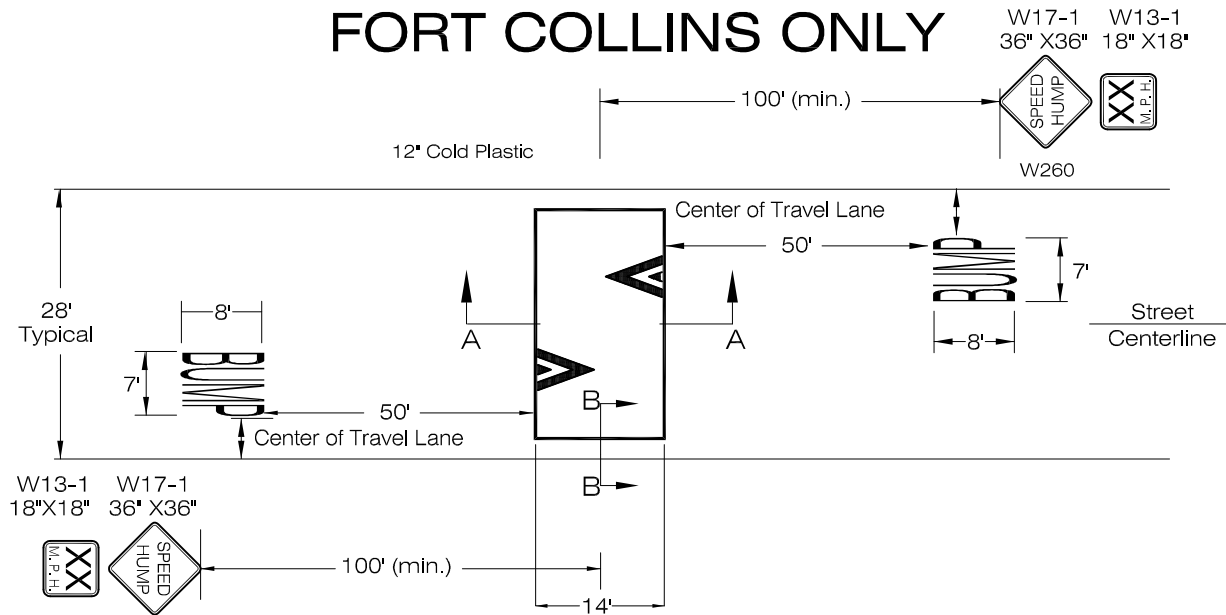
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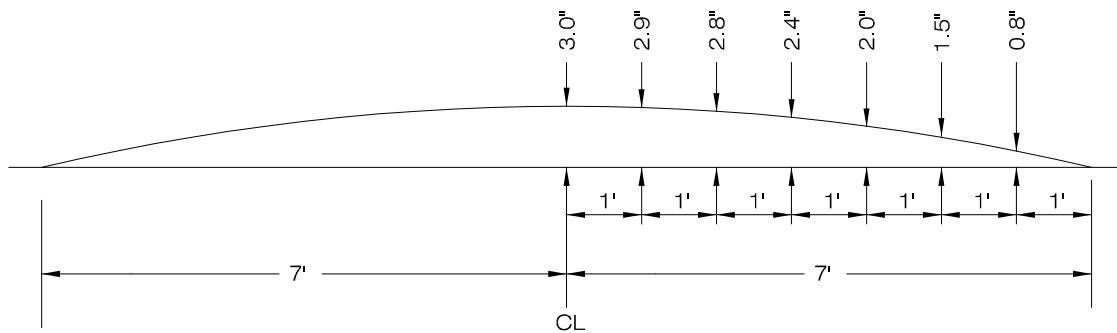
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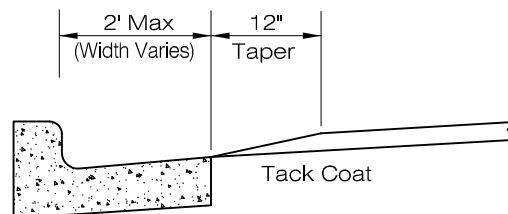
FORT COLLINS ONLY



SPEED HUMP (Typ.)



SECTION A-A
PARABOLIC CROWN



SECTION B-B
Curb Detail

14' LOCAL SPEED HUMP

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

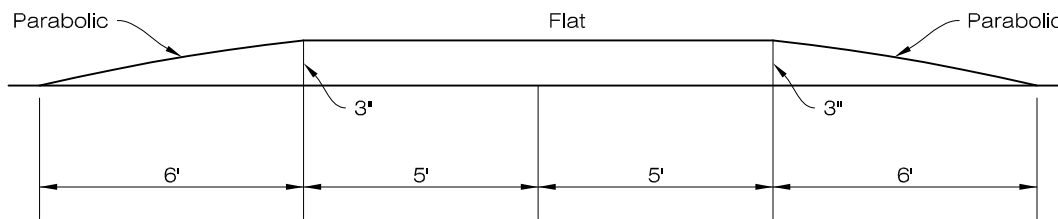
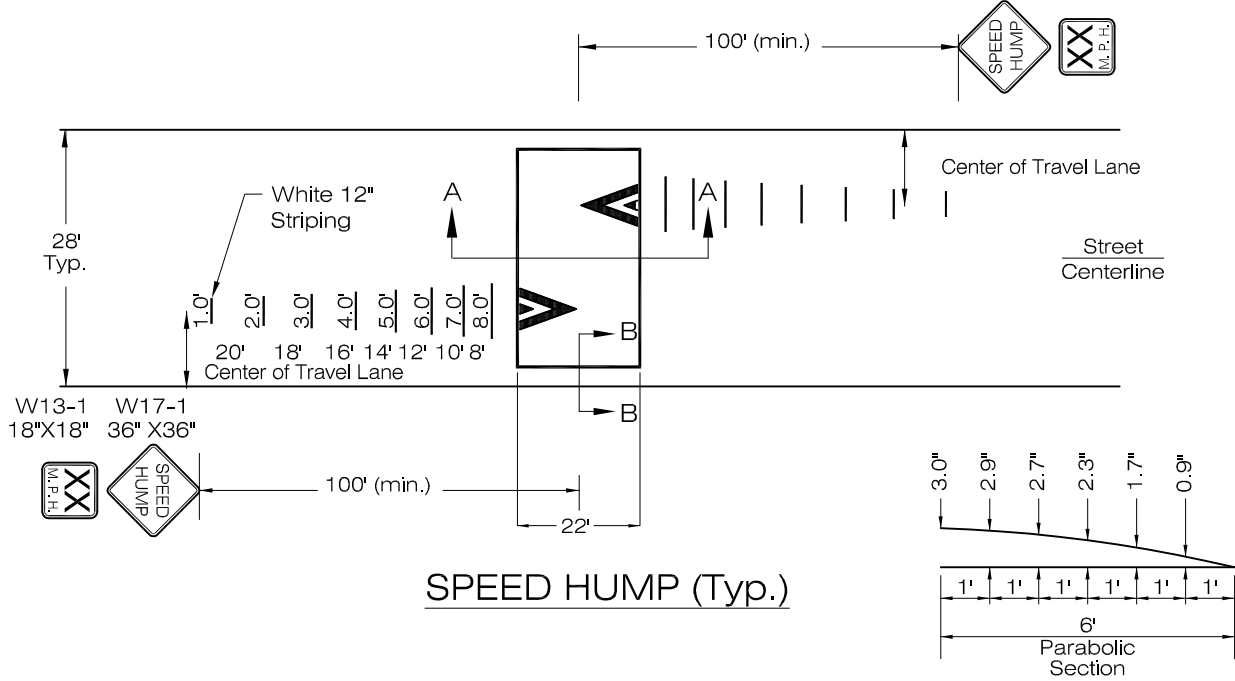
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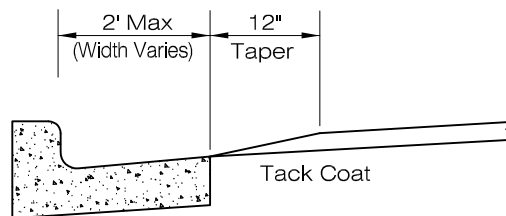
DRAWING
1801F

FORT COLLINS ONLY

W17-1 36" X36" W13-1 18" X18"



SECTION A-A



SECTION B-B

Curb Detail

22' SPEED HUMP

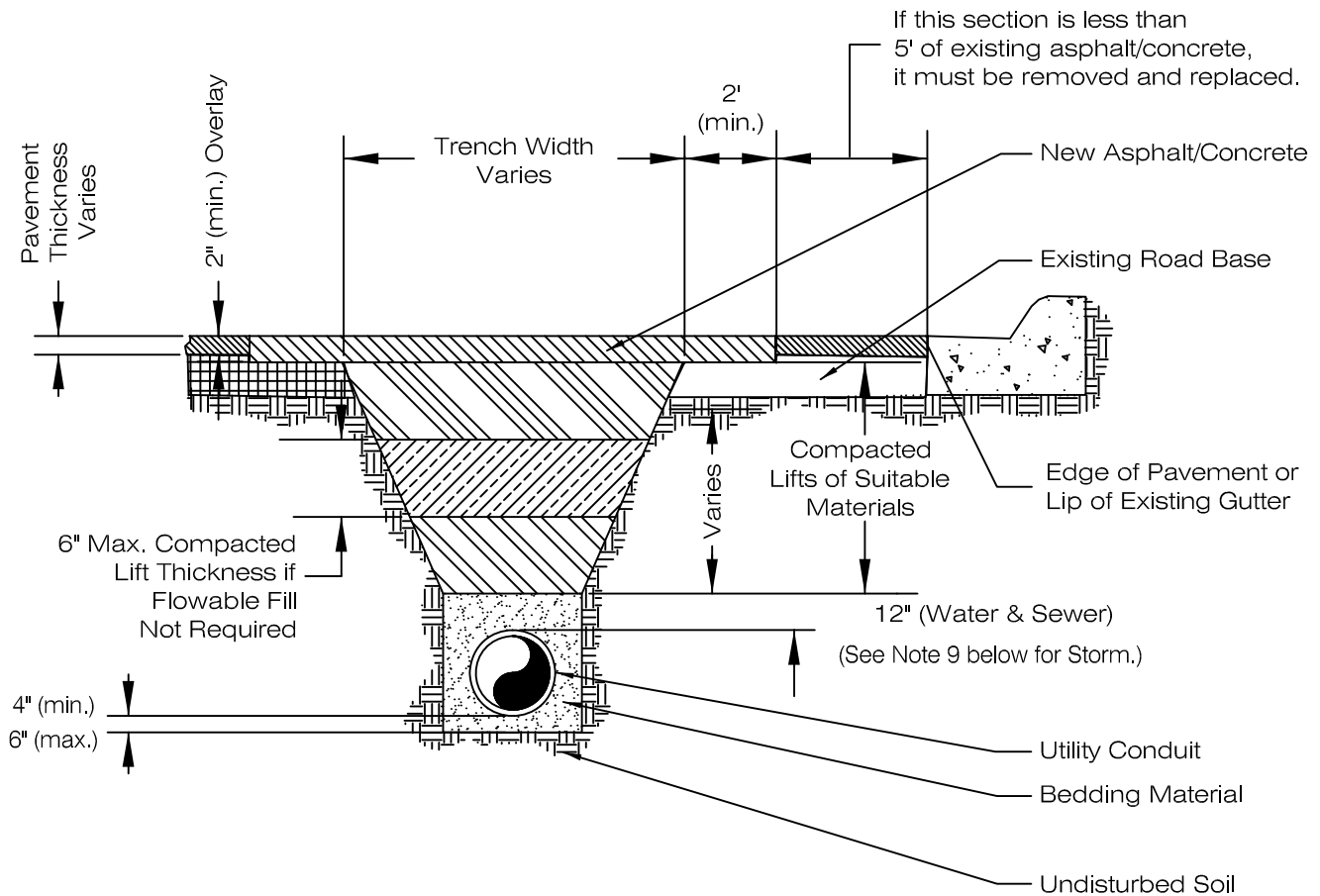
LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 03/01/02

DRAWING
1802F

FULL DEPTH ASPHALT PATCH:
THE THICKNESS OF THE ASPHALT PATCH SHALL BE ONE-INCH
THICKER THAN THE EXISTING ASPHALT THICKNESS WITH A
MINIMUM ASPHALT THICKNESS PER TABLE 25-1 OF CHAPTER 25.



NOTES:

1. All trenches shall be backfilled in accordance with the above detail unless otherwise specified by the Local Entity Engineer.
2. Prior to placement of asphalt/concrete, pavement edge shall be saw cut to a clean, vertical, and straight edge & outside of the wheel path.
3. Where the surrounding soils are non-expansive, a flowable fill may be substituted for backfill material.
4. Trench width shall not be more than 16" nor less than 12" wider than the outside diameter of the pipe.
5. Use a 18" long #4 epoxy rebar at 18" on centers along the perimeter of concrete panel replacement sections.
6. Refer to **Chapter 22, Materials & Construction Specifications** for compaction and testing requirements.
7. In unimproved areas, all disturbed areas shall be regraded, seeded & mulched.
8. In concrete roadways, a minimum of one entire concrete panel must be replaced.
9. Bedding material depth when installing storm sewer shall be up to spring line, except in areas of unsuitable backfill; then, bedding material shall be placed to a level 12" above pipe.

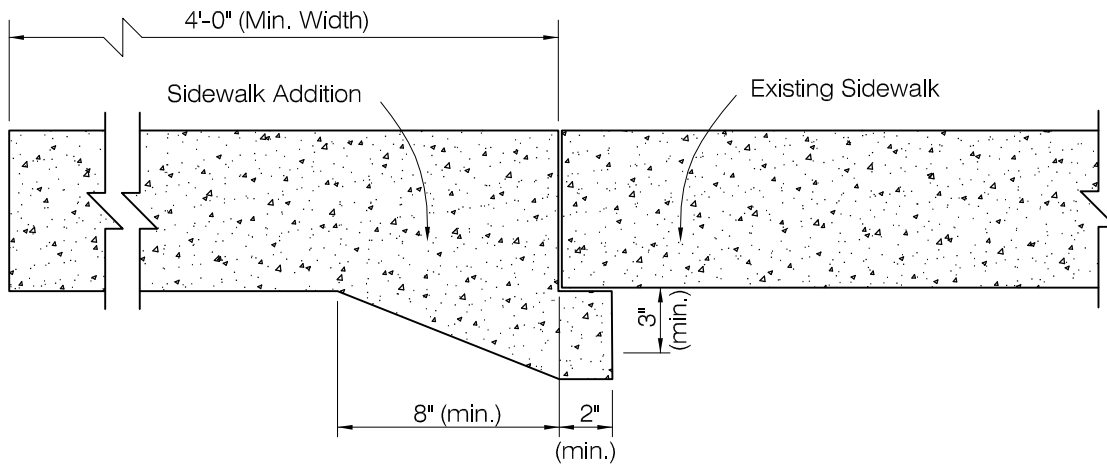
TRENCH DETAIL

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO: 1
DATE: 04/01/07

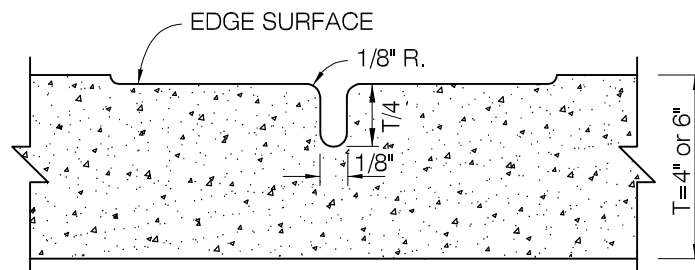
DRAWING
2201



ADDITION TO EXISTING SIDEWALK

NOTES:

1. New walk additions shall be placed to the same line and grade as the existing walk.
2. Match transverse tooled joints to existing tooled joints.



TOOL JOINT FOR WALKS

NOTES:

1. Joint shall be cut 1/4 thickness of initial concrete; tool joint for walks.

SIDEWALK WIDENING DETAILS

LARIMER COUNTY
URBAN AREA
STREET STANDARDS

CONSTRUCTION
DRAWINGS

REVISION NO:
DATE: 08/07/00

DRAWING
2501

Appendix B-1

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Current Information.

For City of Loveland only please see the following link for the latest City of Loveland Reimbursement Forms:

<https://www.lovgov.org/services/public-works/transportation-development-and-construction-standards>

Appendix B-2

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

Licensing (City of Fort Collins)

Appendix B-3/Loveland

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information. For City of Loveland only please see the following links for the latest forms listed below:

<https://www.lovgov.org/services/public-works/transportation-development-and-construction-standards>

- Development Construction Permit Application
- Development Construction Permit
- Public Improvements Opinion of Cost (All Departments)
- Agreement for Right-of-Way
- Grant of Pedestrian Easement & Grant of Pedestrian and Bicycle Easement
- Grant of Temporary Turnaround Access

<https://www.lovgov.org/services/public-works/right-of-way-permits>

- Major Right-of-Way (ROW) Permit Application
- Minor Right-of-Way (ROW) Permit Application
- Revocable Encroachment Permit Application

<https://www.lovgov.org/services/public-works/stormwater/stormwater-standards>

- Grading, Excavation and Fill Permit
- Erosion Control Procedures

Appendix B-4

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity for Current Information.

Appendix C

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current
Information.**

City of Fort Collins Streetscape
Design Standards and Guidelines



Streetscape Standards Fort Collins

LARIMER COUNTY URBAN AREA STREET STANDARDS | APPENDIX C



Streetscape Standards

February 26, 2013



Community Development and Neighborhood Services
Planning Division
281 North College Avenue
Fort Collins, CO 80524
970-221-6376

fcgov.com/cityplanning

For additional copies, please download from our website, or contact us using the information above.

Acknowledgements

City Council

Karen Weitkunat, Mayor
Kelly Ohlson, Mayor Pro Tem, Dist. 5
Ben Manvel, District 1
Lisa Poppaw, District 2
Aislinn Kottwitz, District 3
Wade Troxell, District 4
Gerry Horak, District 6

Planning & Zoning Board

Gino Campana
Jennifer Carpenter
John Hatfield
Kristin Kirkpatrick
Brigitte Schmidt
Andy Smith
Butch Stockover

Project Staff Team

Pete Wray, Senior City Planner (Project Manager)
Clark Mapes, City Planner
Bruce Hendee, Chief Sustainability Officer
Sherry Albertson-Clark, Planning Manager (Interim)
Kraig Bader, Standards Engineering Manager
Tim Buchanan, City Forester
Laurie D'Audney, Water Conservation Specialist
Paul Eckman, Deputy City Attorney
Basil Hamdan, Civil Engineer II
Becca Henry, Graphic Designer
Aaron Iverson, Senior Transportation Planner
Dean Klingner, Civil Engineer III
Sheri Langenberger, Development Review Manager
Amy Lewin, Transportation Planner
Steve Lukowski, Parks Supervisor
Joe Olson, City Traffic Engineer
Michelle Provaznik, Director of the Gardens on Spring Creek
Rick Richter, Engineering and Capital Projects Manager
Bill Whirty, Manager of Parks
Ralph Zentz, Assistant City Forester
Tom Knostman, Pavement Engineer

Consultants

Ripley Design, Inc.
Daman Holland

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SECTION 1

Purpose and Intent

Based on the City of Fort Collins' vision to create a vibrant, world class community, these standards set forth a coordinated approach to the design and management of streets as visually appealing public spaces that contribute to Fort Collins' distinct identity.

The term "streetscape" generally encompasses the visual and pedestrian environment of a street. These streetscape standards involve parameters for tree-lined streets and sidewalks, other landscaping along street edges, and landscaped medians in arterial streets.

In addition to plantings, streetscapes may also encompass various urban design elements in certain settings. Examples include special curb treatments and median edges, low planter walls and landscape walls, railings, bollards, planter pots, stone features, public art, pylons, specialty lighting, signal and light pole treatments, specialty paving, transit stops and furnishings, and the like.

Every streetscape project involves its own context and constraints. Still, there is a need for standards to set the bar for level of quality and investment. These standards provide a framework for programming, budgeting, designing, maintaining, and renovating various incremental projects as part of a whole approach.

Exact details must then be adapted to fit and function with the unique context and constraints which exist in every project. The context and constraints include existing conditions that are expected to remain for the long term, and future change planned or envisioned by the City.

SECTION 2

Applicability & Use

These standards apply to all projects involving streetscapes in the City right-of-way including:

- Private development projects.
- City capital projects.
- Any other miscellaneous maintenance and renovation projects and efforts.

Private development and public capital projects may involve construction of new streets, and/or changes to existing streets.

The standards are intended to be used by:

- Staff, in the design and management of City streetscapes over time.
- Landscape architects and designers.
- Developers and decision makers in the development review process.
- Property owners, where plans and activities involve streetscapes.
- Citizens, City Councils, and staff, in discussions involving streetscape issues.

SECTION 3

Project Plan Submittal and Review

Streetscape projects that are part of development applications follow a standard City development review process, which will include collaboration with staff on streetscape design.

City capital projects involving streetscapes are reviewed administratively by interested City departments in an internal process of collaboration and routing of plans.

3.1

STREETSCAPE PROJECT DESCRIPTION REQUIRED

For streetscapes to be successful, it is important for City staff in multiple departments to have a clear understanding of the design intent, assumptions, and the needs for maintenance, monitoring, and replacements of plants or other components.

A project description is needed to supplement technical project plans. The purpose is to prompt designers and staff to record the whole story of the streetscape project.

3.1.1 Streetscape Project Description required.

All streetscape projects involving landscaping and urban design elements shall include a Streetscape Project Description developed by City staff in collaboration with any project consultants, upon completion of design. The description shall:

- Be concise and avoid technical jargon.
- Include relevant commentary in addition to objective facts and information.
- Describe the design intent, assumptions, and maintenance and renovations that will be needed over time to realize the design intent.
- Note all aspects of the project from initial grading and soil preparation, to irrigation systems, to planting and establishment procedures, to management and maintenance.
- Note outstanding issues that need to be monitored over time.

Examples of topics to be addressed include:

- Reasons and concepts for all project decisions including planting, irrigation, mulches, boulders, hardscape, and urban design elements.
- Plant species needing pruning or trimming, specific weeding control practices, annual clean-up, dividing or periodic replacing to achieve the intent.

- Plant species with a limited track record in streetscapes that warrant monitoring.
- Mulches that need replenishing or clean-up.
- Urban design features that may need touch ups, replacements, stocking of parts, or other maintenance and renovations.
- Any other information useful for future understanding and management of the streetscape.

3.1.2 Project Statement File.

Staff shall maintain Project Statements for streetscapes on file.

SECTION 4

All Streets

The following standards apply to all street classifications city-wide, except where specific areas have applicable planning documents that set forth alternative standards tailored to the area.

4.1

STREET TREES

Rows of street trees along street edges are the fundamental, unifying element of continuity in city streetscapes.

Street trees can be considered as multi-functional public infrastructure that:

- Defines the street as distinct space, providing a unifying framework for abutting developments.
- Provides canopy shading along streets and sidewalks to reduce glare and summer heat build-up.
- Provides a buffer between pedestrians on the sidewalk and vehicles in the roadway.
- Provides space for streetlights and signs, and for snow storage in winter.



Street trees in an arterial parkway.

4.1.1 Tree planting in parkways.

Wherever the sidewalk is separated from the curb in accordance with the *Larimer County Urban Area Street Standards*, rows of canopy shade trees shall be planted in the parkway at 30 to 40 foot intervals, centered between the curb and the sidewalk.



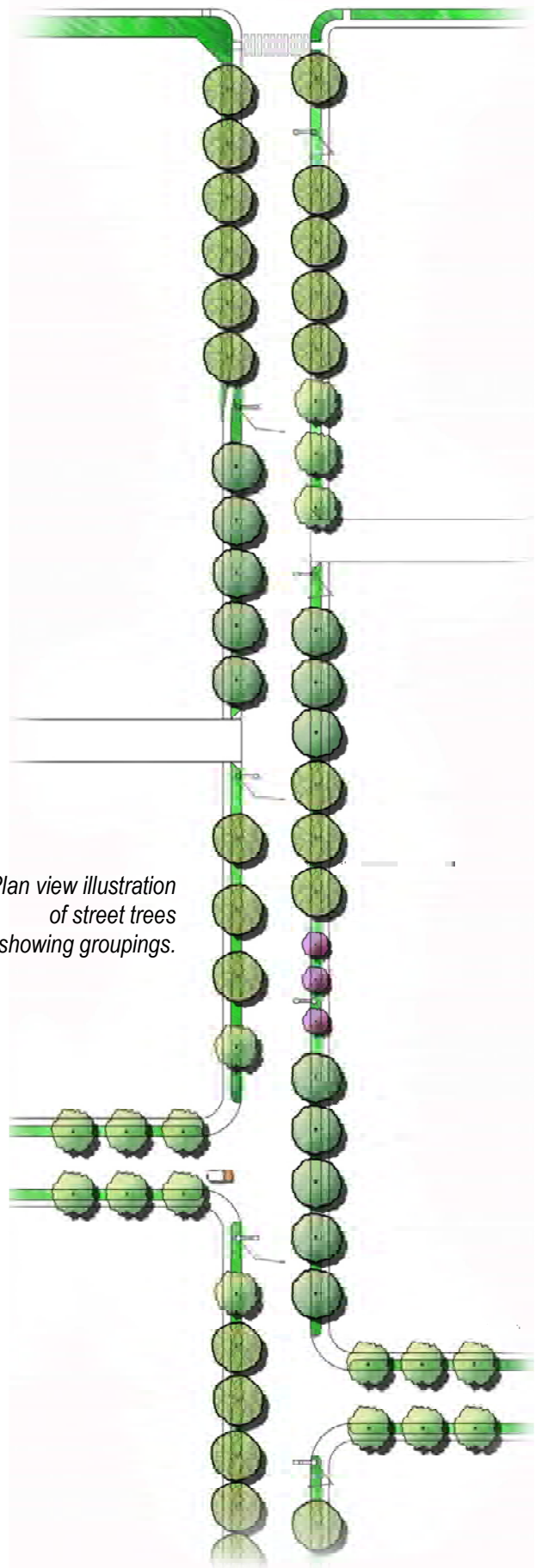
Street trees in a local street parkway.

4.1.2 Species groupings within tree rows.

To the extent reasonably feasible, street tree rows in landscape areas, whether inside or outside of the sidewalk, shall be in groupings of three, five, or more of a single species. The intent is to provide a degree of species diversity within a deliberate, repeating design pattern.

Designers are encouraged to arrange changes in species to reflect roadway conditions, such as open stretches of roadway between access points, stretches approaching intersections and driveways, and/or changes in adjoining land use.

Plan view illustration of street trees showing groupings.



4.1.3 Street trees in sidewalk cutouts.

If a project involves a new sidewalk that must be attached to the curb due to unique constraints or context, then the sidewalk width shall be wide enough to incorporate planting cutouts with tree grates to the maximum extent feasible.

- To the maximum extent feasible, such sidewalks shall be 12-15 feet wide with cutouts at least 25 square feet at 30- to 50-foot spacing. Larger cutouts with more than 25 square feet are encouraged.
- In all cases, trees in sidewalk cutouts shall be located at least 8 feet away from buildings and offset from building entrances.
- If such an attached sidewalk has an abutting landscape area, then 8 feet shall be the minimum width in which canopy trees shall be provided in sidewalk cutouts.
- The minimum area of any sidewalk cutouts shall be 16 square feet, using 4x4-foot tree grates. Larger cutouts with more than 16 square feet of area are encouraged, for example 4x6-foot or 4x9-foot tree grates, to support tree health.



8-foot sidewalk with 4'x4' tree grates, where there is an abutting landscape area.

- The soil surface in a sidewalk cutout shall be level with the bottom of the sidewalk slab. Trees shall then be planted with the top of the root ball 1-2 inches above the soil surface.
- All tree grates shall be installed per manufacturer's instructions. Frames shall be set in a true, flat plane to prevent rocking of the grate. The grate or a template shall be set in the frame before concrete is poured to ensure the final installation is square and flat.
- Grates shall be of a pedestrian-safe ADA-compliant style with slot openings 3/8-inch or less.
- A spacing interval up to 50 feet shall be permitted for street trees in grates where abutting commercial buildings face the street with no intervening vehicle use area between the street and the building.

4.1.4 Tree planting outside of sidewalks where existing constraints preclude parkway tree planting or sidewalk cutouts.

Where a sidewalk is attached to the curb and is less than 8 feet in width, canopy shade trees shall, to the extent reasonably feasible, be established in an area ranging from 3 to 7 feet behind the sidewalk at 30 to 40 foot intervals. This standard shall also apply where unusual constraints preclude tree planting in a parkway.

Any such planting will typically require coordination with abutting property owners.



Examples of street trees outside of sidewalks.

4.1.5 Adjustment of spacing intervals.

The Director or the City Forester may approve or require larger or smaller spacing intervals to better fit the growth habits of different street tree species, for safe use of the street or sidewalk, and to better fit with existing trees or other existing conditions unique to the location.

4.1.6 Overhead power line conflicts.

Ornamental trees may be planted in substitution of the canopy shade trees where overhead lines and fixtures prevent normal growth and maturity.

4.1.7 Spacing from driveways.

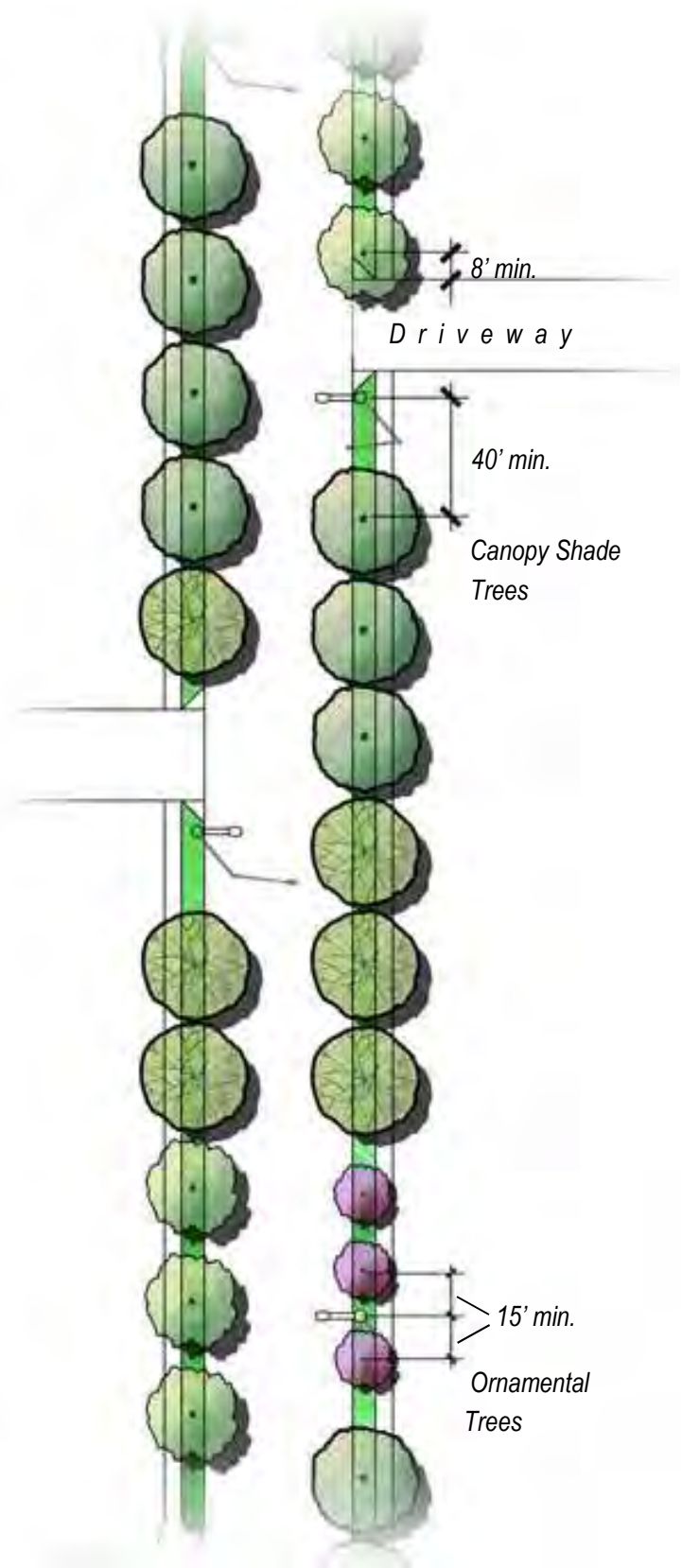
No tree shall be planted closer than 8 feet from any driveway or alley.

4.1.8 Tree separation from utilities.

Landscape and utility plans shall be coordinated. Following are the minimum dimension requirements for the most common tree/utility separations.

- 40 feet between canopy shade trees and streetlights. Fifteen (15) feet between ornamental trees and streetlights.
- 10 feet between trees and water or sewer lines.
- 4 feet between trees and gas lines.
- 4 feet between trees and underground electric lines shall be provided to the extent reasonably feasible.

Exceptions to these requirements may occur where utilities are not located in their standard designated locations, as approved by the City Forester or the Director. Tree/utility separations shall not be used as a means of avoiding the planting of required street trees.



Tree separations from streetlights and driveways.

4.2

PARKWAY LANDSCAPING - TURF-TYPE GRASS

Turf-type grass in parkways provides a multi-functional solution for landscaped edges along city streets of all classifications. Two main types of turf-type grasses may be used in Fort Collins streetscapes: cool-season turfgrasses, and warm-season native shortgrasses. Cool-season turfgrasses include improved varieties of Kentucky Bluegrass, Tall Fescue, Perennial Ryegrass, and Wheatgrasses. Warm-season native shortgrasses include improved varieties of Buffalograss and Blue Grama.

Efficiently irrigated, mowed cool-season turfgrass provides a living green edge to city streets over a long growing season. The green edge, along with street trees, is a unifying element that helps define City streets as continuous spaces, in conjunction with street trees.

Cool-season turfgrass can be a sustainable, functional landscape solution consistent with “xeriscape” and “water-wise” landscaping principles. These principles recognize cool-season turfgrass as an appropriate use of water in high visibility, multi-functional, high-use areas, and parkways typically fit that description. Cool-season turfgrass can be reasonably drought tolerant, depending on the species and improved variety. Problems resulting from periods of neglect are relatively easy to correct, and the turf rarely, if ever, needs replacement.

Non-gardeners and typical commercial crews can readily maintain cool-season turfgrass. It naturally inhibits weeds, and mowing is an efficient way to control weeds that do occur. It works well in conjunction with street trees with tolerance for shading. In winter, dormant turf is easy to keep tidy and trash-free. It tolerates foot traffic better than any other living ground cover.



Turfgrass parkways provide continuity and multiple functions.

Blue Grama and Buffalograss have very low irrigation and mowing needs. They are active and green for a shorter season than cool-season turfgrasses, but have an attractive straw color when dormant. They can offer a beautiful alternative to cool-season turfgrasses with their fine textures and soft gray-green color. They require full sun and significant weed control to maintain a high quality appearance in city landscapes. They do not tolerate shady spots, high levels of foot traffic, or overwatering. They are not as competitive with weeds, and weeds stand out in contrast to the texture and color of the grasses.

4.2.1 Requirements.

Section 5 includes parkway landscaping standards for Arterial Streets. Section 6 includes parkway landscaping standards for Collector and Local Streets.

4.3

PARKWAY LANDSCAPING - ALTERNATIVES TO TURF-TYPE GRASS

Mulched planting beds can be an acceptable alternative solution to turfgrass for parkway landscaping in some situations.

This alternative typically requires less water than cool-season turfgrass. With appropriate plant selection and proper maintenance it can offer seasonal interest and add character. While maintenance needs can be less frequent than a cool-season turfgrass mowing regime, they can be more complex and occasionally more time-consuming as weeding, trimming, mulching and replacing materials are important to keep the plantings healthy and attractive.



Mulched planting bed in the parkway limits water use and can provide visual interest.

4.3.1 Where Appropriate.

Alternatives to irrigated turfgrass can be an appropriate choice for property owners abutting collector and local streets, depending on whether the parkway is governed by an approved Development Plan. Alternatives can also be appropriate for arterial street projects in special plan areas that have recommended alternatives.

4.3.2 Requirements.

Section 5 includes parkway landscaping requirements for Arterial Streets. Section 6 includes parkway landscaping requirements for Collector and Local Streets.

4.4

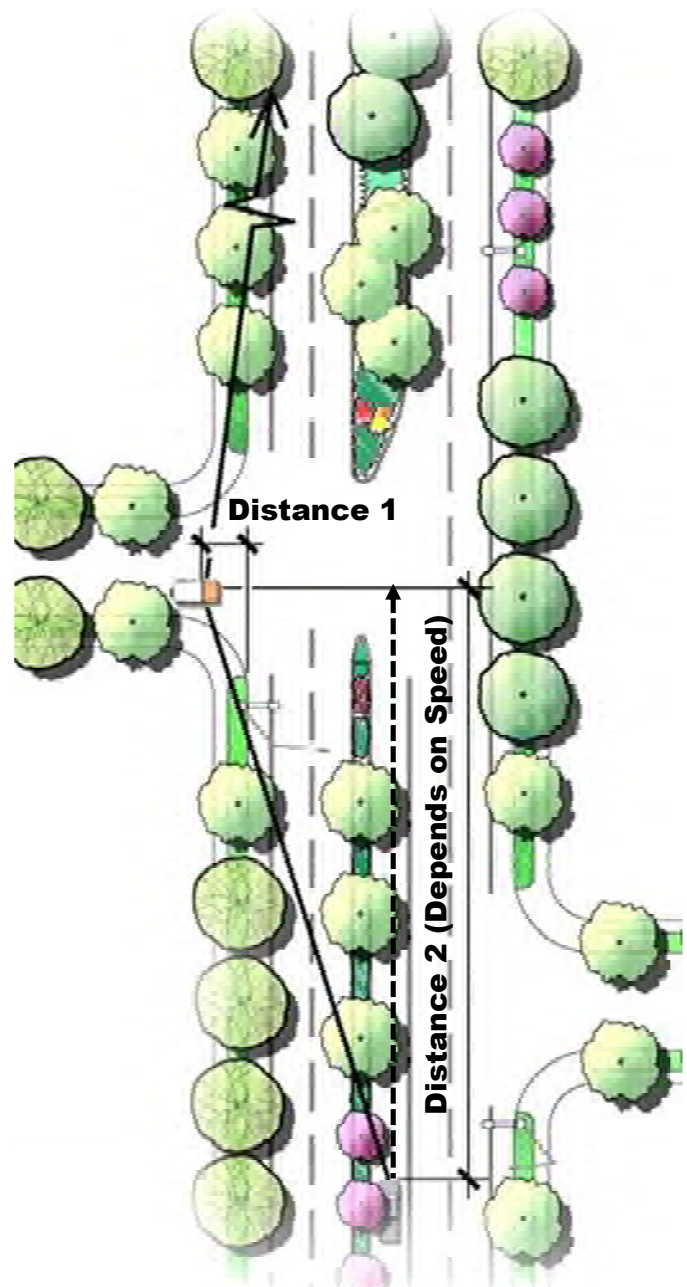
SIGHT DISTANCE TRIANGLES AT INTERSECTIONS

Sight distance generally refers to the line of sight from a driver at an unsignalized intersection to approaching vehicles that the driver needs to see in order to safely enter traffic.

4.4.1 Requirements.

A visual sight distance triangle, free of any structures or landscape elements shall be maintained at street intersections and driveways, as required in Figure 7-16 in the *Larimer County Urban Area Street Standards*.

Deciduous trees may be permitted to encroach into the clearance triangle provided that the lowest leaves shall be at least six (6) feet from grade and are spaced so that they do not obstruct line of sight.



Site Distance Triangle concept.

4.5

LOW IMPACT DEVELOPMENT - STORMWATER MANAGEMENT

In a “Low Impact Development” (LID) approach to streetscapes, landscaped parkways and medians are depressed rather than raised, to help manage stormwater runoff closer to the source. Depressed landscape areas are designed with special soil mixes, corresponding plantings, and other design techniques to infiltrate and filter runoff, instead of concentrating and conveying all runoff to centralized detention and treatment facilities.

The City’s Stormwater Criteria Manual, which governs the management of stormwater in the city, describes design, plant selection, and maintenance techniques applicable to streetscapes.

4.5.1 LID encouraged.

LID techniques and technologies are encouraged whenever the drainage patterns and the infrastructure allows for such measures to be used.

4.5.2 Low Impact Development streetscape projects.

In any streetscape where a Low Impact Development approach is used, Streetscape Standards shall be adapted or modified as needed per the Stormwater Criteria Manual.



Illustration of LID concepts in a parkway.

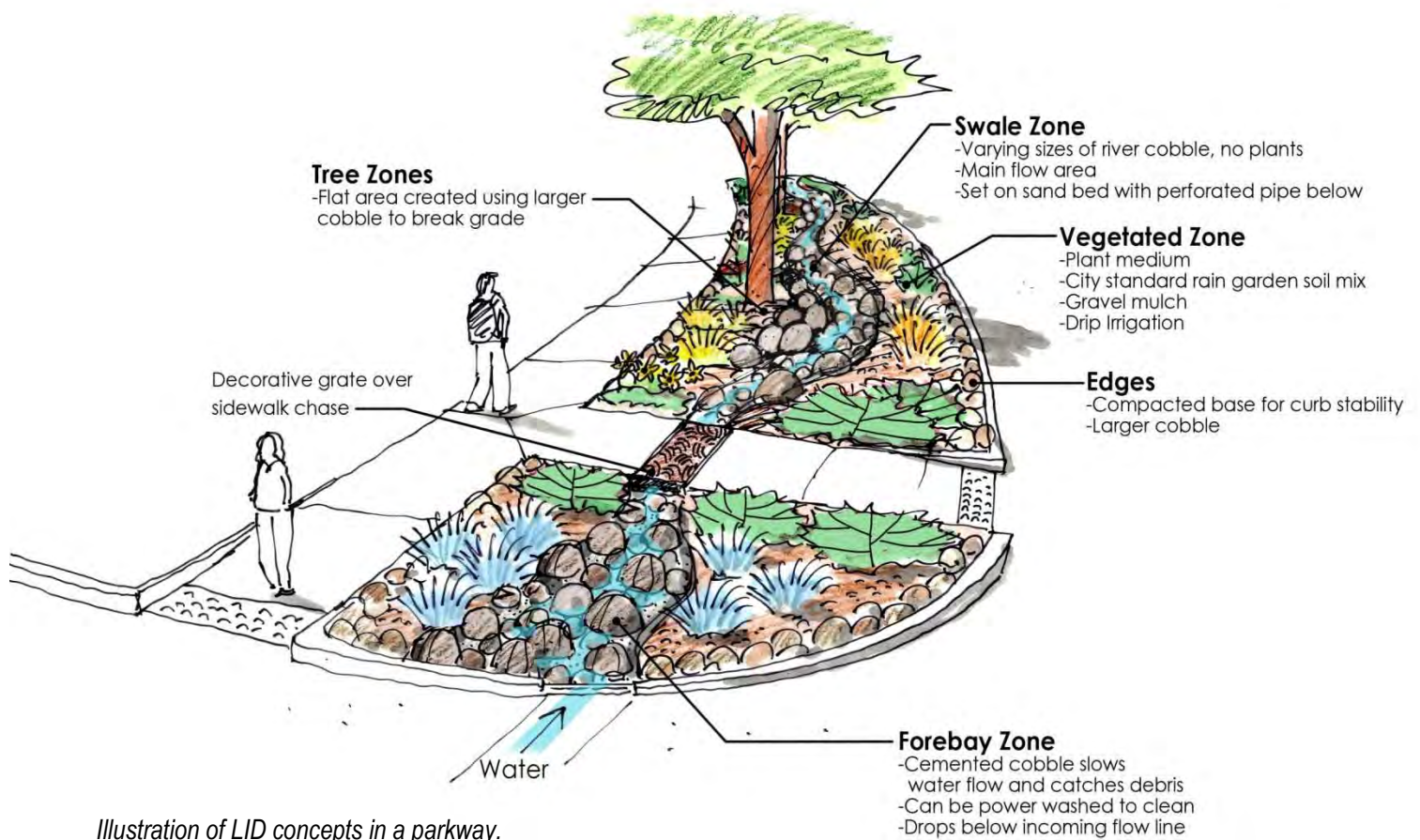


Illustration of LID concepts in a parkway.



Illustration of LID median concept with street runoff directed to a depressed median with a flush band instead of curb and gutter.

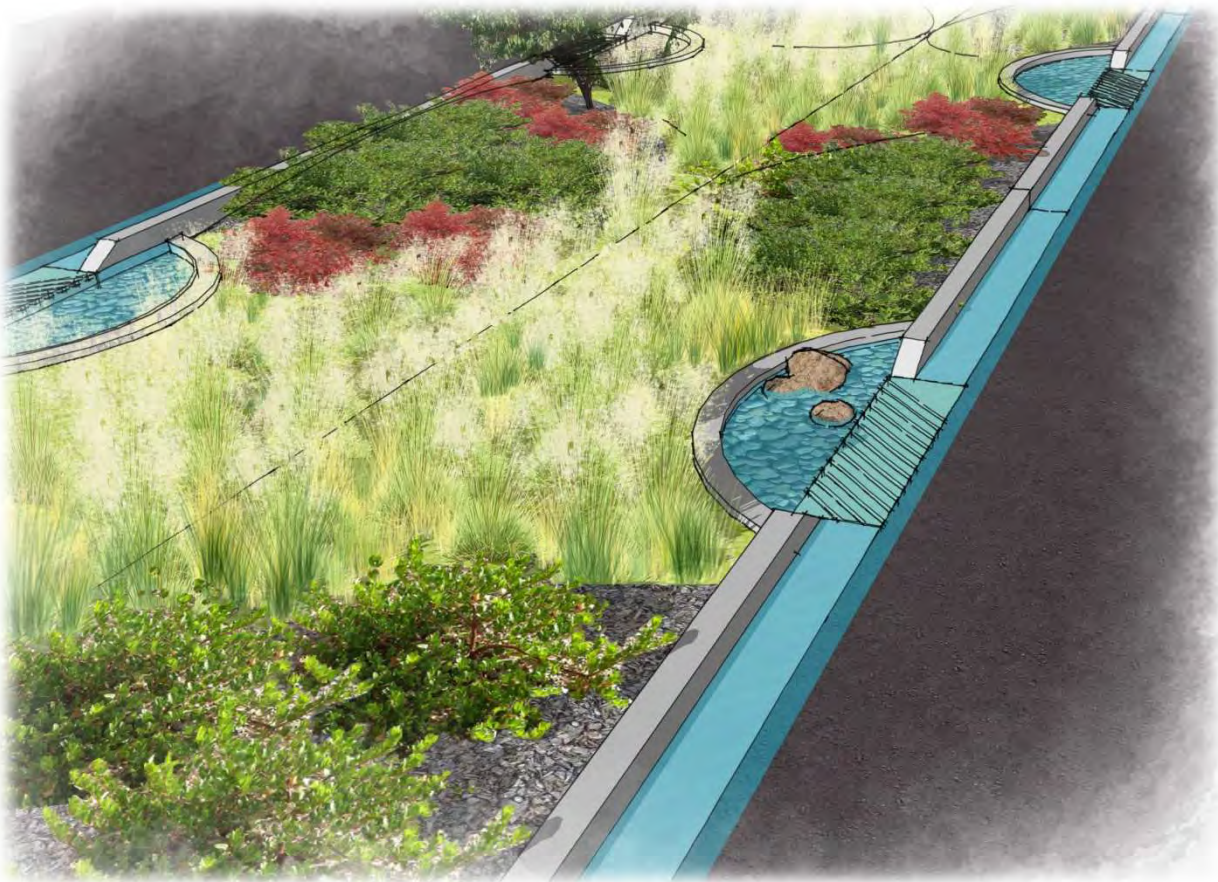


Illustration of LID median concept with street runoff directed to a depressed median with special curb and gutter inlets.

SECTION 5

Arterial Streets

The city's arterial streets are complex and expensive public infrastructure, combining virtually all utility and transportation systems of the city. Besides the functional needs for traffic and utilities, a pervasive theme throughout the City's Comprehensive Plan is the importance of streets as public space. As high-visibility public space, arterials create first impressions, are experienced by all residents on a daily basis, and play a large role in determining the character and conveying the civic intention of the City of Fort Collins.

Arterial streetscapes vary widely, from the Downtown core, to suburban residential areas, to the Natural Areas in the Poudre River valley.



Poudre River valley.

Some arterials are distinguished by the inclusion of medians along street corridors and in roundabouts. Besides managing traffic, medians provide very high-visibility space for landscaping, and provide a refuge for pedestrians crossing the road. Medians can humanize the scale of a wide street, and add beauty and civic identity. They are a highly visible mainstay of urban design, and thus are a major aspect of the City's streetscape efforts.



Downtown core.



Medians in a roundabout.



Suburban residential area.

5.1

ARTERIAL STREETSCAPES MAP

The Arterial Streetscapes Map recognizes differences between various arterials throughout the city. It indicates where a “Standard Arterial Streetscape” approach should apply, and where other corridor segments and gateway intersections warrant their own tailored approach to streetscape design and management.

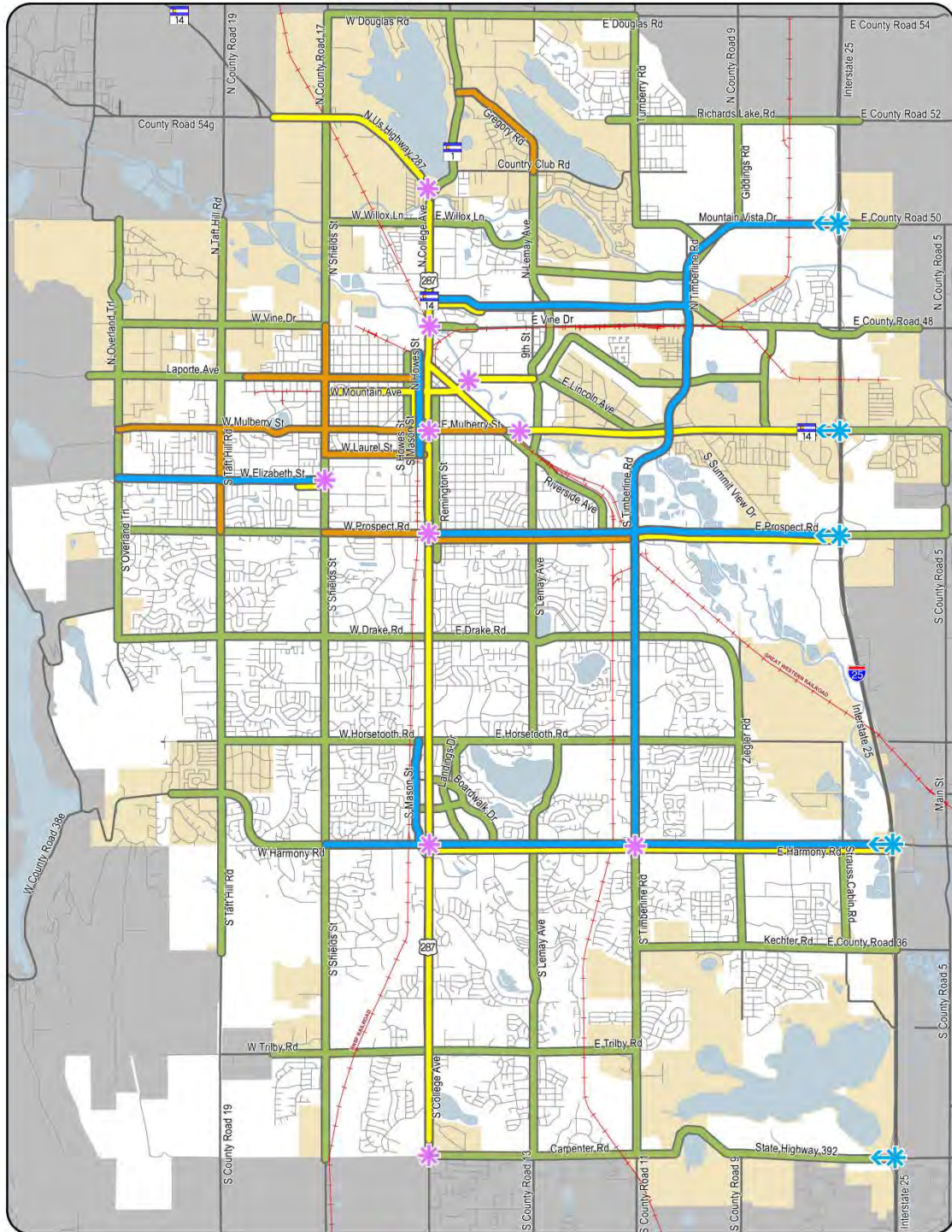
The map works in conjunction with design standards in the following chapters to guide investment in streetscapes throughout the city.

The types of Arterial Streetscapes and Gateways are:

- Standard Arterial Streetscapes.
- Enhanced Travel Corridors.
- Special Planning Areas.
- Streetscapes constrained by Existing Development.
- Gateway Intersections.
- Community Entrance Gateways (at Interstate 25).

Streetscape Design Standards and Guidelines

Arterial Streetscapes



Streetscape Types

- Standard Arterial Streetscape
- Enhanced Travel Corridor
- Special Planning Area
- Constrained by Existing Development

- ★ Gateway Intersections
- ★ Community Entrance Gateway (Interstate)
- Unincorporated Land in GMA
- City Limits



12.10.2012

5.2

ARTERIAL STREETSCAPE DESIGN: STANDARD ARTERIAL STREETSCAPES - MEDIANS

The primary focus of “Standard Arterial Streetscapes” is on medians, including the medians in roundabouts.

Median standards emphasize mixed plantings of perennials, grasses, shrubs, and tree groupings, with a mulched ground surface. The intent of these standards is to reflect Fort Collins’ western regional character with regionally-specific plants suited to the harsh roadway environment.

Planting compositions must include:

- Varied plant forms, textures, and foliage in addition to flowers.
- Coordinated, repeating groupings of plants to form an overall pattern.
- Accent groupings to add detail and variation within the overall pattern.
- Related elements such as mulches and boulders.



Illustration of standard arterial median landscaping approach.

5.2.1 Median width measurements.

All references to median widths are from face of curb to face of curb.

- Medians less than three feet wide shall be paved rather than planted.

5.2.2 Median grading.

The ground surface in landscaped medians shall be crowned with a high point in the center, with slopes not to exceed 7:1 or approximately 14 percent. This standard shall not apply where a median has a cross slope due to opposing traffic lanes and curbs having different elevations, such that a crown may not be feasible.

5.2.3 Median grading in roundabouts.

The ground surface in center medians in roundabouts shall be crowned with slopes not to exceed 7:1 or approximately 14 percent. The intent of this standard is to increase the visual prominence of landscaping, and work in conjunction with planting and hardscape elements to achieve year-round screening of visibility across the roundabout to a height of at least 4 feet.

5.2.4 Median planting general approach.

Tree groupings and mixed plantings of other plant types shall be established and maintained in medians.

This standard shall not apply in the following situations:

- Trees shall not be planted in medians less than seven feet wide.

5.2.5 Median tree groupings:

- Canopy shade trees, ornamental trees, and evergreen trees shall be planted in groups of three, five, or more to the extent reasonably feasible. Open intervals shall be provided between the groups.
- Open intervals between tree groups shall constitute 30-60% of the length of a given median. These percentages are intended to convey a general proportion rather than a precisely measured formula.
- Determination of the open intervals shall be based on the design intent and growth assumptions for trees over a given time frame.
- Where median length allows, repetition of tree groupings is encouraged.

5.2.6 Tree separation from median edges.

Separation of trees from concrete edges shall be provided by designers as needed based on assumptions for growth and pruning over a given time frame. The following minimum separations shall be provided for tree types as listed in Exhibit List of Recommended Plants:

Large canopy trees - 2.5 feet.

Ornamental trees - 1.5 feet.

Large evergreen trees - 7 feet.

Small evergreen trees - 5 feet.

5.2.7 Evergreen tree setbacks from face of curbs.

Evergreen trees shall be set back from the face of curbs:

Large evergreen trees - 9 feet.

Small evergreen trees - 7 feet.

5.2.8 Staggered median tree groupings if space permits.

Tree groupings shall be staggered rather than aligned in straight rows, where median width permits a stagger of at least 2 feet.

Example plan view of a median showing tree groupings.



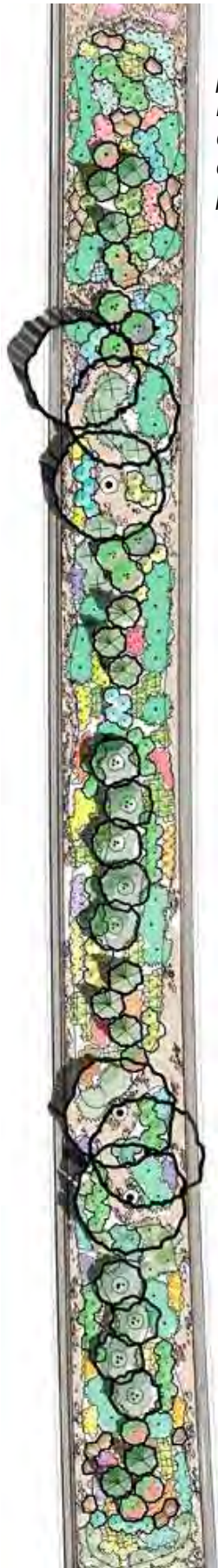
5.2.9 Mixed plantings.

Mixed plantings of perennials, ornamental grasses, shrubs, and shrubby trees shall be planted and maintained to cover at least 75% of the median area within 5 years, based on assumptions for growth and maintenance of plants by the designer.

- Mixed plantings shall be composed of groups of at least 3 plants per group, with each group composed of a single species.
- Mixed plantings shall be composed for understory conditions at tree groupings, and open conditions in intervals between tree groupings.
- Mixed plantings shall be arranged in an informal pattern rather than formal rows or geometrically-shaped groupings. The informal pattern shall include coordinated, repeating groupings of plants in an overall composition, rather than random placement. Plantings shall be designed and maintained to span the full width of the median at maturity.
- Mixed planting standards apply to all medians 3 feet wide or wider.



Mixed planting in a newly planted median.



This – informal pattern, but with repeated groupings to create an overall order in the design pattern.



Not This – formal, geometric pattern of massed plantings. While this kind of design pattern is not the “Standard Arterial Streetscape” approach, it may be appropriate for special planning areas.

5.2.10 Mixed plantings – two options for intensity.

Two options for mixed plantings shall be permitted:

- Perennial Garden Style.
- Shrub Garden Style.

Perennial Garden Style: This option emphasizes the maximum degree of planting intensity, color, and variety, with perennials used for the full length of a median. This results in a higher number of different plant groupings and a higher total number of plants to achieve the required 75% plant coverage.

Shrub Garden Style: This option allows the use of larger shrubs and shrubby trees to achieve the required 75% coverage with a lower number of different plant groupings and lower total number of plants.

5.2.11 Perennial Garden Style requirements.

An average of at least 4 groupings of perennial or ornamental grasses, and 3 groupings of shrubs per 250 square feet shall be planted and maintained. Groupings shall be composed of single species with at least 3 plants.



Illustration of Perennial Variety Style mixed planting, with open areas and tree groupings.

5.2.12 Shrub Garden Style requirements.

An average of at least 3 groupings of shrubs per 250 square feet shall be planted and maintained. Groupings shall be composed of single species with at least 3 plants.

In open areas at the ends of medians at intersections, at least 4 perennial or ornamental grass groupings and 3 shrub groupings shall be planted and maintained, with emphasis on color and/or texture over a long growing season.



Example of a mixed shrub planting with regionally adapted species (not a streetscape).



Plan view illustrations comparing perennial variety concept (on the left) and shrub variety concept (on the right).

5.2.13 Decision on options.

The option to be used in any project shall be approved by the Director based on consideration of the relative importance of a given median to community image, intensity of adjacent land uses, the width and length of the median, and City budget considerations. In general, the Perennial Garden Style is more appropriate in higher-activity, mixed-use areas. The Shrub Garden Style is generally more appropriate in residential and other lower-activity areas.

5.2.14 Median noses and narrow ribbons - planting.

Median areas 3-7 feet wide shall be planted with low mixed planting under 30 inches in height.

5.2.15 Plants and mulches in conjunction.

Plant groupings shall be designed in association with either cobble mulch or organic mulch. Plants selected to feature green leaves and flowers are generally complemented by organic mulch, while stone mulch can detract from their effects. Stone mulch can complement evergreens, other plants selected to feature distinct forms or textures, and xeric plants with grey-green foliage.

When mulches are mixed, the patterns shall be in sweeping curves, and not rectangular blocks or strips along the edge.

5.2.16 Mulches.

Organic mulch shall be used, either solely or in combination with stone mulch to add visual interest with a design pattern. Organic mulch shall be undyed shredded woody material. If a combination is used, the pattern shall be designed in conjunction with plant groupings, and the pattern shall span the full width of the median rather than dividing the median lengthwise into linear strips or lining the edge of the median.



This - mulch pattern spans the median in a sweeping curve.



Not this - mulch pattern in linear strips.



This - mulch pattern in sweeping curves designed with the direction of travel in mind.



Not this - mulch pattern in linear strips.



Not this - mulch pattern in blocks.

Stone mulch, if used, shall consist of 2-4-inch stone combined with groupings of 4-12 inch or larger stone hand placed as accents for visual interest and to separate abutting organic and stone mulches. Larger stone shall be placed

first, to be embedded, mingled, and settled with the smaller stone rather than loosely dumped.



Stone mulch placement example.

5.2.17 Boulders.

Boulders may be used to structure and complement plant groupings. They shall be designed and placed in deliberate groupings in association with the planting and mulch design pattern, and any low walls or slopes. They shall be placed prior to planting and mulching, and slightly sunk into the ground, to be embedded and mingled with mulches and plantings. Permitted boulders shall be tan Masonville sandstone quarry blocks, rounded river boulders, or weathered moss rock boulders.

Boulder selection shall be based on continuing an established theme, or establishing a theme where none exists.



Tan Masonville sandstone quarry blocks.



Rounded river boulders as part of a whole design approach to plantings and mulches.

5.2.18 Median hardscape – edges and paving.

Hardscape treatments depend on different median widths and different contexts throughout the city, and shall comply with the following requirements:

- A. In median areas that are at least 7 feet wide, a double curb edge shall be installed where a project includes 1) a new median, or 2) an existing median that lacks splash blocks or has splash blocks that warrant replacement. The purpose of this standard is to provide additional depth for planting areas, space for maintenance personnel, an additional correction barrier for vehicles leaving the roadway, and a visual design that complements the curb and gutter. Where a median tapers to less than 7 feet, the upper curb shall return across the median to enclose the upper landscape area.

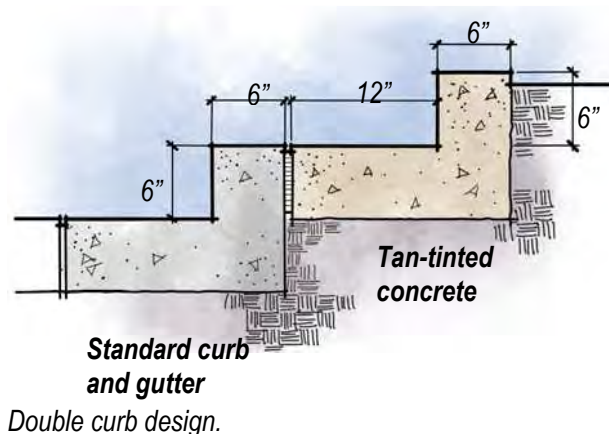
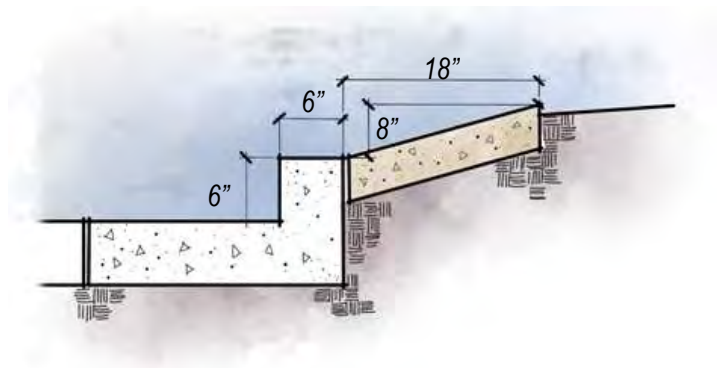


Illustration of double curb.

The following exceptions to the double curb shall apply:

- 1) Sloped concrete splash blocks with integral tan tint and exposed aggregate finish shall be permitted in lieu of a double curb if a median project is located in a street segment or area of the city where existing splash blocks have a previously established theme and are expected to remain for a long term.



Sloped splash block design.



Sloped splash block design: existing Standard Arterial Streetscape corridors throughout the city include extensive segments with existing sloped concrete splash blocks, per a former standard.

- 2) Where a median is less than 7 feet wide, the edge shall be a standard 6-inch curb with no double curb or splash block.

- B. Median areas under 3 feet wide shall be paved rather than planted. Paving shall be rectangular concrete or brick pavers set on a concrete base.

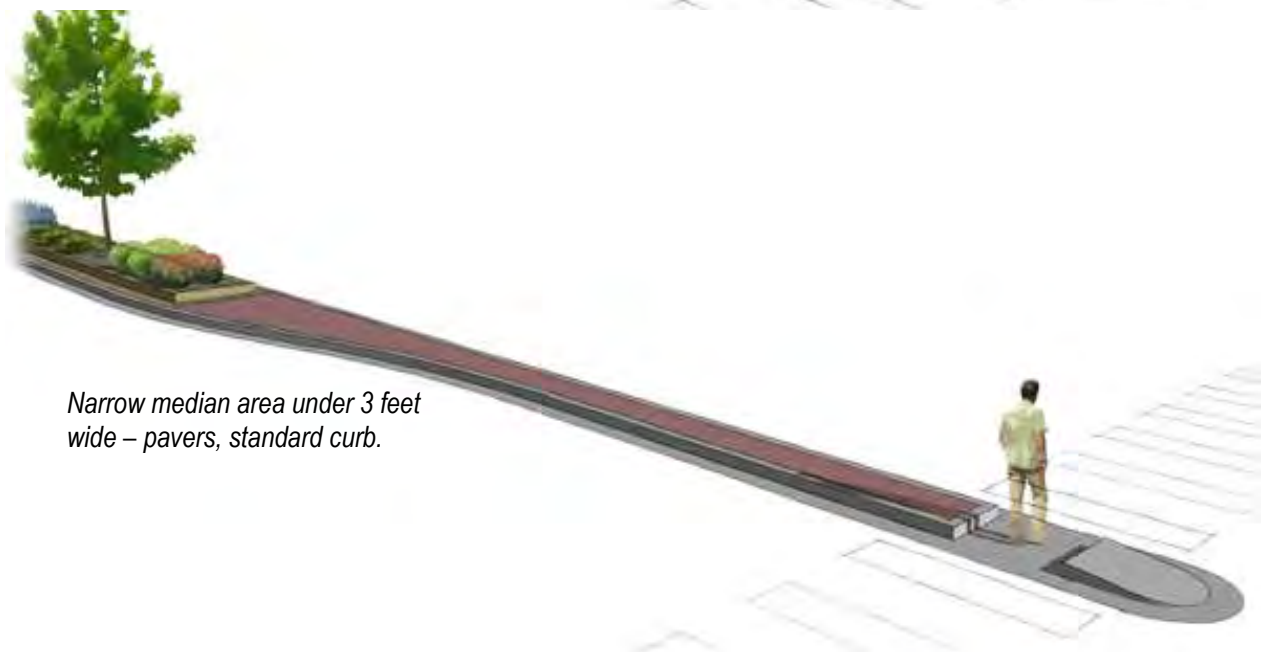
The following exception to pavers shall apply: where existing tan exposed-aggregate concrete median paving establishes a prevailing theme, it shall be permitted for paving of medians under 3 feet wide.



Tan exposed-aggregate concrete median paving.



Rectangular pavers set in a herringbone pattern.

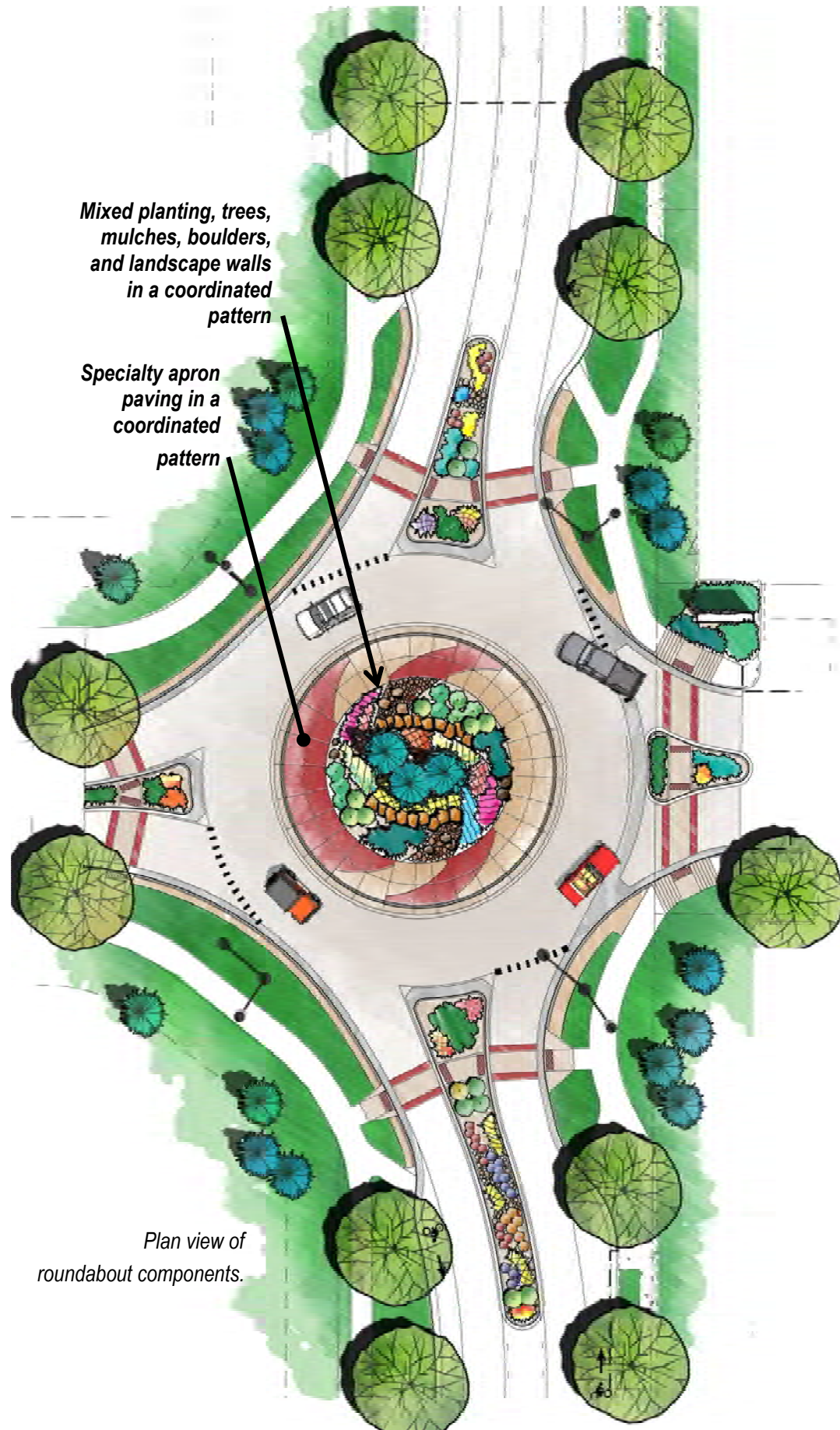


5.2.19 Roundabout planting and hardscape:

Roundabout medians in Standard Arterial Streetscape areas shall be developed and maintained with tree groupings and mixed plantings in the Perennial Variety Style, with boulders and a mulched ground surface. Landscape walls may be included to reinforce the pattern and provide year-round structure for plantings.

Apron paving and any special curbs shall be designed for visual interest with tinted, textured concrete, pavers, or similar material.

Design of each individual roundabout shall be unique unless multiple roundabouts are related in a pair or group as part of a single traffic management project. Design elements include planting themes, plant species, apron paving, and other hardscape details.





Illustrations of roundabout landscaping approach with mixed planting, boulders, mulch and hardscape patterns all designed in conjunction. Lower graphic shows the inclusion of landscape walls.

5.3

ARTERIAL STREETSCAPE DESIGN: STANDARD ARTERIAL STREETSCAPES - PARKWAYS

The City maintains most arterial street parkways, with exceptions in a limited number of situations where other arrangements are made with another entity. Turfgrass provides a range of benefits as a solution to arterial street parkways as described in Section 4. The benefits describe are relevant for all street classifications, but are particularly relevant for arterials which form a continuous city-wide framework of public space.

5.3.1 Irrigated Turfgrass.

Parkways in Standard Arterial Streetscapes shall consist of irrigated turfgrass and street tree plantings as described in Chapter 4. Appropriate irrigation shall be provided to maintain health of plantings with efficient use of water.



Arterial street parkway.

5.4

ARTERIAL STREETSCAPE DESIGN: ENHANCED TRAVEL CORRIDORS (ETC'S)

Standard Arterial Streetscape standards may or may not be adequate and appropriate for design and maintenance of these corridors, depending on unique circumstances in each ETC.

These arterial corridors are intended to evolve as a framework that incorporates and supports high frequency transit with special emphasis on walkability and bicycling.

5.4.1 Tailored streetscape approach.

For streetscape projects where previous ETC plans do not define a streetscape approach, the Standard Arterial Streetscape standards in Section 5.2 shall be considered as the minimum requirement for the level of quality and investment.

Design and maintenance shall then be adapted to unique circumstances in each corridor as appropriate, based on study of and response to:

1. Guiding policies for ETC's.
2. Established precedents in the corridor that are consistent with the vision and policies for ETC's.

Examples of permissible design variations include:

3. Planting patterns to reinforce the pattern of transit facilities.

4. Hardscape elements - edge treatments, paving, planters, and the like, particularly where related to transit stops and shelters.
5. Urban design amenities in a coordinated program, particularly including paving, furnishings, and structures at transit stops and shelters.

In all cases, design shall include repeating elements to create a theme for the corridor and avoid clutter of unrelated elements.

5.5

ARTERIAL STREETSCAPE DESIGN: OTHER SPECIAL PLANNING AREAS

Special planning areas have subarea plans, corridor plans, or other planning documents that recognize their unique context and character. The level of specific direction for streetscapes varies among the plans.

These areas warrant their own distinctive streetscapes with tailored design and maintenance characteristics, rather than the Standard Arterial Streetscape.

5.5.1 Tailored streetscape approach.

For streetscape projects where plan documents are not definitive, the Standard Arterial Streetscape standards in Section 5.2 shall be considered as the minimum requirement for the level of quality and investment, and may be considered as a reference for design.

Design and maintenance shall then be adapted by project designers and staff based on study of and response to the context and any established precedents that are consistent with the vision and policies for the area, and are thus expected to remain.

Examples of permissible design variations on the Standard Arterial Streetscape include:

6. Distinct patterns of trees and other plant groupings.
7. Signature plant species.
8. Hardscape elements - edge treatments, paving, low planter walls or landscape walls, and the like.
9. Urban design amenities such as paving, street furnishings, and transit stop shelters or other themed structures in a coordinated program.

In all cases, design shall include repeating elements to create a theme for the area and avoid clutter.



Custom-tailored streetscape with parkway and median details as part of a whole planning approach to a street segment in Campus West.

5.6

ARTERIAL STREETSCAPE DESIGN: CONSTRAINED CORRIDORS AND SEGMENTS

These are arterial corridors and segments where the Standard Arterial Streetscape is not feasible due to physical constraints of existing development. Typically, both parkways and medians are constrained.



Example of a constrained arterial (East Prospect).

5.6.1 Tailored streetscape approach.

Streetscape projects in these areas shall incorporate aspects of a Standard Arterial Streetscape to the extent reasonably feasible. The allocation of available space and the compromises on each component of the street shall be determined on a project-by-project basis.

The most important aspects to consider in the streetscape approach are safe sidewalks and street trees as described in Chapter 4.

5.7

ARTERIAL STREETSCAPE DESIGN: GATEWAY INTERSECTIONS

These intersections are exceptional locations where the Standard Arterial Streetscape should be augmented with additional intensity of streetscape development in any capital projects. These locations warrant the highest level of investment for design, construction and maintenance.

The intent is to highlight entryways into the city, and also edges of districts within the city. The locations consist of intersections, whether signalized or roundabouts, extending outward as appropriate to include medians associated with the intersection.

5.7.2 Components.

Streetscape projects at gateway intersections shall be enhanced with a coordinated program of components including at least four of the following:

- Plantings of annual flowers in beds or large pots.
- Railings or low walls.
- Bollards.
- Pedestrian lighting/ other specialty lighting.
- Columns, pylons or other urban design structures.
- Signal or light pole treatments.
- Color themes in repeated components.
- Special paving.

- Sculpture or other public art in addition to the components listed above.



Examples of enhanced gateway components – annual flowers, planter pots on plinths, railings, pedestrian lights, public art pylons, and tinted concrete paving.



Example of a median approaching a gateway intersection incorporating themed railings mingled with plant groupings.



Illustrations of themed plantings, walls, median planters, and specialty paving as examples of special treatments to mark an enhanced gateway signalized intersection (above) and gateway roundabout (below).



5.8

ARTERIAL STREETSCAPE DESIGN: COMMUNITY ENTRANCE GATEWAYS (I-25)

Interstate 25 interchanges act as major community entrances, in conjunction with the arterial streets leading into Fort Collins from the interchanges.

Future improvements to the interchanges are expected to include gateway design features to reinforce the community entrance role.

Design and management of any such interchange improvements, and arterial streetscapes near the interchanges, may present opportunities for coordination.

For example, any interchange gateway features may be appropriate to extend westward along a segment of the arterial streetscape. If such features are not appropriate to be extended, they may still influence, or be influenced by, the character of the arterial streetscape.



Example of enhanced gateway components at an I-25 Interchange, including stone walls and a themed planting design.



SECTION 6

Collector and Local Streets

6.1

PARKWAY LANDSCAPING

Streetscapes on collector and local streets typically consist of parkways only. The primary intent for parkway landscaping is to provide a setting for street trees, and work in conjunction with street trees for a number of purposes:

- Define streets as the framework of public space within which individual properties fit.
- Contribute to the attractiveness and visual interest of the street edge.
- Mark the transition from public to private space.
- Blend public interests in street infrastructure with interests of abutting property owners who are required to maintain these parkways by City Code.

6.1.1 Two approaches.

Two main approaches to landscaping parkways are permitted in collector and local streets: turf-type grasses, and mulched planting beds. Pros and cons of each are discussed in Section 4. In both approaches, appropriate irrigation shall be provided to maintain health of plantings with efficient use of water.

In developments where there is no development plan that specifies parkway landscaping, the owner of the property abutting the parkway may select either approach, regardless of any Homeowner Association covenants that may apply to the development, and shall be responsible for the installation and maintenance of the parkway landscaping in accordance with Section 24-42 of the City Code.

6.1.2 Approved development plans govern.

In developments with approved landscape plans, the parkway landscaping must be in accordance with the plan.

A Homeowners Association (HOA), or a property owner with notice to and opportunity for comment from the HOA, may request a Parkway Landscaping Amendment to an approved plan for parkway landscaping. Such a request by a property owner shall be limited to the parkway strip abutting the lot of the property owner and shall be reviewed by the Director in accordance with Section 2.2.10(D) of the Land Use Code.

6.1.3 New development landscape plans.

Where a developer desires to offer non-turf grass options to homeowners, the landscape plan shall contain notes and drawings specifying options for non-turf ground cover plantings, with consistent mulch and a recommended plant palette.

6.1.4 Turf-type grass.

Turf-type grass shall be permitted, including both cool-season turfgrasses and warm-season native shortgrasses as discussed in Section 4. The choice of grass species and variety can make a major difference in water use needs, ease of establishment, survival of the grass, weeding, mowing, and renovation requirements.



Cool-season turfgrass parkway congruent among properties along the street, and also congruent with adjoining landscaping.

6.1.5 Mulched planting beds.

Non-turf ground cover plantings shall be permitted, including mulched planting beds and ground cover plantings. With an understanding of plant selection and proper irrigation and maintenance, these plantings can provide seasonal interest with little water required.

Property owners are encouraged to incorporate choices that provide a degree of congruence with neighboring properties in terms of mulches and character of plantings.



Mulched planting bed with a perennial garden in a parkway.



Combination of turf and planting beds in parkway areas.

6.1.6 Requirements for non-turf ground cover plantings:

- A. Landscaping shall be designed, installed and maintained so that at least 50% of the area shall be covered with live plant material within 3 years from installation.
- B. Plant materials shall be under 2 feet tall if within 5 feet of a driveway and under 3 feet tall in other areas. Owners are encouraged to select plants that maintain these height limits with little or no pruning.

- C. Plant materials must not obscure the line of sight for traffic or obstruct the sidewalk. Plantings of any height that obstruct the line of sight or cause safety concerns may be required to be kept trimmed to a lower height or removed so visibility is provided/maintained.
- D. No fences or thorny/prickly plant material are allowed.
- E. In mulched planting beds, the soil surface shall be 2-3 inches below the curb and sidewalk to allow for mulch to be contained. To avoid clutter, no additional timbers, concrete products, plastic or metal

edging, or similar material shall be included.

- F. Exception: if edging is needed to keep turfgrass out of mulched areas, perpendicular to the street, such edging shall be flush or within 1 inch of the ground surface, so it is not a visible element.
- G. Plant materials and mulch must be kept off the street and sidewalk.
- H. Avoid cutting tree roots if converting an established turf parkway to a planting bed. Within a tree's dripline, minimize grade change to protect the tree roots.



This – organic mulch, healthy plants, and stepping stones if needed.



Not this – gravel that is not congruent with any other portions of the streetscape, dead plants, weeds, concrete products, and exposed fabric prevent this parkway from contributing to the street as attractive public space.

SECTION 7

Maintenance Standards

The purpose of this Section is to foster a consistent, high quality appearance for all streetscapes, whether maintained by the City, its agents, or by private developers, businesses, or individuals.

Given the high visibility of city streetscapes, the public is able to observe maintenance practices in the field as well as the results of that maintenance. The public perception of a well-maintained landscape is promoted by practices which benefit the health of the landscape materials and achieve a neat, well-cared for appearance. Quality maintenance is a function of workmanship, funding, knowledge, and technique. These standards attempt to ensure that all streetscapes are cared for in a manner which reflects the high esteem that citizens have for these important public spaces. Generally, all landscaping shall be maintained in a healthy condition throughout the growing season. A neat and attractive appearance is essential. Irrigation systems, structures, and sidewalks shall be maintained to represent the original integrity of the design and installation.

7.1

TREE MAINTENANCE AND MANAGEMENT REQUIREMENTS

7.1.1 Separate standards document.

A separate document, *The City of Fort Collins Tree Management Standards and Best Management Practices*, contains

the City's standards for planting and maintenance for all trees in the public rights-of-way and apply whether the work is performed for the City contractually, by the City, or by private entities or individuals. Exceptions to the standards and practices require written approval of the City Forester.

7.1.2 Permits for tree work.

A permit must be obtained from the City Forester before any planting, pruning, removal, or destruction of any tree or shrub within the public right-of-way of any street or sidewalk. Businesses performing this work must be licensed by the City. No tree shall be cut back in such a manner that its health will be impaired or it creates an unsafe condition. An exception to this rule may occur to provide emergency relief of an immediate danger to persons or property. Any such emergency procedures must be reported promptly to the City Forester with plans for completion or follow-up work submitted for approval. See the *City of Fort Collins Tree Management Standards and Best Management Practices* for details on acceptable pruning practices.

7.2

MAINTENANCE RESPONSIBILITIES

Maintenance responsibilities vary among different street types, and also with specific circumstances of abutting properties.

7.2.1 Maintenance responsibilities standards and requirements:

- A. Street trees located on the City right-of-way are the responsibility of the City Forestry Division to

manage, maintain, and replace on all streets, regardless of who maintains the surface.

- B. Exception: some streetscape projects include a warranty period for establishment of newly planted trees in which the project is responsible.
- C. Medians in arterial streets shall be maintained by the City.

Exception: some streetscape projects include a warranty period for establishment of median landscaping in which the project is responsible.
- D. Parkway landscaping on Collector and Local streets shall be maintained by the adjacent property owner in accordance with City Code.
- E. Parkway landscaping on arterial streets shall be the responsibility of the City if there is no individual, organization, or homeowners' association that prefers to maintain them, or that can be fairly allocated the maintenance responsibility based on their unique benefit .
- F. The following four other different scenarios for planting and continuing maintenance are possible depending on circumstances:
 - 1) The developer installs the landscape and the City takes responsibility for tree maintenance after a warranty period for full tree establishment during which time specific obligations are met. The surface (turfgrass, other plantings, mulches, irrigation) must continue to be

maintained by the developer, homeowners' association, or other responsible party.

- 2) The developer installs the landscape and after meeting obligations during the first two years, the City takes responsibility for both tree and surface maintenance.
- 3) The landscape is part of a Capital Improvements Project and a contractor does the landscape work. The City is responsible for tree maintenance and may or may not be responsible for surface maintenance.
- 4) Adopt A Median -- the City encourages homeowners' associations, business groups, and other civic groups to take part in the Adopt-A-Median program. Contact the City Parks Division at 221-6660 for further information.

7.3

ACCEPTANCE OF NEW ARTERIAL STREETSCAPE PROJECTS FOR CITY MAINTENANCE

7.3.1 Streetscape installed to City standards.

Any new streetscape landscaping not designed and installed to these standards may be rejected by the City Parks Division for inclusion in its maintenance program. Developers and City capital projects shall notify the City Parks Division and conduct a walk-through with Parks and Forestry Division staff at the end of the warranty period. Any defects in the landscaping or irrigation system shall be corrected by

the project that installed the streetscape.

7.4

GENERAL MAINTENANCE STANDARDS

7.4.1 Trash.

Trash shall be removed on a regular basis.

7.4.2 Turf-type grass.

Cool-season turfgrasses shall be maintained at a 3-inch cut during the growing season. Trimming shall be concurrent with mowing, to match height of open turf, around mowing obstructions such as trees, curbs, and vacuum breakers. Turfgrass shall be edged concurrent with mowing when needed to prevent growth over edges. Visible clippings shall be removed from sidewalks and streets.

Buffalograss and Blue grama shall be maintained at a maximum height of 12 inches.

7.4.3 Shrubs.

Shrubs shall be pruned as needed to: 1) achieve the design intent; 2) remove dead or diseased branches; and 3) support plant health and vigor. Dead shrubs shall be removed and replaced immediately. Shrubs shall not extend over the curb or sidewalk.

7.4.4 Perennials.

Perennials shall be deadheaded and trimmed throughout the growing season as appropriate for the design intent for each species. Depending upon design intent, perennials and ornamental grasses shall be cut back in late fall or early spring prior to new growth. Dead

perennials shall be removed immediately and replaced per the design intent.

7.4.5 Annuals.

Planting of annuals in the spring shall be in designated annual flower beds. Annuals shall be regularly deadheaded of spent blooms. Annuals shall be removed in the fall after the first hard freeze.

7.4.6 Mulch.

Mulch shall be replenished as needed to maintain complete coverage of the soil surface with a depth of 2-4 inches, with careful placement and reduced depth as needed underneath plants to avoid burying leaves or tender stems.

7.4.7 Weeds.

All landscaped areas shall be kept free of weeds and invasive grasses that are not part of the design intent. Weeding may be done manually or by the use of herbicide and or pre-emergent. The use of any restricted herbicides or soil sterilants is prohibited. In accordance with Best Management Practices, the effectiveness of the herbicide shall be monitored.

SECTION 8

Irrigation Standards

Proper watering systems help achieve City goals and citizen expectations for public spaces. Irrigation of parkway and median plant material is necessary to maintain a quality appearance and long term health of streetscape plantings.

It is the City's intent to be a good steward of water resources consistent with "xeriscape" and "water-wise" principles related to social, environmental, and economic sustainability.

All irrigation systems will be designed to meet the needs of each unique landscape by following best management practices and up-to-date technology. Without proper irrigation design and maintenance, good stewardship of the landscapes is not achievable.

8.1

IRRIGATION SYSTEM DESIGN

8.1.1 General design standards.

Irrigation design and installation shall comply with the following general standards:

- A. Irrigation design shall be done by a certified irrigation designer unless otherwise approved by the Parks Department.
- B. Irrigation system design and installation shall be monitored,

inspected, and approved by the City Parks Division. Irrigation systems shall be installed and maintained so that irrigation equipment will not spray onto any streets, walkways, or features and structures that could be damaged by water.

- C. The irrigation system must comply with the International Plumbing Code and with the City of Fort Collins Electrical Code.
- D. Any deviation in taps from the approved construction plans must be approved by City of Fort Collins Utilities prior to installation. Any water service line shall be coordinated with City of Fort Collins Utilities.
- E. Any deviation in layout of the irrigation system from the approved construction plans must be reviewed and approved by the City Parks Division prior to or during installation.
- F. The irrigation system shall be designed to provide full coverage and matched precipitation rates.
- G. Lateral piping shall be sized based on flow demands in gallons per minute (gpm); with velocities not to exceed 5.5 feet per second.
- H. Xeriscape principles shall be utilized in the design of the irrigation system.

- I. All designs shall meet the industry's Best Management Practices from the Irrigation Association and ALCC (Associate Landscape Contractors of Colorado).
- J. Newly installed irrigation systems shall be subject to water audits.
- K. The minimum distribution uniformity for spray heads shall be .55; for rotor heads it shall be .65; for stream rotors it shall be .75; and for impact heads it shall be .65.
- L. Design considerations shall include:
 - 1) shrub and perennial beds are to be zoned separately from turf areas;
 - 2) sloped areas will have separate zoning for heads at the higher elevations from those at the lower elevation;
 - 3) areas with different exposures are to be zoned separately; and
 - 4) In-head check valves are to be used for all areas adjacent to walkways and at the bottom of berms and pond areas.
- M. Xeric irrigation and drip systems come in a wide variety of configurations. The correct application shall be approved for each landscape design by the City Parks Department.
- N. Trees planted in non-turf irrigated landscape areas require short-term and long-term irrigation and should be on individual or separate zones. Supplemental emitters shall be installed on top and around the root ball for short term health. Perimeter irrigation of the root ball shall be installed for long term and permanent irrigation.
- O. The contractor shall install the saddle for the PVC or AC pipe.
- P. The backflow prevention device and water meter shall meet the City of Fort Collins standards, and the flow meter shall be *Data Industrial*.
- Q. A curb stop shall be installed between the meter pit and the backflow prevention device for isolation purposes. The curb stop shall be sleeved from the valve to grade and covered with a round valve box.
- R. A blowout tube no larger than ¼" shall be placed between the meter pit-curb stop and the back flow prevention device. The injection port on the blow out tube shall be sweated on, attaching a female adapter with a threaded brass plug.
- S. A blowout tee shall be installed immediately downstream of the backflow prevention device.

8.2

MATERIALS STANDARDS

8.2.1 Pipe:

- A. Copper shall be type K rigid conforming to *ASTM Standard B88*.
- B. Mainline shall be Class 200 PVC, NSF approved. If 3 inches or larger, use ringtite pipe.
- C. Laterals shall be Class 200 PVC, NSF approved.

- D. No laterals shall be smaller than 1-inch pipe.
- E. Trickle tubing shall be weather and UV resistant material.
- F. Polyethylene drip pipe shall be NSF approved, SDR pressure-rated pipe, only as approved for drip applications.
- G. Funny pipe shall be used only for pop-up spray heads, and shall be compatible with the elbows needed for the sprinkler heads.
- H. Lateral fittings shall be Schedule 40, Type 1, PVC solvent-weld, with *ASTM Standards D2466* and *D1784*.
- I. Copper or cast bronze fittings, soldered or threaded per installation details shall be used for all copper pipe.
- J. Mainline fittings shall be ductile iron for 3-inch and larger pipe; and shall be PVC Schedule 80 for smaller pipe.
- K. Sleeving shall be ductile iron or PVC pipe under all paved surfaces. Sizes shall be a minimum of two sizes larger than the pipe being sleeved, but shall in no case be smaller than 2-inch diameter pipe.

8.2.2 Valves:

- A. Remote control zone valves shall be electrically operated, appropriate for the water supply, with manual bleed device and flow control stem. Valves shall have a slow-opening and slow-closing action for protection against surge pressure.

Brand and model shall be Rainbird PE Series Remote Control Valves, scrubber option with self cleaning screen unless City specifies other brand and model.

- B. Valves used for two-wire system shall be properly grounded per manufacturers recommendation.
- C. Drip valves, bubbler valves, and micro-spray valves shall be accompanied by pressure-reducing devices matched with recommended filters to assure proper operation and reduced failure of such equipment.
- D. Isolation gate valves shall be *Kennedy 1571X* or *Matco #100M*, able to withstand a continuous operating pressure of 150 psi. Clear waterway shall be equal to full diameter of pipe. Shall be opened by turning square nut to the left (wheel opening is unacceptable).
- E. Manual drain valves shall be ¾-inch ball valve with tee handle, *Watts #B-6000*, or approved equal.
- F. Quick coupler valves shall be 1-inch brass, *Rainbird #5RC* units with rubber cover. Supply 1-inch brass key for *Rainbird 55K*.
- G. Spears True Union ball valves shall be installed upstream of the remote control zone valve. Equivalent substitutes shall be accepted.
- H. Valve boxes shall have matching locking cover which shall be *Carson, Pentex* or approved equal.

Box sizes shall be as specified to house one valve per box.

8.2.3 Control System:

- A. Controllers shall have smart controller technology and shall be approved by the Parks Department. The number of stations shall include two extra stations for possible future use. The controller box shall be weather tight and vandal resistant with locking exterior disconnect. One *Eicon* pigtail or compatible remote controller pigtail shall be used for each 12 stations.
- B. The Control System Enclosure shall be *Hofman* Model A242408LP with A24P24 steel panel, Model A-FK1208 floor stand kit and AL-2BR lock kit, or approved equal.
- C. The surge protection shall be an 8-foot copper grounding rod, #4 solid copper wire, grounding buss receptacle, ground terminal strip and *Irritrol* SPD-587 surge protector per manufacturer's specifications and details.
- D. The master valve shall be normally opened.
- E. Control wiring shall be #14 solid copper direct burial UF or PE cable, UL approved, or larger, per system design and manufacturer's recommendations.
- F. Five-wire systems shall have a consistent color scheme throughout: Red = live; White = ground; Black, Blue and Green = extra.

G. If two-wire systems are used, approved shielded wire or manufacturers recommended wire shall be used.

H. Approved wire connectors and water-proofing sealant shall be used to join control wires to zone valve wires. The wire connectors shall be what each specific manufacturer recommends. Two-wire systems shall use manufacturers specified wire per warranty provisions.

8.2.4 Sprinkler heads.

All sprinkler heads shall be of the same manufacturer as specified on the plans, marked with the manufacturer's name and model in such a way that materials can be identified without removal from the system. The City will specify brands and models to match other equipment in use in public systems in the vicinity. Gear driven rotor heads shall be *Hunter* or approved equal. Pop-up spray heads shall be *Hunter*, *Rainbird*, or approved equal. All heads should have pressure regulating device integrated in them to maintain proper operating pressure. They also shall have anti water draining valves to avoid water waste when not in operation. (Example: Rain Bird 1804 PRS/SAM heads. A minimum of 4" pop-up is required.)

8.3

INSTALLATION PREPARATION

8.3.1 Utility locates.

Locate all utilities prior to trenching and protect from damage. Required calls shall include, but are not limited to the following: City Parks Division, 221-6660, for locates and 1-800-922-1987 for utility locates within the City of Fort Collins. Contact other utilities as required.

8.3.2 Preliminary inspection.

The Contractor shall inspect tap and any existing irrigation system, as applicable, prior to work.

8.4

INSTALLATION PROCEDURES

8.4.1 Water service connections (taps):

- A. Forty-eight hours prior to connection, the contractor shall contact the City of Fort Collins Water Utilities, at 221-6700 to schedule the work for water taps and inspections. A minimum two weeks prior notice shall be given to the Water Meter Shop, 221-6759, for installations which will require meters and/or backflow devices larger than 2 inches.
- B. The contractor shall be responsible for excavation, connection to corporation stop at the water main, providing and installing the saddle for the PVC or A.C. pipe, making the connection to the existing water service, backfill and

compaction, and pavement / shoulder / surface treatment replacement as needed. Soldered joints or fittings are permissible above grade or inside a vault. No solder, sealants, fluxes, pipe dope, and other materials shall contain any lead. All taps and installations are subject to approval and inspection by the City of Fort Collins Water Utilities. Install meter as specified in a precast vault. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with the City of Fort Collins Utilities.

- C. The contractor shall install a winterization assembly downstream of the meter vault a minimum of 6 feet away from the outside of the meter vault on the copper pipe.
- D. Copper pipe shall be soldered so that a continuous bead shows around the joint circumference. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.

8.4.2 Pipe trenching:

- A. Install pipe in open-cut trenches of sufficient width to facilitate thorough tamping/ puddling of suitable backfill material under and over pipe.
- B. Trenches shall be as straight as possible, but when a bend of 20 degrees or more is necessary, proper fittings shall be used to reduce stress on the pipe.

- C. Trench depths for mainlines shall be a minimum of 24 inches deep from top of pipe to finished grade.
- D. Trench depths for laterals shall be a minimum of 16 inches deep from top of pipe to finished grade.

8.4.3 Sleeving:

- A. Wires shall be in separate sleeves from pipe, and shall be 2-inch minimum size pipe.
- B. Sleeves shall have traceable marker tape on upper side and both ends for future locates.
- C. Sleeves shall be installed at a depth which permits the encased pipe or wiring to remain at the specified burial depth.
- D. Boring for sleeving shall not be permitted unless an obstruction in a pipe path cannot be moved, or pipe cannot be re-routed.
- E. Any mainline installed in existing sleeves at a greater depth than adjacent pipe shall have a manual drain valve at each end if the sleeve is longer than 20 feet, or at one end if the sleeve is less than 20 feet.
- F. Sleeves shall be installed so ends extend past edge of curb, gutter, sidewalk, bikepath or other obstruction, a minimum of 2 feet.
- G. Sleeves shall be marked with an "x" chiseled in walk (or other surface) directly over the sleeve location.

- H. Sleeves shall be laid to drain at minimum grade of 5 inches per 100 feet.

- I. Sleeves shall be bedded in 2 inches of fill sand and covered by 6 inches of fill sand.

- J. Sleeves installed for future use shall be capped at both ends.

- K. Sleeving shall not have joints unless necessary due to length of sleeving run. If joints are necessary, only solvent welded joints are allowed.

- L. Compaction of backfill for sleeves shall be 95% of *Standard Proctor Density*, ASTM D698-78. Use of water (puddling) around sleeves for compaction, is prohibited.

8.4.4 Pipe installation:

- A. Teflon tape shall be used on all threaded joints; only Schedule 80 pipe may be threaded.
- B. Reducing of pipe size shall be done with reducing insert couplings, at least 6 inches beyond the last tee of the larger pipe.
- C. PVC lateral pipe shall be snaked from side to side within the trench.
- D. Cut pipe ends shall be cut square and deburred. Pipe ends shall be cleaned before using primer and solvent cement. Pipe ends shall be joined in a manner recommended by manufacturer and in accordance with accepted industry practices. Joints shall cure for 30 minutes

before handling, and 24 hours before allowing water in the pipe.

- E. Backfill shall be free from rubbish, stones larger than two 2-inch diameter, frozen material and vegetative matter. Backfill shall not be placed in freezing weather. If backfill material is rocky, the pipe shall be bedded in 2 inches of fill sand covered by 6 inches of fill sand.
- F. After puddling or tamping, all trenches shall be left slightly mounded to allow for settling.
- G. Backfill shall be compacted to proper densities depending on whether the surface area over the line will be paved or landscaped.

8.4.5 Thrust blocks:

- A. Thrust blocks shall be installed where PVC mainline 2.5 inches or larger changes direction over 20 degrees.
- B. Thrust blocks shall consist of a minimum of one cubic foot of concrete.
- C. No concrete shall be allowed to remain on pipe joints.
- D. Wiring shall be placed away from thrust blocks to avoid contact with concrete.

8.4.6 Valve installation:

- A. Valves shall be installed at least 12 inches from, and aligned with, with adjacent walls or paved edges.
- B. Automatic Remote Valves shall be installed so that valves are accessible for repairs. Make electrical connections so as to allow pigtail so solenoids can be removed from the valve with 24 inches (minimum) slack to allow the ends to be pulled 12 inches above ground. The zone wire should be coiled. Flush completely before installing the valve. Thoroughly flush piping system under full head of water for three minutes through furthest valve, before installing heads.
- C. The top of the valve box shall be flush with the finish grade.
- D. The valve assembly shall include the ball valve and union per detail for ease of maintenance and repair. Valves shall be installed in valve boxes per details.
- E. Quick couple valves shall be installed in 10-inch round locking valve boxes. Valves shall be flush completely before installation. Thoroughly flush the piping system under a full head of water for three minutes through the furthest valve.
- F. Isolation gate valves shall be installed in the valve box.
- G. Valve boxes shall be branded with the following codes: "SV" and the controller valve number per as-built plans for all remote control valves; "DV" for all drain valves; "GV" for

all isolation valves; “DRGV” for all drip system isolation valves; “QC” for all quick coupling valves; “WA” for all winterization assemblies; “FM” for all flow meter assemblies; and “MV” for all master valve assemblies. Use a branding iron stamp with 3-inch high letters.

- H. Valve boxes shall NOT rest on mainlines. Brick or other non-compressible material shall be used per details.
- I. Valves shall be installed in boxes with adequate space to access valves with ease. Valves shall not be too deep to be accessible for repairs. A 3-inch depth of ¾-inch washed gravel shall be placed in the bottom of each valve box with enough space to fully turn valve for removal per detail.
- J. Six-inch valve boxes shall be limited to wire splices, drip end caps, and drains.

8.4.7 Head installation:

- A. Heads shall be set plumb and level with the finish grade. In sloped areas, heads shall be tilted as necessary to provide the full radius spray pattern.
- B. Lateral lines shall be flushed before installing heads. Thoroughly flush the piping system under a full head of water for three minutes through the furthest head, before installing the heads. Cap the risers if a delay of head installation occurs.

- C. Pop-up heads along walks and bikeways shall be bedded in a 6 inch layer of sand under the base of the head. Heads that border sidewalks and curbs shall be 1-1 ½ inches from the concrete.
- D. Nozzles appropriate for best performance shall be installed.
- E. Nozzles and radius of throw shall be adjusted to minimize overspray onto hard surfaces.

8.4.8 Electrical connections:

- A. New connections shall be approved through the City of Fort Collins Electric Utilities. Call 221-6700 to obtain power information and request connection. Actual connection to transformer or other power source will be done by the City of Fort Collins Electric Utilities. Work shall be coordinated and scheduled by calling 221-6700.
- B. All work other than actual connection, including access to the transformer box where applicable, shall be supplied by the contractor.
- C. All materials shall be provided by the contractor. When working near any City electric facility, prior coordination and approval is required.

8.4.9 Controller Installation:

- A. Controllers shall be installed in an above-ground location suitable to prevent vandalism and provide protection from adverse weather conditions, and per City direction.

- B. All exposed wiring to and from the controller shall be encased in galvanized metal conduit.
- C. Exterior controllers to be installed on a 6-inch thick concrete pad.
- D. Controllers shall be installed per City direction and manufacturers specifications. Surge protection, grounding rods and other accessory components shall be included as specified.
- E. Wire markers shall be attached to the ends of control wires inside the controller unit. Label wires with the identification number of the remote control valve activated by the wire.

8.4.10 Wiring:

- A. Wiring shall comply with City of Fort Collins Electrical Code.
- B. The power source shall be brought to the controller via a ground fault receptacle installed within the controller casing.
- C. Control wires shall be strung as close as possible to the mainline, consistently along and slightly below one side of the pipe.
- D. A minimum loop of 24 inches shall be left at each valve and controller, and at each splice, at the ends of each sleeve, at 100-foot intervals along continuous runs of wiring, and changes of direction of 90 degrees or more.
- E. Band wires together at ten (10) foot intervals with pipe wrapping tape.
- F. Install common ground wire and one control wire for each remote control valve. Multiple valves on a single control wire are prohibited. Install three extra wires, as specified, to the furthest valve on the system and/or each branch of the system.

8.5

TESTING

8.5.1 Testing requirements:

- A. All tests shall be run in the presence of staff from the City Parks Division. Schedule all tests a minimum of forty-eight hours in advance. Repeat any failed tests until full acceptance is obtained.
- B. An operational test shall activate each remote control valve from the controller.
- C. The contractor shall replace, adjust or move heads and nozzles as needed to obtain acceptable performance of the system as directed by staff.
- D. The contractor shall replace defective valves, wiring or other appurtenances to correct operational deficiencies.

8.6

COMPLETION SERVICES

8.6.1 Requirements upon completion of construction:

- A. When project construction is complete, the contractor shall request a punchlist inspection for construction acceptance from the City Parks Division.
- B. The system shall be demonstrated to staff from the City Parks Division.
- C. Product ordering information shall be provided to City Parks Division staff including model numbers, sizes and styles for all components.
- D. Electronic as-built drawings shall be provided.
- E. Two sets of as-built drawings shall be provided, showing the system as installed with each sheet clearly marked “As-built Drawings”, the name of the project, and all information clearly provided.
- F. The as-built drawings provided shall consist of one set of reproducible mylars, no larger than 24" x 36", and one set of all sheets reduced to 11" x 17", with each station color coded, and each sheet plastic laminated.
- G. A completed backflow test for the backflow prevention device shall be provided by a licensed backflow tester.

- H. All excess materials, tools, rubbish and debris shall be removed to leave a cleaned-up site.

8.6.2 Warranty and maintenance period:

- A. A two-year warranty and maintenance period provided by the contractor shall begin upon construction acceptance by the City Parks Division.
- B. The system shall be maintained in optimal working condition for the duration of the period between construction acceptance and final acceptance. Periodic adjustments shall be made to achieve the most effective and efficient application of water.

8.6.3 Final acceptance:

- A. The contractor shall schedule a final acceptance inspection by the City Parks Division at least thirty days before the end of the one-year maintenance period.
- B. The contractor shall provide operating keys, servicing tools, test equipment, warranties/guarantees, maintenance manuals, and the contractor's affidavit of release of liens. Submittal of all these items must be accompanied by a transmittal letter and delivered to the City Parks Division offices (delivery at the project site is not acceptable.)

- C. The yearly backflow test report on the backflow device shall be submitted to the City Parks Division.

8.7

GUARANTEE/WARRANTY AND REPLACEMENT

8.7.1 Requirements.

For the period following construction acceptance notice by the City, and prior to final acceptance, all irrigation materials, equipment, workmanship and other appurtenances are to be guaranteed and warranted against defects. Settling of trenches or other depressions, damages to structures or landscaping caused by settling and other defects shall be corrected by the contractor at no cost to the City. Repairs shall be made within seven days of notification by the City Parks Division. The guarantee and warranty shall apply to all originally installed materials and equipment, and to replacements made during the guarantee/warranty period.

SECTION 9

Fine Grading And Soil Preparation Standards

9.1

GENERAL STANDARDS

Soil preparation is a crucial part of streetscape landscaping success. Individual projects may require specially tailored soil preparation, beyond the scope of these minimum standards, for sustainable health of specialized plantings.

9.1.1 Soil testing.

Soils tests conducted by the CSU Soils Lab must be completed and submitted to the City for review; and recommendations in the lab reports shall be followed in all cases. Generally this will include soil amendment and fertilizer recommendations; and in some cases, complete replacement of topsoil may be required.

9.1.2 Topsoil required.

If a landscape area is undisturbed, topsoil shall be stripped to a 6-inch depth, or to topsoil depth as determined by field inspection. Stockpile and re-spread stripped topsoil over landscape areas after rough grades are established. If the site has been disturbed, or sufficient topsoil is not available, topsoil shall be imported to achieve six 6-inch depth in all landscaped areas.

9.2

SUBMITTALS

9.2.1 Soil Amendments.

Submit a representative sample and written confirmation from the supplier of soil amendment material composition including: percent organic matter, salts, nutrient composition and trademark.

9.2.2 Topsoil.

Submit a representative sample and written confirmation from supplier of material composition including: percent organic matter, salts, and nutrient composition.

9.3

MATERIALS STANDARDS

9.3.1 Soil Amendment.

Premium 3, by *A-1 Organics*, or an approved equal high quality composted material containing a minimum of 50% organic matter shall be required for all soil amendment. The mixture shall be free from clay subsoil, stones, lumps, plants or roots, sticks, weed stolons, seeds, high salt content and other materials harmful to plant life. The compost shall be coarsely ground with an even composition and have an acidity in the range of pH 5.5 to pH 7.0. All material shall be sufficiently composted such that no original source material used is recognizable.

9.3.2 Topsoil.

Topsoil must be taken from a well drained, arable site and shall be reasonably free of subsoil, stones, clods, sticks, roots and other

objectionable extraneous matter or debris. No stones or other materials over 2 inches in size shall be allowed. Topsoil shall contain no toxic materials and have an acidity in the range of pH 5.5 to pH 8.5.

9.3.3. Fertilizer.

Triple superphosphate with a chemical analysis of 0-46-0 shall be incorporated into soil along with soil amendment.

9.4

ROUGH GRADING OPERATIONS

9.4.1 Utility locates.

All utilities shall be located prior to trenching and shall be protected from damage. Required calls shall include, but are not limited to the following: 221-6660 for Parks Division locates and 1-800-922-1987 for utility locates.

9.4.2 Acceptance of rough grading by other contractors.

The landscape contractor shall inspect and confirm that any rough grading from other contractors is per approved plans, and allows for 6-inch minimum depth of topsoil and specified soil amendments.

9.4.3 Clearing and grubbing.

The contractor shall grub and remove unsuitable woody and rock material present in the surface grade.

9.4.4 Maintain drainage.

The contractor shall take precautions to accommodate proper drainage and flow during and after grading and soil preparation.

9.4.5 Kill weeds.

Apply herbicide to areas where noxious weed beds have been established and / or where seed mix is to be planted. Herbicide must be applied by certified contractors at the rate recommended by the manufacturer after proper notification has been done in accordance with the chemical applicator's standards.

9.4.6 Rip planting areas.

Rip to 8-inch depth with agriculture subsoiler in all areas to receive plantings. Remove all objects greater than 2 inches in diameter.

9.5

FINISH GRADING OPERATIONS

9.5.1 Topsoil placement shall include the following procedures:

- A. Spread 6 inches of topsoil over the entire landscaped area and grade to smooth and even lines. Establish swales and drainage as required per plans.
- B. Evenly distribute soil amendment at rate of 3 cubic yards per 1,000 square of area, or 1-inch depth over the entire area to be prepared. Modify the rate if a soil test recommends otherwise. Till amendments into top 6 inches of soil. Compact to a firm, but not hard density (80% of *Standard Proctor Density* at 2% optimum moisture). Evenly distribute triple superphosphate fertilizer at the rate of 15 pounds per 1,000 square feet. Modify the type and rate if a soil test recommends otherwise.

- C. Trim finish grade elevations adjacent to paved areas to one inch below pavement finish grade.

SECTION 10

Grass Seeding Standards

10.1

GRASS SEEDING

10.1.1 Seed Mixes.

Seed mixes shall be approved by the City Parks Division based on the activity to take place, planned irrigation method and maintenance to be performed in the area being seeded.

10.1.2 Pre-approved Dryland Mix.

For temporary or permanent unmowed and non-irrigated areas, the following mix shall be permitted:

45% Blue Grama,
25% Buffalograss (treated), and
30% Little Bluestem.

10.1.3 Pre-approved turfgrass mix.

For irrigated, mowed areas, the following mixes shall be permitted: 1) a blend of five turf type dwarf Tall Fescues, or 2) a mix of Kentucky Bluegrass varieties and up to 15% Perennial Rye.

10.1.4 Submittals.

Certificates showing State, Federal or other inspection showing source and origin shall be submitted.

10.1.5 Seed quality.

Seed shall be of fresh, clean, new crop seed composed of the varieties approved by the City with tested minimum percentages of purity and germination clearly labeled on the package. All seed shall be at least 99.9% free of *Poa annua* and all weeds.

10.1.6 Mulch for seeded areas.

Mulch depends on the slope of the seeded area as follows:

- A. For slopes 30% and less, native grass straw without weed seed and consisting of grasses as specified for the seeded application shall be used.
- B. For slopes 30% and greater: Hydromulch using *Weyerhaeuser* "Silva-Fiber" mulch or approved equal shall be used. The mulch shall not contain any substance which might inhibit germination or growth of grass seed. The mulch shall be dyed a green color to allow metering of its application.

10.1.7 Tackifier.

Teratack III, or approved equal shall be used.

10.1.8 Netting.

For slopes greater than 30%, *Soil Saver* jute netting or approved equal shall be used. Netting shall be stapled with No. 11 gauge steel wire forged into a 6-inch long U-shape, and painted for visibility in mowed areas.

10.1.9 Fertilizer.

Fertilizer. Fertilizer with a formula of 18-46-0 shall be used on all areas to be seeded. Apply 8 pounds per 1,000

square foot of seeded area and rake lightly into top 1/8 inch of soil just prior to seeding operation.

10.1.10 Inspection.

The contractor shall inspect finish grade and trim where needed to obtain finish grades of one inch below adjacent pavements. Verify positive drainage away from all structures. Verify or complete removal of rock and debris larger than one inch from all areas to be seeded.

10.1.11 Weather for seeding.

Seed shall not be sown in windy weather or when ground is frozen or otherwise untillable.

10.1.12 Methods for seeding:

- A. A brillion type drill or hydraulic seeding methods may be used. Drill the seed in a manner such that after surface is raked and rolled, the seed has ¼-inch of cover.
- B. Hydraulic seeding shall be used in areas that are not accessible for machine methods. A hydraulic pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure shall be used. The equipment shall have an acceptable pressure gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimating the volume used or remaining in the tank. Do not seed and mulch in the same operation.

10.1.13 Seeding rates.

The following rates of application shall apply:

- A. Dryland Mix - 12 pounds pure live seed per acre.
- B. Irrigated Mix - 9 pounds pure live seed per acre for the Tall Fescue blend, or 4 pounds pure live seed for the Kentucky Blue/Perennial Rye mix.

10.1.14 Mulching operations for native grass mulch.

Mulch shall be applied at a rate of two 2 tons per acre within 24 hours after seeding.

10.1.15 Hydromulching operations.

Wood cellulose fibers shall be evenly dispersed by agitation in water. When sprayed uniformly on the soil surface, the fibers shall form a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil. Cellulose fiber mulch shall be added with the proportionate quantities of water and other approved materials in the slurry tank. All ingredients shall be mixed to form a homogenous slurry. Using the color of the mulch as a metering agent, spray apply the slurry mixture uniformly over the seeded area. Apply with tackafier used at a rate of 120 pounds per acre. Unless otherwise ordered for specific areas, fiber mulch shall be applied at the rate of 2,000 pounds per acre. Hydraulic mulching shall not be performed in the presence of free surface water resulting from rains, melting snow or other causes.

10.1.16 Mulch netting operations.

Mulched areas over 30% slope shall be stabilized with netting. If the contractor fails to net and subsequent soil erosion occurs, the contractor shall re-establish the finish grade, soil preparation, seed bed, and apply netting at no cost to the City.

10.1.17 Watering.

Immediately after seeding and mulching, water the seeded area slightly to a depth of 2 inches, but with care so that no erosion takes place and no gullies are formed. Water lightly two times per day and keep the seeded area moist until turf is established. Sloped areas shall be hand watered until turf is established to prevent erosion. Water these areas more often but for shorter periods of time.

10.1.18 Clean up.

All hydromulch and other mulch materials shall be removed from all plant materials, fences, concrete and other areas except for the seed bed.

10.1.19 Protection of seeded areas for establishment.

The contractor shall provide and install barriers as required to protect seeded areas from pedestrian and vehicular damage. Signage shall be provided if needed.

EXHIBIT A


List of Recommended Plants

The list below contains recommended plant species for streetscapes. This list will be monitored by staff as part of an ongoing program with periodic updates based on evaluation of success of plantings over time.

Designers of individual streetscape projects may propose plants not on the list based on the design intent for the particular project.

List of Recommended Plants

Last Amended 11.8.2012

	Comments
	Key:  CO native status as determined by USDA Plants Database
Canopy Shade Trees	
<i>Acer negundo</i> - Boxelder 'Sensation'	
<i>Catalpa speciosa</i> - Northern Catalpa	Tolerant of alkaline soils; holds a strong dominant leader; male tree so no boxelder bugs
<i>Celtis occidentalis</i> - Northern Hackberry	
<i>Gleditsia triacanthos</i> v. <i>inermis</i> - Honeylocust 'Imperial,' 'Shademaster', 'Skyline'	Wrap young trees
<i>Gymnocladus dioica</i> - Kentucky Coffeetree 'Espresso'	
<i>Quercus buckleyi</i> - Texas Red Oak	Many seed sources, not predictably cold hardy
<i>Quercus macrocarpa</i> - Bur Oak	Slow growing
<i>Quercus muehlenbergii</i> - Chinkapin Oak	
<i>Quercus robur</i> - English Oak, Skymaster	
<i>Quercus shumardii</i> - Shumard Oak	From a northern source
<i>Tilia americana</i> - American Linden 'Boulevard', 'Frontyard', 'Legend', 'Sentry'	Do not use in along roads that are treated with deicing salts
<i>Tilia cordata</i> - Littleleaf Linden 'Chancellor', 'Dropmore', 'Greenspire', 'Norlin', 'Olympic', 'Prestige', 'Shamrock'	Do not use in along roads that are treated with deicing salts
<i>Tilia x euchlora</i> - Redmond Linden	Do not use in along roads that are treated with deicing salts
<i>Tilia x flavescens</i> - Glenleven Linden	Do not use in along roads that are treated with deicing salts
<i>Ulmus davidiana</i> - David Elm	
<i>Ulmus japonica</i> x <i>U. wilsoniana</i> – Elm 'Accolade', 'Triumph'	Use in smaller quantities
Ornamental Trees	
<i>Acer grandidentatum</i> - Wasatch Maple	
<i>Acer tataricum</i> - Tatarian maple 'Hot Wings', 'Pattern Perfect'	
<i>Crataegus crusgalli</i> - Thornless Cockspur Hawthorn	
<i>Malus</i> sp. - Crabapple 'Adams', 'Profusion', 'Radiant', 'Spring Snow', 'Thunderchild'	Spring Snow' has some limited fireblight problems.
<i>Pyrus calleryana</i> - Flowering Pear 'Aristocrat', 'Capital', 'Chanticleer', 'Cleveland Select', 'Redspire'	
<i>Quercus gambelli</i> - Gambel Oak	
<i>Quercus alba</i> x <i>robur</i> – Oak 'Crimson Spire'	
<i>Syringa reticulata</i> - Japanese Tree Lilac 'Ivory Silk'	

	Comments
Large Evergreen Trees	
<i>Picea Pungens</i> - Blue Spruce 'Fat Albert', 'Baby Blue Eyes'	Sensitive to salt.
<i>Pinus nigra</i> - Austrian Pine	Only use in wide medians.
Small Evergreen Trees	
<i>Juniperus scopulorum</i> - Rocky Mountain Juniper 'Cologreen', 'Moonglow', 'Wichita Blue'	
<i>Juniperus monosperma</i> - Oneseed Juniper	Very low water use
<i>Picea pungens</i> - Dwarf Blue Spruce 'Sester', 'Globosa', 'Montgomery'	
<i>Pinus mugho</i> - Mugo Pine 'Tannenbaum'	
Shrubby Trees/Large Shrubs	
<i>Acer grandidentatum</i> - Bigtooth Maple	
<i>Quercus gambelli</i> - Gambel Oak	
<i>Cercocarpus ledifolius</i> - Curlleaf Mountain-Mahogany	
<i>Xanthoceras sorbifolia</i> - Yellowhorn	
<i>Rhus glabra</i> , <i>R. glabra cismontana</i> - Smooth Sumac, Rocky Mountain Smooth Sumac	
Deciduous Shrubs	
<i>Amelanchier alnifolia</i> - Regent Serviceberry	
<i>Amorpha canescens</i> - Leadplant	Deadhead
<i>Amorpha nana</i> - Dwarf Leadplant	Deadhead
<i>Aronia arbutifolia</i> - Red Chokeberry	
<i>Aronia melanocarpa</i> - Chokeberry, Dwarf Iroquois Beauty	
<i>Artemisia tridentata</i> - Tall Western Sage	
<i>Atriplex canescens</i> - Fourwing Saltbush	
<i>Caragana pygmaea</i> - Pygmy Peashrub	
<i>Caragana rosea</i> - Rose Peashrub	
<i>Ceratoides lanata</i> - Winterfat	
<i>Cercocarpus ledifolius</i> - Curl Leaf Mountain Mahogany	Can grow to be quite large with too much water
<i>Cercocarpus ledifolius intricatus</i> - Little Leaf Mountain Mahogany	
<i>Cercocarpus montanus</i> - True Mountain Mahogany	
<i>Chamaebatiaria millefolium</i> - Fernbush	Deadhead
<i>Chrysothamnus nauseosus nauseosus</i> - Dwarf Blue Rabbitbrush	Gets large with irrigation

	Comments
<i>Chrysothamnus nauseosus albiculatus</i> - Tall Blue Rabbitbrush	
<i>Chrysothamnus nauseosus graveolens</i> - Green Rabbitbrush	
<i>Caryopteris incana</i> - Blue Mist Spirea	Shear back after blooming, prune out dead wood annually
<i>Caryopteris x clandonensis</i> - Dark Knight Spirea	Used on Harmony project
<i>Cotoneaster apiculatus</i> - Cranberry Cotoneaster	
<i>Cotoneaster horizontalis</i> - Rock Cotoneaster	
<i>Cytisus scoparius 'Burkwoodii'</i> - Red Burkwoodii Broom	
<i>Ephedra equisetina</i> - Bluestem Joint Fir	
<i>Ephedra viridis</i> - Mormon Tea	
<i>Euonymus alatus 'Compactus'</i> - Dwarf Burning Bush	
<i>Fallugia paradoxa</i> - Apache Plume	
<i>Ligustrum vulgare 'Lodense'</i> - Lodense Privet	
<i>Physocarpus monogynus</i> - Mountain Ninebark	
<i>Physocarpus opulifolius</i> - Ninebark	
<i>Potentilla fruticosa</i> - Potentilla	
<i>Potentilla fruticosa davarica 'Prairie Snow'</i> - Prairie Snow Potentilla	
<i>Potentilla fruticosa 'Yellow Gem'</i> - Yellow Gem Potentilla	
<i>Prunus besseyi 'Pawnee Buttes'</i> - Creeping Western Sand Cherry	
<i>Rhus aromatica</i> 'Gro-low' - Fragrant Dwarf Sumac	Needs ample space
<i>Rhus glabra cismontana</i> - Rocky Mountain Sumac	Needs ample space
<i>Rhus trilobata 'Autumn Amber'</i> - Creeping Three-leaf Sumac	
<i>Ribes aureum</i> - Golden Currant	
<i>Ribes cereum</i> - Wax Currant	
<i>Rosa x var.</i> - Shrub Rose	Remove deadwood each spring, many will continue blooming if deadheaded.
<i>Spiraea nipponica</i> - Snowmound Spirea	
<i>Spiraea thunbergii</i> - Mellow Yellow Spirea	
<i>Spiraea x vanhouttei</i> - Vanhoutte Spirea	
<i>Symphoricarpos occidentalis</i> - Snowberry	
<i>Symphoricarpos orbiculatus</i> - Red Coralberry	
<i>Symphoricarpos x chenaultii</i> - 'Hancock' Coralberry	
<i>Syringa meyeri</i> - Dwarf Korean Lilac	Looks best when deadheaded after blooming
<i>Syringa patula 'Miss Kim'</i> - Miss Kim Dwarf Lilac	Looks best when deadheaded after blooming

	Comments
Evergreen Shrubs	
<i>Juniperus chinensis</i> - Chinese Juniper	
<i>Juniperus communis</i> - Common Juniper	
<i>Juniperus horizontalis</i> - Creeping Juniper	
<i>Juniperus monosperma</i> - Oneseed Juniper	
<i>Juniperus scopulorum</i> - Rocky Mountain Juniper	
<i>Picea pungens</i> - Globe Spruce	
<i>Pinus mugo</i> - Mugo Pine	
Evergreen (Broad-leafed)	
<i>Arctostaphylos uva-ursi</i> - Kinnikinnick	
<i>Arctostaphylos x coloradoensis panchito</i> - Panchito Manzanita	
<i>Euonymus kiautschovicus</i> - Manhattan Euonymus	
<i>Yucca filamentosa</i> - Adam's needle Yucca	
<i>Yucca glauca</i> - Soapweed	
Ornamental Grasses	
<i>Boutelous gracilis</i> - Blue Grama Grass	Winter interest; cut back in spring
<i>Bouteloua gracilis</i> - 'Blonde Ambition' Blue Grama Grass	
<i>Deschampsia caespitosa</i> - Tufted Hair Grass	
<i>Festuca ovina glauca</i> - Blue Fescue	
<i>Pennisetum alopecuroides</i> - Fountain Grass	This acts more like an annual
<i>Schizachyrium scoparium</i> - Little Bluestem	
<i>Sorghastrum nutans</i> - Indiangrass	
Perennials	
<i>Achillea filipendulina</i> 'Parker's Variety' - Tall Yellow Yarrow	Deadhead
<i>Achillea</i> 'Moonshine' - Moonshine Yarrow	Deadhead
<i>Asclepias tuberosa</i> - Butterfly Weed	
<i>Agastache</i> 'Coronado Red' - Coronado Red Hyssop	Do not cut back until spring to promote overwintering
<i>Agastache cana</i> 'Sonoran Sunset' - Sonoran Sunset Hyssop	Do not cut back until spring to promote overwintering
<i>Agastache rupestris</i> - Sunset Hyssop	Do not cut back until spring to promote overwintering
<i>Artemisia frigida</i> - Fringed Sage	
<i>Artemisia schmidtiana</i> - Silver Mound Sage	Cut back in mid-summer when sprawls

	Comments
<i>Artemisia versicolor</i> - Sea Foam Sage	
<i>Coreopsis verticillata</i> 'Zagreb' - Coreopsis	Grows well in rocky, well drained soil
<i>Echinacea purpurea</i> - Purple Coneflower	Deadhead, if too much irrigation, will get root fungus
<i>Echinacea purpurea</i> 'White Swan' - White Coneflower	Deadhead, if too much irrigation, will get root fungus
<i>Erigeron speciosus</i> var. <i>macranthus</i> - Aspen Fleabane, Aspen Daisy	
<i>Gaillardia aristata</i> - Native Blanket Flower	Short lived
<i>Geranium cinereum</i> - 'Ballerina' Cranesbill	
<i>Geranium dalmaticum</i> - Compact Rose Cranesbill	Alpine and rock gardens, does not seed out
<i>Geranium endressii</i> - 'Wargrave Pink' Pink Cranesbill	Attractive to pollinators
<i>Geranium himalayense</i> 'Plenum' - Birch Double Cranesbill	Very showy
<i>Geranium x 'Johnson's Blue'</i> - Blue Cranesbill	
<i>Geranium sanguineum</i> - Bloody Cranesbill	
<i>Hemerocallis</i> spp. - Daylily	Deadhead, cut back in late fall
<i>Hesperaloe parviflora</i> - Red False Yucca	Needs good drainage, don't use bark mulch around crown, marginal hardiness
<i>Lavandula angustifolia</i> - Lavender	Shear back after bloom, can have winter dieback
<i>Liatris punctata</i> - Gayfeather, Dotted Blazing Star	
<i>Liatris spicata</i> 'Floristan Violet' - Purple Gayfeather	
<i>Linum flavum</i> 'Compactum' - Yellow Flax	
<i>Lychnis coronaria</i> - Rose Compion	Bennial, reseeds aggressively
<i>Oenothera macrocarpa</i> - Missouri Primrose	Self sows
<i>Penstemon pinifolius</i> - Pineleaf Penstemon	Shear back after bloom
<i>Penstemon strictus</i> - Rocky Mountain Pentstemon	Deadhead
<i>Persicaria affinis</i> - Himalayan Border Jewel	
<i>Rudbeckia fulgida</i> 'Goldsturm' - Black-Eyed Susan	Other varieties may live longer
<i>Salvia pachyphylla</i> - Mojave Sage	Marginal hardiness, needs excellent drainage
<i>Sedum 'Autumn Joy'</i> - Stonecrop	
Groundcovers	
<i>Alyssum montanum</i> - Mountain Basket of Gold	
<i>Callirhoe involucrata</i> - Winecups	Self sows. Cut back after first flush of blooms to promote new growth
<i>Ceratostigma plumbaginoides</i> - Plumbago	Can die out in winter
<i>Euonymus fortunei</i> - Euonymus	Invasive in some states
<i>Polygonum Reynoutria</i> - Fleeceflower	Considered invasive in many states; plant where it can be contained

Appendix D

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current
Information.**

City of Fort Collins Master Street Plan Questions and Answers

City of Fort Collins “Master Street Plan”

<https://www.fcgov.com/fcmoves/msp>

City of Loveland “Transportation Master Plan”

<https://www.lovgov.org/services/public-works/transportation-development-and-construction-standards>

Appendix E – Standard Notes, Approval Blocks, Checklists

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

E-1-FC/Lar	General Notes - City of Fort Collins and Larimer
E-1-Lov	General Notes - City of Loveland
E-2	Construction Notes
E-3	Signature Block
E-4-FC	Checklist - City of Fort Collins
E-4-Lov	Checklist - City of Loveland
E-5	Stop Work Orders
E-6	Criteria for Scanable Quality Mylars

Appendix E-1-FC/Lar

General Notes (City of Fort Collins and Larimer County)

Submissions shall include a General Notes sheet. Please contact the Local Entity Engineer for current General Notes. The following General Notes are provided as a guideline for the Local Entities as noted. Include these notes on the plan as follows:

- **Include only the notes that apply to the project**
- **Preserve note numbers given below**

1. All materials, workmanship, and construction of public improvements shall meet or exceed the standards and specifications set forth in the *Larimer County Urban Area Street Standards* and applicable state and federal regulations. Where there is conflict between these plans and the specifications, or any applicable standards, the most restrictive standard shall apply. All work shall be inspected and approved by the Local Entity.

2. All references to any published standards shall refer to the latest revision of said standard, unless specifically stated otherwise.

3. These public improvement construction plans shall be valid for a period of three years from the date of approval by the Local Entity Engineer. Use of these plans after the expiration date will require a new review and approval process by the Local Entity prior to commencement of any work shown in these plans.

4. The engineer who has prepared these plans, by execution and/or seal hereof, does hereby affirm responsibility to the Local Entity, as beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the Local Entity Engineer shall not relieve the engineer who has prepared these plans of all such responsibility. Further, to the extent permitted by law, the engineer hereby agrees to hold harmless and indemnify the Local Entity, and its officers and employees, from and against all liabilities, claims, and demands which may arise from any errors and omissions contained in these plans.

5. All sanitary sewer, storm sewer, and water line construction, as well as power and other "dry" utility installations, shall conform to the Local Entity standards and specifications current at the date of approval of the plans by the Local Entity Engineer.

6. The type, size, location and number of all known underground utilities are approximate when shown on the drawings. It shall be the responsibility of the Developer to verify the existence and location of all underground utilities along the route of the work before commencing new construction. The Developer shall be responsible for unknown underground utilities.

7. The Engineer shall contact the Utility Notification Center of Colorado (UNCC) at 1-800-922-1987, at least 2 working days prior to beginning excavation or grading, to have all registered utility locations marked. Other unregistered utility entities (i.e. ditch / irrigation company) are to be located by contacting the respective representative. Utility service laterals are also to be located prior to beginning excavation or grading. It shall be

the responsibility of the Developer to relocate all existing utilities that conflict with the proposed improvements shown on these plans.

8. The Developer shall be responsible for protecting all utilities during construction and for coordinating with the appropriate utility company for any utility crossings required.

9. If a conflict exists between existing and proposed utilities and/or a design modification is required, the Developer shall coordinate with the engineer to modify the design. Design modification(s) must be approved by the Local Entity prior to beginning construction.

10. The Developer shall coordinate and cooperate with the Local Entity, and all utility companies involved, to assure that the work is accomplished in a timely fashion and with a minimum disruption of service. The Developer shall be responsible for contacting, in advance, all parties affected by any disruption of any utility service as well as the utility companies.

11. No work may commence within any public storm water, sanitary sewer or potable water system until the Developer notifies the utility provider. Notification shall be a minimum of 2 working days prior to commencement of any work. At the discretion of the water utility provider, a pre-construction meeting may be required prior to commencement of any work.

12. The Developer shall sequence installation of utilities in such a manner as to minimize potential utility conflicts. In general, storm sewer and sanitary sewer should be constructed prior to installation of the water lines and dry utilities.

13. The minimum cover over water lines is 4.5 feet and the maximum cover is 5.5 feet unless otherwise noted in the plans and approved by the Water Utility.

14. A State Construction Dewatering Wastewater Discharge Permit is required if dewatering is required in order to install utilities or water is discharged into a storm sewer, channel, irrigation ditch or any waters of the United States.

15. The Developer shall comply with all terms and conditions of the Colorado Permit for Storm Water Discharge (Contact Colorado Department of Health, Water Quality Control Division, (303) 692-3590), the Storm Water Management Plan, and the Erosion Control Plan.

16. The Local Entity shall not be responsible for the maintenance of storm drainage facilities located on private property. Maintenance of onsite drainage facilities shall be the responsibility of the property owner(s).

17. Certification of grading and drainage facilities must be completed by a registered engineer and submitted to the Stormwater Utility Department at least two weeks prior to Stormwater Utility Department acceptance, or otherwise in accordance with the Development Agreement.

18. The Local Entity shall not be responsible for any damages or injuries sustained in this Development as a result of groundwater seepage, whether resulting from groundwater flooding, structural damage or other damage unless such damage or injuries are sustained as a result of the Local Entity failure to properly maintain its water, wastewater, and/or storm drainage facilities in the development.

19. All recommendations of the final drainage and erosion control study (name of the study and date) by (Engineering Firm) shall be followed and implemented.
20. Temporary erosion control during construction shall be provided as shown on the Erosion Control Plan. All erosion control measures shall be maintained in good repair by the Developer, until such time as the entire disturbed areas is stabilized with hard surface or landscaping.
21. The Developer shall be responsible for insuring that no mud or debris shall be tracked onto the existing public street system. Mud and debris must be removed within 24 hours by an appropriate mechanical method (i.e. machine broom sweep, light duty front-end loader, etc.) or as approved by the Local Entity street inspector.
22. No work may commence within any improved or unimproved public Right-of-Way until a Right-of-Way Permit or Development Construction Permit is obtained, if applicable.
23. The Developer shall be responsible for obtaining all necessary permits for all applicable agencies prior to commencement of construction. The Developer shall notify the Local Entity Engineering Inspector (Fort Collins - 221-6605) and the Local Entity Erosion Control Inspector (Fort Collins – 221-6700) at least 2 working days prior to the start of any earth disturbing activity, or construction on any and all public improvements. If the Local Entity Engineer is not available after proper notice of construction activity has been provided, the Developer may commence work in the Engineer absence. However, the Local Entity reserves the right not to accept the improvement if subsequent testing reveals an improper installation.
24. The Developer shall be responsible for obtaining soils tests within the Public Right-of-Way **after** right of way grading and all utility trench work is complete and prior to the placement of curb, gutter, sidewalk and pavement. If the final soils/pavement design report does not correspond with the results of the original geotechnical report, the Developer shall be responsible for a re-design of the subject pavement section or, the Developer may use the Local Entity's default pavement thickness section(s). Regardless of the option used, all final soils/pavement design reports shall be prepared by a licensed Professional Engineer. The final report shall be submitted to the Inspector a minimum of 10 working days prior to placement of base and asphalt. Placement of curb, gutter, sidewalk, base and asphalt shall not occur until the Local Entity Engineer approves the final report.
25. The contractor shall hire a licensed engineer or land surveyor to survey the constructed elevations of the street subgrade and the gutter flowline at all intersections, inlets, and other locations requested by the Local Entity inspector. The engineer or surveyor must certify in a letter to the Local Entity that these elevations conform to the approved plans and specifications. Any deviations shall be noted in the letter and then resolved with the Local Entity before installation of base course or asphalt will be allowed on the streets.
26. All utility installations within or across the roadbed of new residential roads must be completed prior to the final stages of road construction. For the purposes of these standards, any work except c/g above the subgrade is considered final stage work. All

service lines must be stubbed to the property lines and marked so as to reduce the excavation necessary for building connections.

27. Portions of Larimer County are within overlay districts. The *Larimer County FloodPlain Resolution* should be referred to for additional criteria for roads within these districts.

28. All road construction in areas designated as Wild Fire Hazard Areas shall be done in accordance with the construction criteria as established in the Wild Fire Hazard Area Mitigation Regulations in force at the time of final plat approval.

29. Prior to the commencement of any construction, the contractor shall contact the Local Entity Forester to schedule a site inspection for any tree removal requiring a permit.

30. The Developer shall be responsible for all aspects of safety including, but not limited to, excavation, trenching, shoring, traffic control, and security. Refer to OSHA Publication 2226, *Excavating and Trenching*.

31. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority. (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.

32. Prior to the commencement of any construction that will affect traffic signs of any type, the contractor shall contact Local Entity Traffic Operations Department, who will temporarily remove or relocate the sign at no cost to the contractor; however, if the contractor moves the traffic sign then the contractor will be charged for the labor, materials and equipment to reinstall the sign as needed.

33. The Developer is responsible for all costs for the initial installation of traffic signing and striping for the Development related to the Development's local street operations. In addition, the Developer is responsible for all costs for traffic signing and striping related to directing traffic access to and from the Development.

34. There shall be no site construction activities on Saturdays, unless specifically approved by the Local Entity Engineer, and no site construction activities on Sundays or holidays, unless there is prior written approval by the Local Entity.

35. The Developer is responsible for providing all labor and materials necessary for the completion of the intended improvements, shown on these drawings, or designated to be provided, installed, or constructed, unless specifically noted otherwise.

36. Dimensions for layout and construction are not to be scaled from any drawing. If pertinent dimensions are not shown, contact the Designer for clarification, and annotate the dimension on the as-built record drawings.

37. The Developer shall have, onsite at all times, one (1) signed copy of the approved plans, one (1) copy of the appropriate standards and specifications, and a copy of any permits and extension agreements needed for the job.

38. If, during the construction process, conditions are encountered which could indicate a situation that is not identified in the plans or specifications, the Developer shall contact the Designer and the Local Entity Engineer immediately.

39. The Developer shall be responsible for recording as-built information on a set of record drawings kept on the construction site, and available to the Local Entity's Inspector at all times. Upon completion of the work, the contractor(s) shall submit record drawings to the Local Entity Engineer.

40. The Designer shall provide, in this location on the plan, the location and description of the nearest survey benchmarks (2) for the project as well as the basis of bearings. The information shall be as follows:

Benchmarks—Local Entity survey.

B.M.Number _____, Elev.= _____,

Description _____.

41. All stationing is based on **centerline/flowline (insert proper word)** of roadways unless otherwise noted.

42. Damaged curb, gutter and sidewalk existing prior to construction, as well as existing fences, trees, streets, sidewalks, curbs and gutters, landscaping, structures, and improvements destroyed, damaged or removed due to construction of this project, shall be replaced or restored in like kind at the Developer's expense, unless otherwise indicated on these plans, prior to the acceptance of completed improvements and/or prior to the issuance of the first Certificate of Occupancy.

43. When an existing asphalt street must be cut, the street must be restored to a condition equal to or better than its original condition. The existing street condition shall be documented by the Local Entity Construction Inspector before any cuts are made. Patching shall be done in accordance with the Local Entity Street Repair Standards. The finished patch shall blend in smoothly into the existing surface. All large patches shall be paved with an asphalt lay-down machine. In streets where more than one cut is made, an overlay of the entire street width, including the patched area, may be required. The determination of need for a complete overlay shall be made by the Local Entity Engineer and/or the Local Entity Inspector at the time the cuts are made.

44. Upon completion of construction, the site shall be cleaned and restored to a condition equal to, or better than, that which existed before construction, or to the grades and condition as required by these plans.

45. Standard Handicap ramps are to be constructed at all curb returns and at all "T" intersections.

46. After acceptance by the Local Entity, public improvements depicted in these plans shall be guaranteed to be free from material and workmanship defects for a minimum period of two years from the date of acceptance.

47. The Local Entity shall not be responsible for the maintenance of roadway and appurtenant improvements, including storm drainage structures and pipes, for the following private streets: (list).

48. Approved Variances are listed as follows: (Plan set must have a list of all applicable variances for the project).

Appendix E-1-Lov

General Notes - City of Loveland

Submissions shall include a General Notes sheet. Please contact the Local Entity Engineer for current General Notes. The following General Notes are provided as a guideline for the Local Entities as noted. Include these notes on the plan as follows:

- **Include only the notes that apply to the project**
- **Preserve note numbers given below**

General Notes shall be shown on this sheet. Typical General Notes required by the Local Entity are as follows:

1. All materials, workmanship, and construction of public improvements shall meet or exceed the standards and specifications set forth in the *Larimer County Urban Area Street Standards* and applicable state and federal regulations. Where there is conflict between these plans and the specifications, or any applicable standards, the most restrictive standard shall apply. All work shall be inspected and approved by the Local Entity.
2. The Developer is specifically cautioned that the location and/or elevation of existing utilities, as shown on these plans, is based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied upon as being exact or complete. The Engineer shall contact the Utility Notification Center of Colorado (UNCC) at 1-800-922-1987, at least 2 working days prior to beginning excavation or grading, to have all registered utility locations marked. Other unregistered utility entities (i.e. ditch / irrigation company) are to be located by contacting the respective representative. Utility service laterals are also to be located prior to beginning excavation or grading. It shall be the responsibility of the Developer to relocate all existing utilities that conflict with the proposed improvements shown on these plans.
3. No work may commence within any improved public Right-of-Way until a Right-of-Way Permit or Development Construction Permit is obtained, if applicable. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority, (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.
4. The Developer shall be responsible for obtaining all necessary permits for all applicable agencies. The Developer shall notify the Local Entity Engineer at least 2 working days prior to the start of any earth disturbing activity, or construction on any and all public improvements. If the Local Entity Engineer is not available after proper notice of construction activity has been provided, the Developer may commence work in the Engineer absence. However, the Local Entity reserves the right not to accept the improvement if subsequent testing reveals an improper installation.

5. The engineer who has prepared these plans, by execution and/or seal hereof, does hereby affirm responsibility to The City of Loveland, as beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the City Engineer shall not relieve the engineer who has prepared these plans of all such responsibility. Further, to the extent permitted by law, the engineer hereby agrees to hold harmless and indemnify the City, and its officers and employees, from and against all liabilities, claims, and demands which may arise from any errors and omissions contained in these plans.

6. All utility installations within or across the roadbed of new residential roads must be completed prior to the final stages of road construction. For the purposes of these standards, any work except c/g above the subgrade is considered final stage work. All service lines must be stubbed to the property lines and marked so as to reduce the excavation necessary for building connections.

7. The Developer shall coordinate and cooperate with the Local Entity, and all utility companies involved, with regard to relocations, adjustments, extensions and rearrangements of existing utilities during construction, and to assure that the work is accomplished in a timely fashion and with a minimum disruption of service. The Developer shall be responsible for contacting, in advance, all parties affected by any disruption of any utility service as well as the utility companies.

8. No work may commence within any public storm water, sanitary sewer or potable water system until the Developer notifies the utility provider. Notification shall be a minimum of two (2) working days prior to commencement of any work. At the discretion of the water utility provider, a pre-construction meeting may be required prior to commencement of any work.

9. The Developer shall be responsible for protecting all utilities during construction and for coordinating with the appropriate utility company for any utility crossings required.

10. The type, size, location and number of all known underground utilities are approximate when shown on the drawings. It shall be the responsibility of the Developer to verify the existence and location of all underground utilities along the route of the work before commencing new construction. The Developer shall be responsible for unknown underground utilities.

11. When applicable, the Developer shall have onsite at all times, each of the following:

- The Notice of Intent (NOI)
- Best Management Practices (BMP) maintenance folder
- Up to date Stormwater Management Plan (SWMP) that accurately represents current field conditions
- One (1) signed copy of the approved plans
- One (1) copy of the appropriate standards and specifications
- A copy of any permits and extension agreements needed for the job.

12. The Developer shall be responsible for all aspects of safety including, but not limited to, excavation, trenching, shoring, traffic control, and security. Refer to OSHA Publication 2226, Excavating and Trenching.
13. If, during the construction process, conditions are encountered which could indicate a situation that is not identified in the plans or specifications, the Developer shall contact the Designer and the Local Entity Engineer immediately.
14. All references to any published standards shall refer to the latest revision of said standard, unless specifically stated otherwise.
15. The Developer shall submit a Construction Traffic Control Plan, in accordance with MUTCD, to the appropriate Right-of-Way authority. (Local Entity, County or State), for approval, prior to any construction activities within, or affecting, the Right-of-Way. The Developer shall be responsible for providing any and all traffic control devices as may be required by the construction activities.
16. The Developer is responsible for providing all labor and materials necessary for the completion of the intended improvements, shown on these drawings, or designated to be provided, installed, or constructed, unless specifically noted otherwise.
17. The Developer shall be responsible for ensuring that no mud or debris shall be tracked onto the existing public street system. Mud and debris must be removed by the end of each working day by an appropriate mechanical method (i.e. machine broom sweep, light duty front-end loader, etc.) or as approved by the Local Entity street inspector.
18. The Developer shall be responsible for recording as-built information on a set of record drawings kept on the construction site, and available to the Local Entity's Inspector at all times.
19. Dimensions for layout and construction are not to be scaled from any drawing. If pertinent dimensions are not shown, contact the Designer for clarification, and annotate the dimension on the as-built record drawings.
20. The Developer shall comply with all terms and conditions of the Colorado Permit for Storm Water Discharge, the Storm Water Management Plan, and the Erosion Control Plan.
21. All structural erosion control measures shall be installed, at the limits of construction and at areas with disturbed soil, on- or off-site, prior to any other ground-disturbing activity. All erosion control measures shall be maintained in good repair by the Developer, until such time as the entire disturbed areas is stabilized with hard surface or landscaping. To mitigate erosion, the Developer shall use standard erosion control techniques described in the Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices, as published by the Urban Drainage and Flood Control District (UDFCD).
22. The Developer shall sequence installation of utilities in such a manner as to minimize potential utility conflicts. In general, storm sewer and sanitary sewer should be constructed prior to installation of the water lines and dry utilities.

23. There shall be no site construction activities on Saturdays, unless specifically approved by the Local Entity Engineer, and no site construction activities on Sundays or holidays, unless there is prior written approval by the Local Entity.
24. The Designer shall provide on the cover sheet the location of the nearest survey benchmark for this project as well as the basis of bearing. The benchmark shall be on the current City approved datum.
25. Upon completion of construction, the site shall be cleaned and restored to a condition equal to, or better than, that which existed before construction, or to the grades and condition as required by these plans.
26. Existing fences, trees, streets, sidewalks, curbs and gutters, landscaping, structures, and improvements destroyed, damaged or removed due to construction of this project shall be replaced or restored in like kind at the Developer's expense, unless otherwise indicated on these plans.
27. Overlot grading construction must comply with the State of Colorado permitting process for "storm water discharges associated with construction activity." Contact the Colorado Department of Public Health & Environment, Water Quality Control Division, phone (303) 692-3500.
28. A State Construction Dewatering Wastewater Discharge Permit is required if dewatering is required in order to install utilities or before water is discharged into a storm sewer, channel, irrigation ditch or any waters of the United States.
29. The Developer is responsible for field locating and verifying elevations of all existing sewer mains, water mains, curbs, gutters and other utilities at the points of connection shown on the plans, and at any utility crossings prior to installing any of the new improvements. If a conflict exists and/or a design modification is required, the Developer shall coordinate with the engineer to modify the design. Design modification(s) must be approved by the Local Entity prior to beginning construction.
30. After acceptance by the Local Entity, public improvements depicted in these plans shall be guaranteed to be free from material and workmanship defects for a period of two years from the date of acceptance.
31. These public improvement construction plans shall be valid for a period of three years from the date of approval by the Local Entity Engineer. Use of these plans after the expiration date will require a new review and approval process by the Local Entity prior to commencement of any work shown in these plans.
32. Paving shall not start until a soils report and pavement design is accepted by the Local Entity Engineer and subgrade compaction tests are taken and accepted by the Local Entity Engineer.
33. The Developer shall be responsible for obtaining soils tests within the Public Right-of-Way after right of way grading and all utility trench work is complete. If the final soils/pavement design report does not correspond with the results of the original geotechnical report, the Developer shall be responsible for a re-design of the subject pavement section or, the Developer may use the Local Entity's default pavement thickness section(s). Regardless of the option used, all final soils/pavement design reports

shall be prepared by a licensed Professional Engineer. The final report shall be submitted to the Inspector a minimum of ten (10) working days prior to placement of base and asphalt. Placement of base and asphalt shall not occur until the Engineering Division approves the final report.

34. All road construction in areas designated as Wild Fire Hazard Areas shall be done in accordance with the construction criteria as established in the Wild Fire Hazard Area Mitigation Regulations in force at the time of final plat approval.

35. Portions of Larimer County are within overlay districts. The Larimer County Floodplain Resolution should be referred to for additional criteria for roads within these districts.

36. Standard Handicap ramps are to be constructed at all curb returns and at all “T” intersections.

37. All stationing is based on centerline of roadways unless otherwise noted.

38. The Local Entity shall not be responsible for the maintenance of roadway and appurtenant improvements, including storm drainage structures and pipes, for the following private streets: (list). If this note applies, then this special note shall be placed on the cover sheet of the Civil Construction Plans.

39. Approved Variances are listed as follows: (Plan set must have a list of all applicable variances for the project). If this note applies, then this special note shall be placed on the cover sheet of the Civil Construction Plans.

Appendix E-2

Construction Notes

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

A. Standard Grading and Erosion and Sediment Control Construction Plan Notes

1. The erosion control inspector must be notified at least twenty-four (24) hours prior to any construction on this site.
2. There shall be no earth-disturbing activity outside the limits designated on the accepted plans.
3. All required perimeter silt and construction fencing shall be installed **prior** to any land disturbing activity (stockpiling, stripping, grading, etc). All other required erosion control measures shall be installed at the appropriate time in the construction sequence as indicated in the approved project schedule, construction plans, and erosion control report.
4. At all times during construction, the Developer shall be responsible for preventing and controlling on-site erosion including keeping the property sufficiently watered so as to minimize wind-blown sediment. The Developer shall also be responsible for installing and maintaining all erosion control facilities shown herein.
5. Pre-disturbance vegetation shall be protected and retained wherever possible. Removal or disturbance of existing vegetation shall be limited to the area(s) required for immediate construction operations, and for the shortest practical period of time.
6. All soils exposed during land disturbing activity (stripping, grading, utility installations, stockpiling, filling, etc.) shall be kept in a roughened condition by ripping or disking along land contours until mulch, vegetation, or other permanent erosion control BMPs are installed. No soils in areas outside project street rights-of-way shall remain exposed by land disturbing activity for more than fourteen (14) days before required temporary or permanent erosion control (e.g. seed/mulch, landscaping, etc.) is installed, unless otherwise approved by the City of Loveland.
7. In order to minimize erosion potential, all temporary (structural) erosion control measures shall:
 - a. Be inspected at a minimum of once every two (2) weeks and after each significant storm event and repaired or reconstructed as

necessary in order to ensure the continued performance of their intended function.

- b. Remain in place until such time as all the surrounding disturbed areas are sufficiently stabilized as determined by the erosion control inspector.
- c. Be removed after the site has been sufficiently stabilized as determined by the erosion control inspector.

8. When temporary erosion control measures are removed, the Developer shall be responsible for the clean up and removal of all sediment and debris from all drainage infrastructure and other public facilities.

9. The contractor shall immediately clean up any construction materials inadvertently deposited on existing streets, sidewalks, or other public rights of way, and make sure streets and walkways are cleaned at the end of each working day.

10. All retained sediments, particularly those on paved roadway surfaces, shall be removed and disposed of in a manner and location so as not to cause their release into any waters of the United States.

11. No soil stockpile shall exceed ten (10) feet in height. All soil stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing. Any soil stockpile remaining after thirty (30) days shall be seeded and mulched.

12. The stormwater volume capacity of detention ponds will be restored and storm sewer lines will be cleaned upon completion of the project and before turning the maintenance over to the City of Loveland or Homeowners Association (HOA).

13. City Ordinance and Colorado Discharge Permit System (CDPS) requirements make it unlawful to discharge or allow the discharge of any pollutant or contaminated water from construction sites. Pollutants include, but are not limited to discarded building materials, concrete truck washout, chemicals, oil and gas products, litter, and sanitary waste. The developer shall at all times take whatever measures are necessary to assure the proper containment and disposal of pollutants on the site in accordance with any and all applicable local, state, and federal regulations.

14. A designated area shall be provided on site for concrete truck chute washout. The area shall be constructed so as to contain washout material and located at least fifty (50) feet away from any waterway during construction. Upon completion of construction activities the concrete washout material will be removed and properly disposed of prior to the area being restored.

15. To ensure that sediment does not move off of Individual lots one or more of the following sediment/erosion control BMPs shall be installed and maintained

until the lots are sufficiently stabilized, as determined by the erosion control inspector, (Loveland GMA & city limits only).

- (a.) Below all gutter downspouts.
- (b.) Out to drainage swales.
- (c.) Along lot perimeter.
- (d.) Other locations, if needed.

16. Conditions in the field may warrant erosion control measures in addition to what is shown on these plans. The Developer shall implement whatever measures are determined necessary, as directed by the City of Loveland.

17. A Vehicle Tracking Control Pad shall be installed whenever it is necessary for construction equipment including but not limited to personal vehicles exiting existing roadways. No earthen materials, i.e., stone, dirt, etc., shall be placed in the curb & gutter or roadway as a ramp to access temporary stockpile(s), staging area(s), construction material(s), concrete washout area(s) and/or building site(s).

Additional notes can (should) be added to reflect the stormwater runoff control plan of the individual development.

B. Street Improvements Notes

1. All street construction is subject to the General Notes on the cover sheet of these plans as well as the Street Improvements Notes listed here.
2. A paving section design, signed and stamped by a Colorado licensed Engineer, must be submitted to the Local Entity Engineer for approval, prior to any street construction activity, (full depth asphalt sections are not permitted at a depth greater than 8 inches of asphalt). The job mix shall be submitted for approval prior to placement of any asphalt.
3. Where proposed paving adjoins existing asphalt, the existing asphalt shall be saw cut, a minimum distance of 12 inches from the existing edge, to create a clean construction joint. The Developer shall be required to remove existing pavement to a distance where a clean construction joint can be made. Wheel cuts shall not be allowed unless approved by the Local Entity Engineer in Loveland.
4. Street subgrades shall be scarified the top 12 inches and re-compacted prior to subbase installation. No base material shall be laid until the subgrade has been inspected and approved by the Local Entity Engineer.
5. Ft. Collins only. Valve boxes and manholes are to be brought up to grade at the time of pavement placement or overlay. Valve box adjusting rings are not allowed.

6. When an existing asphalt street must be cut, the street must be restored to a condition equal to or better than its original condition. The existing street condition shall be documented by the Inspector before any cuts are made. Cutting and patching shall be done in conformance with **Chapter 25, Reconstruction and Repair**. The finished patch shall blend smoothly into the existing surface. The determination of need for a complete overlay shall be made by the Local Entity Engineer. All overlay work shall be coordinated with adjacent landowners such that future projects do not cut the new asphalt overlay work.
7. All traffic control devices shall be in conformance with these plans or as otherwise specified in M.U.T.C.D. (including Colorado supplement) and as per the Right-of-Way Work Permit traffic control plan.
8. The Developer is required to perform a gutter water flow test in the presence of the Local Entity Inspector and prior to installation of asphalt. Gutters that hold more than ¼ inch deep or 5 feet longitudinally, of water, shall be completely removed and reconstructed to drain properly.
9. Prior to placement of H.B.P. or concrete within the street *and* after moisture/density tests have been taken on the subgrade material (when a full depth section is proposed) or on the subgrade and base material (when a composite section is proposed), a mechanical "proof roll" will be required. The entire subgrade and/or base material shall be rolled with a heavily loaded vehicle having a total GVW of not less than 50,000 lbs. and a single axle weight of at least 18,000 lbs. with pneumatic tires inflated to not less than 90 p.s.i.g. "Proof roll" vehicles shall not travel at speeds greater than 3 m.p.h. Any portion of the subgrade or base material which exhibits excessive pumping or deformation, as determined by the Local Entity Engineer, shall be reworked, replaced or otherwise modified to form a smooth, non-yielding surface. The Local Entity Engineer shall be notified at least 24 hours prior to the "proof roll." All "proof rolls" shall be preformed in the presence of an Inspector.
10. Loveland only. 2-inch PVC conduit (with 3' min. cover) shall be provided along arterial roadways with pull boxes at 500' spacing or deflection points for future traffic signal interconnect.

C. Traffic Signing and Pavement Marking Construction Notes

1. All signage and marking is subject to the General Notes on the cover sheet of these plans, as well as the Traffic Signing and Marking Construction Notes listed here.
2. All symbols, including arrows, ONLYS, crosswalks, stop bars, etc. shall be pre-formed thermo-plastic.
3. All signage shall be per Local Entity Standards and these plans or as otherwise specified in MUTCD.

4. All lane lines for asphalt pavement shall receive two coats of latex paint with glass beads.
5. All lane lines shall be latex paint.
6. Prior to permanent installation of traffic striping and symbols, the Developer shall place temporary tabs or tape depicting alignment and placement of the same. Their placement shall be approved by the Local Entity Engineer prior to permanent installation of striping and symbols.
7. Pre-formed thermo-plastic applications shall be as specified in these Plans and/or these Standards.
8. Latex paint applications shall be applied as specified in CDOT Standard Specifications for Road and Bridge Construction.
9. All surfaces shall be thoroughly cleaned prior to installation of striping or markings.
10. All sign posts shall utilize break-away assemblies and fasteners per the Standards.
11. A field inspection of location and installation of all signs shall be performed by the Local Entity Engineer. All discrepancies identified during the field inspection must be corrected before the 2-year warranty period will begin.
12. The Developer installing signs shall be responsible for locating and protecting all underground utilities.
13. Special care shall be taken in sign location to ensure an unobstructed view of each sign.
14. Signage and striping has been determined by information available at the time of review. Prior to initiation of the warranty period, the Local Entity Engineer reserves the right to require additional signage and/or striping if the Local Entity Engineer determines that an unforeseen condition warrants such signage according to the MUTCD or the CDOT *M and S Standards*. All signage and striping shall fall under the requirements of the 2-year warranty period for new construction (except fair wear on traffic markings).
15. Sleeves for sign posts shall be required for use in islands/medians. Refer to **Chapter 14, Traffic Control Devices**, for additional detail.
16. Contractor is responsible for removing all anchors, posts, signs and/or delineators in Construction area. Contractor may keep the signs, or call the City Traffic Division to have them removed.
17. No “Reset” anchors, posts, signs, and/or delineators will be accepted.
18. All anchors, posts, signs, and/or delineators shall be new and be consistent with the LCUASS criteria.

D. Storm Drainage Notes

1. The City of Fort Collins shall not be responsible for the maintenance of storm drainage facilities located on private property. Maintenance of onsite drainage facilities shall be the responsibility of the property owner(s).
2. All recommendations of the final drainage and erosion control study **(name of the study and date)** by **(Engineering Firm)** shall be followed and implemented.
3. Prior to final inspection and acceptance by The City of Fort Collins, certification of the drainage facilities, by a registered engineer, must be submitted to and approved by the Stormwater Utility Department. Certification shall be submitted to the Stormwater Utility Department at least two weeks prior to the release of a certificate of occupancy for single family units. For commercial properties, certification shall be submitted to the Stormwater Utility Department at least two weeks prior to the release of any building permits in excess of those allowed prior to certification per the Development Agreement.
4. See City of Fort Collins Stormwater Criteria Manual – Appendix F Construction Control Measures Standard Notes and Standard Erosion Control Notes.

E. Waterline Note

1. The minimum cover over water lines is 4.5 feet and the maximum cover is 5.5 feet unless otherwise noted in the plans and approved by the Water Utility.

Appendix E-3
Signature Review Block for Civil Construction Plans

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

(For City of Loveland Only) Please see the following link for the latest form:
<https://www.lovgov.org/services/development-services/current-planning/applications-fees>

(For Larimer County Only)

Reviewed by:

LARIMER COUNTY ENGINEERING

DATE

The Larimer County review constitutes compliance with these Standards. Review by the county does not constitute approval of the plan design.

This review does not constitute review/approval of any private on-site improvements which may be shown. These plans are intended to be for county review of public improvements adjacent to the property. Construction of on-site private improvements cannot commence until all required traffic worksheet or study(s), final development plan(s), special review(s), and building permit(s) are complete, approved and on file with Larimer County.

Appendix E-4

City of Fort Collins

Requirements for Utility Plans

Last revised: 8/1/2021

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

PROJECT NAME: _____

PROJECT PLANNER: _____

DESIGN ENGINEERING FIRM: _____

DEVELOPER: _____

All applications for final development plans **must** include final development plan documents ("Utility Plans"). The standards for these Utility Plans are set forth in Division 3.3 of the City of Fort Collins Land Use Code, these Standards, and as further noted in this appendix.

THIS LIST PROVIDES THE DESIGN ENGINEER INFORMATION TO HELP HIM/HER DETERMINE WHAT THE CITY OF FORT COLLINS EXPECTS TO SEE ON DRAWINGS SUBMITTED FOR REVIEW AND APPROVAL. THIS LIST IS NOT INTENDED TO BE ALL-INCLUSIVE AND SHALL NOT, IN ANY WAY, OVERRIDE OR SUPERCEDE THE STANDARDS SET FORTH IN THE CITY OF FORT COLLINS LAND USE CODE AND/OR THE LARIMER COUNTY URBAN AREA STREET STANDARDS MANUAL. ADDITIONAL INFORMATION MAY BE REQUIRED ON SPECIFIC PLAN DESIGNS AND IS NOT INTENDED TO RELIEVE THE DESIGN ENGINEER OF THEIR OBLIGATION TO UTILIZE GOOD ENGINEERING PRACTICES.

The two "check list" columns to the left of the Utility Plan requirements below are provided for the convenience of both City staff and the Developer's Engineer. The columns are organized as follows:

- (1) The first column, "Applicant Validation," is provided as a check list for the applicant to ensure that all required items are addressed within the Utility Plans.
- (2) Upon submittal, City staff will check off the items in the second column to ensure that all the required items are included within the Utility Plans.

PLEASE NOTE: All items with an arrow (►) are items required prior to public hearing. All items without an arrow will be required during final compliance.

Applicant
Validation
N/A Included

Staff
Check

I. Cover Sheet

			A. ► Preamble title of "Utility Plans For..."
			B. ► Legal description below the project name
			C. ► Vicinity map including project location, nearest two Arterial Streets, existing street system, street names for collector and Arterial Streets, City limit lines, north arrow and major public facilities
			D. ► Index to all sheets contained within the Utility Plan placed on right side of sheet.
			E. The current date (month and year) under the legal description
			F. General Construction Notes, and if applicable, Standard Erosion Control Notes (see attached Appendix E-2) placed on left side of sheet
			G. ► Project Bench Marks referencing the City of Fort Collins' datum
			H. Reference to the updated or current soils investigation report
			I. Stamp and signature of a licensed Civil Engineer registered in the State of Colorado (on approved final development plan documents) in accordance with State Statutes and Board Rules.
			J. The following statement is annotated on the Cover Sheet: <i>I hereby affirm that these final construction plans were prepared under my direct supervision, in accordance with all applicable City of Fort Collins and State of Colorado standards and statutes, respectively; and that I am fully responsible for the accuracy of all design, revisions, and record conditions that I have noted on these plans.</i>
			K. ► Typical street section(s) provided for each street type being proposed. Sections include appropriate horizontal and vertical dimensions and cross slopes, type of curb and gutter and any deviations from standards. See Standard Drawings 7-1F thru 7-13F . (These sections may also be located on the plan/profile sheets or a separate sheet within the utility plan set.)

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	L. The names, addresses, phone numbers for the Developer(s), Owner(s), and Consultant Engineer are provided.
_____	_____	_____	M. Indemnification Statement provided and annotated as follows: <i>These plans have been reviewed by the Local Entity for concept only. The review does not imply responsibility by the reviewing department, the Local Entity Engineer, or the Local Entity for accuracy and correctness of the calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed in any reason as acceptance of financial responsibility by the Local Entity for additional quantities of items shown that may be required during the construction phase.</i>

II. Grading, Drainage & Erosion Control Plan

_____	_____	_____	A. ► Drainage report submitted
_____	_____	_____	B. ► Existing and proposed contours provided at 2' (min.) intervals and labeled.
_____	_____	_____	C. ► Contours extended a minimum of 50' offsite and tie into existing contours.
_____	_____	_____	D. Finish grade elevations provided for streets, lot corners, and finish floors/top of foundation of buildings for all lots.
_____	_____	_____	E. This statement provided: <i>"The top of foundation elevations shown are the minimum elevations required for protection from the 100-year storm. Minimum finished floor elevations above the 100-year water surface in streets, channels, ditches, swales, or other drainage facilities, as illustrated by a master grading plan are to be shown."</i>
_____	_____	_____	F. ► Drainage arrows are provided and show positive drainage to streets or to an approved drainage facility.
_____	_____	_____	G. Phasing of development and construction of all public improvements. All public improvements within each phase stand alone. Phases separated by a thick, ghosted line and identified by either numbers or letters.
_____	_____	_____	H. Temporary and long term erosion control devices are provided and labeled.
_____	_____	_____	I. ► Revegetation methods and specific notes are provided.

Applicant
Validation
N/A Included

Staff
Check

J. ► If the project proposes any construction in a floodplain, please pick up the separate "Preliminary Floodplain Submittal Requirements" available at the Stormwater Utility.

III. Overall Utility Plan Sheet(s)

A. Streets

1. ► R.O.W., property lines and easements with dimensions and labels.

2. ► Cross-pans

3. ► Access ramps

4. ► Curb and gutter

5. ► Sidewalks

6. ► Driveway locations

7. ► Medians, including flowline and lip of gutter

8. General location of signs (speed, stop, monument, etc.)

B. Phasing lines of development and construction of all public improvements. All public improvements within each phase stand alone. Phases separated by a thick, ghosted line and identified by either numbers or letters.

C. Water Facilities

1. ► Mains with sizes

2. ► Fire hydrant locations

3. ► Valves

4. Meter pits and curb stops

5. ► Manhole locations

6. ► Show service locations at preliminary, except for single family uses.

7. Waterline lowerings

8. Dimensioning of manholes and cleanouts from the centerline of the roadways.

<u>Applicant</u> <u>Validation</u>	<u>Staff</u> <u>Check</u>
<u>N/A</u>	<u>Included</u>

D. Sanitary Sewer Facilities

			1. ► Mains with sizes
			2. ► Manhole locations and numbering
			3. Length of segments between manholes
			4. Type of pipe
			5. Slopes
			6. Clean-outs
			7. ► Show services at preliminary, except for single family uses.

E. Storm Sewer Facilities

			1. ► General layout of stormsewers, channels and swales.
			2. ► Manhole locations
			3. ► Junction structures
			4. ► Clean-outs
			5. ► Type of pipe
			6. ► Sizes
			7. ► Slopes
			8. ► Length of segments between manholes
			9. Subdrains (where applicable)
			10. ► Manhole numbering
			F. ► Existing features shown for a minimum of 150' beyond the project limits
			G. ► Proposed utility connections with existing utilities.

IV. Street Plan and Profile Sheets (Horizontal Alignment)

			A. ► Largest possible curve radii used on Arterial and Major Arterial roadways. <i>Minimum curve radii used only where necessary. See Table 7-3.</i>
			B. ► Minimum tangent lengths at intersections. <i>See Table 7-3.</i>

<u>Applicant Validation</u>		<u>Staff Check</u>
<u>N/A</u>	<u>Included</u>	
		C. ► Crossing streets intersect at 90° (minor street can vary ±10°).
		D. ► Angle of departure of streets at intersections do not exceed 10° for the length of the required tangent. See Standard Drawing 8-12 .
		E. ► Minimum tangent between reverse curves provided. See Table 7-3 .
		F. ► Broken-back curves are separated by a length equal to 2 times the tangent length. See Table 7-3 .
		G. ► Compound curves: ratio value of ≤ 1.5 (Larger radius divided by the smaller radius).
		I. ► Minimum deflection angles for centerline arcs on curves used. See Table 7-5 .
		J. ► Curves with deflection angles of $\leq 5^\circ$ have an arc length (L_{cmin}) equal to 15 times the design speed. Length is increased 100' for every 1° reduction below 5°.
		K. Horizontal curves do not begin at the top of a crest curve or the bottom of a sag curve.
		L. ► Tapers and transitions: Refer to Figures in Chapter 8
		M. ► Sight distance triangles and easements: Shown on all plan & profile sheets. Sight distance easements dedicated on the Plat.
		N. ► Minimum Local Street widths provided per Table 7.1 and are consistent with the TIS.
		O. ► Access ramps and crosswalks provided. Crosswalk lengths are a maximum of 56' in length. See Chapter 16, Pedestrian Facilities Design and Technical Criteria . Mid-block access ramps located at all "T" intersections.
		P. ► Complete horizontal alignment includes, but is not limited to: centerline of roads, intersecting streets, driveway locations, and storm drainage facilities.
		Q. ► Existing and proposed Property and/or ROW lines, easements and/or tracts provided, dimensioned, and labeled clearly.
		R. Existing utilities and structures (shown as phantom line) included:
		1. ► Storm sewer and appurtenances

Applicant Validation		Staff Check	
<u>N/A</u>	<u>Included</u>		
			2. Fence lines and gates
			3. ► Water lines and appurtenances
			4. ► Ditches and swales
			5. ► Electric lines and appurtenances
			6. ► Curbs and gutters
			7. ► Sanitary Sewer lines and appurtenances
			8. ► Pavement limits
			9. ► Telephone lines and appurtenances
			10. ► Bridges and/or culverts
			11. ► CATV lines and appurtenances
			12. ► Guardrails
			13. Signs
			14. ► Gas lines and appurtenances
			S. Station, critical elevation, and dimension of all existing and proposed utility and/or drainage structures provided.
			T. Intersections show construction and lane details for new and existing facilities for a minimum of 150' beyond the limits of construction.
V. Street Plan and Profile Sheets (Vertical Alignment)			
			A. ► Maximum grades for streets comply. See Table 7-3.
			B. ► Maximum grades of cul-de-sacs are 3.0%.
			C. Continuance of grade and ground lines for all Local and Collector Streets that dead end (excluding cul-de-sacs) shown for 500' beyond the proposed construction.
			D. Continuance of grade and ground lines for Arterial Streets shown for 1000' beyond the proposed construction.
			E. ► Minimum crest and sag curve lengths for street classifications. See Standard Drawings 7-17 and 7-18. Lengths meet or exceed these minimums.
			F. Crest curves: street centerline, curb and gutter designed with vertical curves. See Table 7-3.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	G. Sag curves: street centerline designed with a vertical curve. See Standard Drawing 7-18 for minimum curve lengths.
_____	_____	_____	H. For grade changes <1.0%: gutter flowline are <u>not</u> designed with vertical curves.
_____	_____	_____	I. For grade changes >1.0%: both street centerline and curb and gutter are designed with vertical curves. See Standard Drawing 7-18 .
_____	_____	_____	J. ► Single point grade breaks do not exceed 0.40%.
_____	_____	_____	K. ► Series of grade breaks meet the vertical alignment criteria for the design speed of the roadways.
_____	_____	_____	L. ► Minimum centerline(*preliminary)/flowline (final compliance) grade for streets is 0.50%.
_____	_____	_____	M. Minimum flowline grade for cul-de-sacs is 1.0%.
_____	_____	_____	N. Minimum desirable grade around curb returns is 1.0%. Minimum allowable grade around curb returns is 0.50%.
_____	_____	_____	O. Curb return profiles (except medians) are provided.
_____	_____	_____	P. ► Centerline profiles through intersections provided.
_____	_____	_____	Q. Flowline profiles provided on both sides of Residential Local, Connector Local, and Collector Streets.
_____	_____	_____	R. Both flowlines and centerline profiles provided for Arterial Streets.
_____	_____	_____	S. ► Proposed (solid line type) and existing (dashed line type) ground lines provided and labeled.
_____	_____	_____	T. ► All proposed and existing vertical curves and grade breaks are dimensioned (Preliminary)/stationed and labeled clearly (Final compliance).

VI. Cross Slopes

_____	_____	_____	A. Minimum cross slope of new streets is 2.0%.
_____	_____	_____	B. Minimum cross slope of any reconstruction or overlay is 1.5%.
_____	_____	_____	C. Maximum allowable cross slope on all new streets is 3.0%.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	D. Maximum allowable cross slope on any reconstruction or overlay of existing roadways is 4.0%.
_____	_____	_____	E. Street modifications (widening, turn-lane, etc): the widened portion is within the stated limits and is not less than the existing cross slope.
_____	_____	_____	F. When tying to existing cross slopes: Curb and gutter or centerline shall be designed such that the when the existing pavement is overlaid it results in a straight line cross slope grade that meets standards.
_____	_____	_____	G. Cul-de-sacs: See Standard Drawing 7-19 .
			VII. Design Speed
_____	_____	_____	A. ► Roadways are designed according to their proper design speed. See Table 7-3 .
			VIII. Curb Return Radii
_____	_____	_____	A. Curb return radii used in accordance with Table 8-2 .
_____	_____	_____	B. Minimum desirable flowline grade around curb returns is 1%.
_____	_____	_____	C. Minimum allowable flowline grade around curb returns is 0.50%.
			IX. Medians
_____	_____	_____	A. Provided as stated on Standard Drawings 7-1F thru 7-13F .
_____	_____	_____	B. ► Width of medians are no less than 4' wide.
_____	_____	_____	C. ► Turn Lane and Access: Left-turn lanes (where warranted) designed using criteria contained in Standard Drawings 8-2 and Figures 8-2& 8-3 .
_____	_____	_____	D. ► Landscaped medians include drainage facilities to handle sprinkler runoff and nuisance flows. Refer to Appendix C.
_____	_____	_____	E. ► Median(s) are designed with keyed curb or curb with outfall gutters (if gutters are not needed to handle drainage), or medians are designed with curb with inflow gutters (if gutters are needed to handle drainage).
_____	_____	_____	F. ► Nose of median(s) located such that vehicle turning movements comply with vehicle tracking templates. See Standard Drawing 7-23 .
_____	_____	_____	G. ► Transition points of medians do not have "angle points". A 100' minimum radius with

Applicant Validation		Staff Check
<u>N/A</u>	<u>Included</u>	
		minimum arc length of 50' is used at transition locations.
		H. ► Permanent structures within medians are a minimum of 5' from the closest travel lane.
		I. ► Pedestrian refuge areas are provided in the noses of medians. See Chapter 16, Pedestrian Facilities Design and Technical Criteria.
		X. Cul-de-sacs
		A. ► Provided only on Local Streets (except on Narrow Residential Local Streets). See Standard Drawings 7-19 & 7-24.
		B. ► Maximum length of 660' (1320' max.) if fire sprinkler systems are installed in structures.
		C. ► Minimum radii used. See Standard Drawing 7-24.
		XI. Eyebrows
		A. ► Provided only on Local Streets. See Standard Drawing 7-25.
		B. ► Spaced in conformance with the requirements in Chapter 9, Access Requirements and Criteria.
		C. ► Minimum length of eyebrow(s) is 25' and maximum length is 100'.
		XII. Dead-end Streets
		A. ► Temporary dead-end streets provided only on streets that do not have direct access from adjoining property.
		B. ► Temporary turnarounds with a minimum radius of 40' provided for permitted dead-end streets. See Standard Drawing 7-28.
		C. Temporary access easements dedicated on the Plat.
		XIII. Driveways
		A. Where curb cuts are provided, concentrated runoff from adjoining properties does not discharge across the sidewalk.
		B. ► Spacing of curb cuts conform to spacing requirements. See Standard Drawing 9-1 and Table 7-3.
		C. Drive approaches slope toward the street.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
			D. ► Driveways intersect streets at 90° ±10° for a minimum of 25' measured perpendicular to the street from the curb edge or EOA.
			E. ► All access/driveway approaches are paved with Portland cement from the street to the ROW.
			1. Residential Approaches
			a. ► Minimum width of driveway(s) is 12' and the maximum width is 24'. See Standard Drawing 7-29 .
			b. ► Sidewalks are continuous through driveways. See Standard Drawing 16-1 .
			c. When pedestrian accessible driveways are required in lieu of mid-block access ramps, the slope of the driveway is ≤ 1:12 and spaced at 300' intervals on both sides of the street.
			2. High Volume Driveway
			a►*. Commercial driveways accessing Arterial or Collector Streets conform with Standard Drawing 7-30 .
			b►*. Maximum width is 36'. If wider, a median separates the inbound and outbound traffic.
			3. ► Multi-Family Dwelling Unit Driveways
			Minimum width of driveway(s) is 24'. Minimum of 28' for driveways serving 12 units or more with maximum width of 36'.

XIV. Grading In The ROW

			A. Maximum slope for all areas within the ROW is 4:1.
			B. Maximum slope outside of the ROW affecting public improvements is 4:1.
			C. Retaining walls provided where slopes exceed 4:1. Retaining walls designed in accordance with Chapter 11, Structures .
			D. Minimum slopes in non-roadway areas is 2.0%

Applicant Validation		Staff Check	
<u>N/A</u>	<u>Included</u>		
			XV. Sub-drains
_____	_____	_____	A. Engineered sub-drain systems meet criteria set forth in Section 7.7.3.
_____	_____	_____	B. Hydrologic study submitted.
			XVI. Cross-pans
_____	_____	_____	A. Cross-pans adjacent to Local Streets are a minimum of 6' wide and 7/8" deep.
_____	_____	_____	B. Cross-pans adjacent to Collector Streets are a minimum of 8' wide and 1 1/8" deep.
_____	_____	_____	C. Cross-pans adjacent to Arterial Streets are a minimum of 10' wide and 1 1/2" deep.
_____	_____	_____	D. Mid-block cross-pans are a minimum of 12' in width and 1 3/4" in depth.
_____	_____	_____	E. Minimum grade of cross-pans are 0.50%.
_____	_____	_____	F. Pavement transitions approaching cross-pans designed using the design speeds in Table 7-3 and meet the requirements in Standard Drawing 7-33 .
_____	_____	_____	G. Spot elevations provided as shown on Standard Drawing 7-32A .
			XVII. Inlets
_____	_____	_____	A. ► Inlets are not located within the curb returns.
			XVIII. Bus Bays
_____	_____	_____	A. ► Bus bays are 11' wide.
_____	_____	_____	B. ► Bus bays are constructed with concrete in accordance with Chapter 22, Construction Specifications .
_____	_____	_____	C. ► Approach Leg Minimum Criteria: Bays are at least 50' long with 60' to 80' of transitions distance. Curves have a radius of 100' and separated by a 10' tangent distance. See Standard Drawing 7-35 dimensions.
_____	_____	_____	D. ► Departure Leg Minimum Criteria: Bays have a 50' long loading area and 40' to 60' of transition distance. 25' to 50' radius curve used at the initial exit, followed by a short tangent and a 50' to 100' radius curve on entry to street. See Standard Drawing 7-35 dimensions.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
			E. ► Mid-Block Bays: See Standard Drawing 7-35 dimensions.
			F. ► Pullout(s) designed >50' from an intersection curb return.

XIX. Intersections

			A. ► Travel lanes are aligned through intersection(s) (a 2' shift is allowed in hardship cases only).
			B. ► Intersections cross at 90° ±10°.
			C. ► Horizontal alignment of streets thru intersections are designed in accordance with Table 7-3 .
			D. ► Exclusive left-turn lanes provided where required. See Section 8.2.5, Exclusive Left Turn Lanes .
			E. ► Exclusive right-turn lanes provided where required. See Section 8.2.6, Exclusive Right Turn Lanes .
			F. ► Adequate turning radii used for each type of intersection. See Section 8.2.8, Turning Radius .
			G. ► ROW is dedicated as shown on Standard Drawing 8-7 .
			H. ► Additional ROW dedicated for right and left turn lanes.
			I. ► Sight distances comply with Standard Drawing 7-16 .
			J. ► Street grades approaching intersections shall be between 0.50% (min.) and 4.0% (max) for a distance equal to the tangent length of the street classification. See Table 7-3)
			K. ► Profile grades within the intersection do not exceed 3%

XX. General Requirements

			A. Phased improvements shown clearly.
			B. Phases within the project limits stand alone and do not leave necessary improvements to future projects.
			C. ► Design of State streets meet the requirements presented in the State Highway Access Code Manual .
			D. ► North arrows and the appropriate bar/graphic scale(s) are provided.

<u>Applicant Validation</u>		<u>Staff Check</u>
<u>N/A</u>	<u>Included</u>	
		E. ► Existing features adjacent to this development are shown in a ghosted or alternate line weight.
		F. The City's signature block is provided in the lower right corner of each sheet contained within the utility plan set. Each signature block measures 3½" high by 4½" wide.
		G. ► Ditch company approval block is provided.
		H. ► Water and Sanitary District approval block is provided.
		I. County approval block is provided.
		J. CDOT approval block is provided.
		K. ► Title block is provided on each sheet of the utility plan set and includes the project name, sheet name, engineer's name, address, telephone number and fax number, sheet numbering, and revision block.
		L. ► The utility plans correlate with the Site and Landscape Plans
		M. Spot elevations at all intersections provided as shown on Standard Drawings 7-32A and 7-32B.
		N. ► Proposed construction within the Property boundary drawn with solid lines and existing features shown with hidden or dashed lines.
		O. Stations and elevations provided at all PC's, driveway intersections and roadway intersections in both plan and profile views.
		P. Flowline curve table provided on each plan and profile sheet that includes radius, angle, arc length, and tangent length.
		Q. Centerline stationing is used except at cul-de-sacs, where flowline stationing is used (Station equations provided.).
		R. ► Street names provided on all sheets.
		T. ► All easements shown in the plan views.
		U. ► Match-lines provided in both plan and profile. Page number, station and elevation included.
		V. The scale of all sheets are as follows:
		1. ► Horizontal - 1" = 20', 30', 40', or 50'
		2. ► Vertical - 1" = 5' or 10'

<u>Applicant Validation</u>		<u>Staff Check</u>
<u>N/A</u>	<u>Included</u>	
		3. ► Overall Plan - 1" = 100'
		W. ► All private improvements, including but not limited to, roadways, driveways, utilities, etc. are clearly shown and labeled as such.
		X. ► A legend is provided on each sheet identifying the symbols used on that particular sheet.
		Y. ► Key map is provided on the plan and profile sheets (for utility plans having 3 or more plan and profile sheets).
		XXI. ► Street Cross Sections (Preliminary = typical for each street)
		A. Cross sections for Arterial Streets and Collector Streets are provided at 50' intervals. Cross also required where special conditions warrant the need (i.e. widening of an existing street). The interval may be adjusted where site topography is unique.
		1. Information Provided on each Cross Section
		a. ► Curb & gutter, existing(f) and proposed(*)
		b. ► Roadway surface, existing and proposed
		c. ► Sidewalk, existing and proposed
		d. ► Cross slopes, existing(f) and proposed(*)
		e. ► ROW, existing and proposed
		f. Side slopes, existing and proposed, 15' beyond the proposed ROW
		g. Stations
		h. Proposed flowline and centerline elevations
		i. Utility crossings
		j. ► Dimensions
		k. Areas of overlay, milling, pavement removal and/or reconstruction

Staff
Check

Plat

- A. ►** Maintenance Guarantee, Repair Guarantee, Notice of Other Documents notes.
- B. ►** Planning & Zoning Board/Hearing Officer certification statement (to be signed at final compliance).
- C. ►** Surveyor certification statement (to be signed at final compliance)
- D. ►** Statement(s) of land ownership
- E. ►** Statement(s) of ownership and/or maintenance of all tracts.
- F. ►** Statement(s) of the dedication of any easements, ROW, tracts, and other public areas.
- G. ►** Vicinity Map: Project location, nearest 2 Arterial Streets, street names, City limits, major public facilities.
- H.** Curve data complete for all curves.
- I. ►** 2 ties to aliquot corners.
- J. ►** All existing and proposed easements and ROW clearly defined.
- K. ►** Adjoining properties labeled.
- L. ►** Scale, graphic scale, north arrow, date of preparation, complete title w/ location.
- M. ►** Boundary legal description closes.
- N. ►** Lot lines.
- O. ►** Designation of areas subject to flooding, including floodplain, floodway, and product corridors. (Elevation Datum must be referenced to City of Fort Collins datum.)

Appendix E-4

City of Loveland

Requirements for Public Improvements – Civil Construction Plans

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information. For City of Loveland Only please see the following link for the latest form:

<https://www.lovgov.org/services/development-services/current-planning/applications-fees>

Appendix E-5

City of Fort Collins - Engineering Inspection **STOP WORK ORDER**



**NOTE: Appendix Forms and Information are for Reference
Only. Contact Local Entity Engineer for
Original Forms and Current Information.**

Job location: _____

I have inspected this structure and these premises and have found the following violations
of City laws.

You are hereby notified that no more work shall be done until the above violations are
corrected.

Date

Inspector

The above signed certifies that a copy of this order was posted on the premises and duly
served upon the below signed.

Acknowledged:

Date

DO NOT REMOVE THIS TAG

Please contact the Engineering Department at 281 North College Avenue, (970) 221-6605

Appendix E-6

City of Fort Collins Engineering Department Electronic Document Criteria

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

1.1.1 GENERAL INFORMATION

In 2000, the City of Fort Collins Engineering Department began converting all Engineering documents into electronic images. The initial conversion included documents such as Subdivision Plats, Utility Plans, Site and Landscape Plans, and Building Elevation Plans. The Colorado Public Records Act states that electronic images must be of a manner and scale to accurately reproduce the original and be of high quality and usable for the customer. To ensure all documents submitted and added to the Engineering Department Document Management System adhere to this act, this set of basic criteria has been developed.

This document is not intended to cover every possible situation that may arise. If you have questions regarding these criteria, please contact the Engineering Department Document Retrieval System Team Leader.

1.1.2 General Submittal Criteria

All final submittals for development projects and City capital projects are required to conform to the criteria set out in this document. This includes all development and capital projects within the jurisdiction of Fort Collins, including those projects soon to be annexed within the Growth Management Area boundaries.

All information shall be clear, concise and legible for final document acceptance. A visual evaluation will be performed on every plan sheet submitted. All sheets, or portions of sheets, found not in conformance with these criteria will be returned to the submitter for correction and resubmittal.

1.2 SUBMITTAL CONTENT REQUIREMENTS

1.2.1 General Requirements

- Adhesive material on mylar shall not be allowed.

- All sheets shall be uniform in contrast, scale, and proportionality to ensure readability.
- An enlarged diagram or detail sheet shall be provided when the details, including short lines, dimensions, and text cannot be clearly shown or read in the body of the plans.
- If an area is congested with a lot of detail, the text information should be located in an open area and referenced back to the point of origin.
- All non-black color will be rejected.
- CAUTION: Photocopied mylars of poor quality will be rejected.

1.2.2 Text and Lettering

The readability of text, lettering and numeric symbols is often obscured when the proportionality between the character and line weight is in conflict. We encourage a design approach that adjusts line weight to the size of the lettering. Smaller text, particularly text that is next to a line, symbol, or other text, is generally unreadable when plotted with a heavier line weight. Therefore these criteria require a proportional line weight to character or letter size to prevent “bleeding” or poor readability.

- The minimum recommended character and/or letter shall be equivalent to a height of 2 mm and a line weight of .25 mm.
- Uppercase lettering is preferable, however, lower case lettering is allowable as long as proper proportionality is used.
- No text, symbols, and/or lines shall be placed on top of other such information to impair readability.

1.2.3 Lines

Line weights have significant impact upon the quality of images. When lines are too thick or close to other information the readability is compromised.

- A minimum recommended grayscale color for any information depicting existing features shall be 252.
- Lines indicating existing facilities and utilities shall be dashed.
- Lines throughout a document shall not be inserted through text, symbols, or numbers. A line should be broken to ensure readability of information.

1.2.4 Shading and Hatching Patterns

When using shading or a hatching pattern to identify areas, the text and other information is often unreadable due to the darkness of the shading or when the thickness of a hatch pattern obscures the underlying information.

- No text, symbols, numbers or other information shall be covered by shading or hatching patterns.

1.2.5 Scale

An appropriate scale shall be used for all engineering drawings and details. Refer to the Larimer County Urban Area Street Standards, Section 3.2.7.

1.3 FIGURES/EXAMPLES

Arrows are provided to draw attention to the specific detail and are not tied to specific words in the caption description.

1.3.1 GOOD EXAMPLES

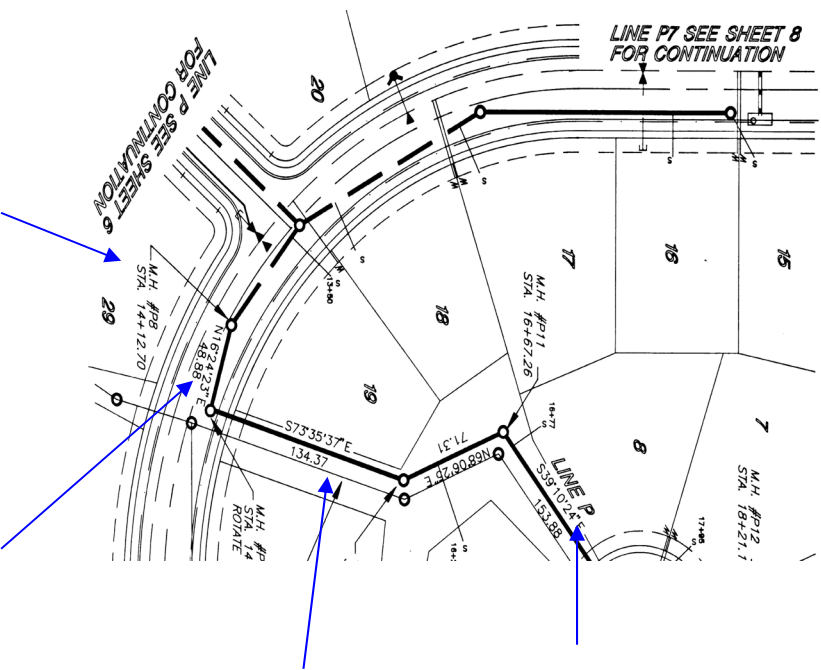


Figure 1.3.1 A – Good overall layout; text is readable; no lines through text or symbols; reduced clutter by using arrows; average proportionality on text.

LINE	DIRECTION	DISTANCE
L1	S 34°37'43" E	34.00'
EL1	N 74°17'10" E	26.69'
EL2	N 15°42'50" W	14.05'
EL3	N 00°17'05" W	14.23'
EL4	N 90°00'00" E	30.24'
EL5	S 89°50'00" E	17.00'

Figure 1.3.1. B - Good proportional text style and pen weight. Round and closed letters are readable.

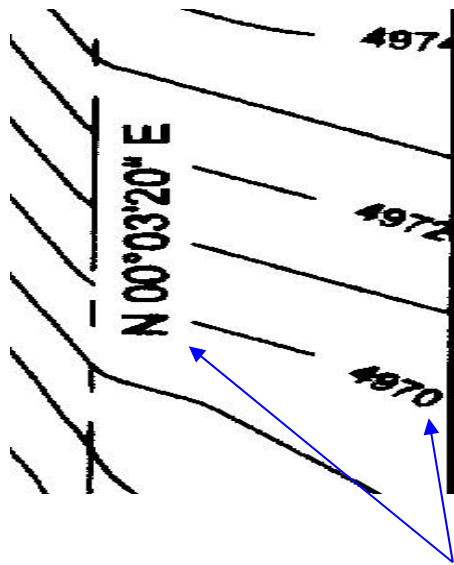


Figure 1.3.1 C – Good line/text usage; line is broken to insert text.

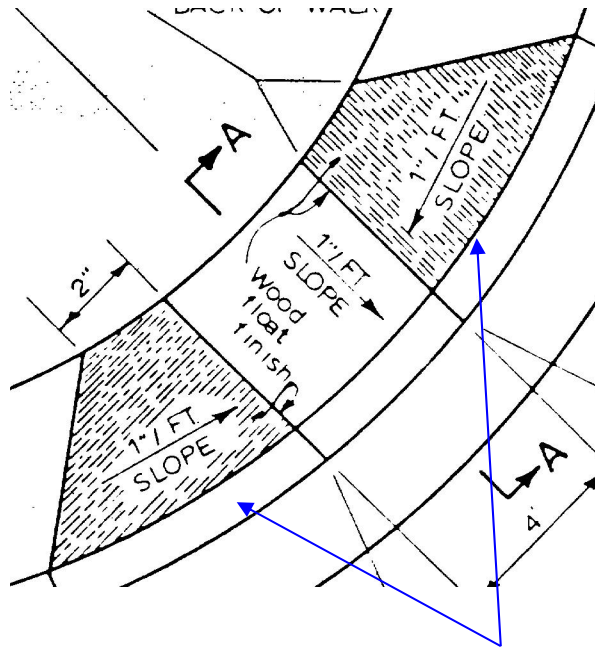


Figure 1.3.1 D – Good hatch pattern; pattern cleared for text.

1.3.2 – Poor Examples

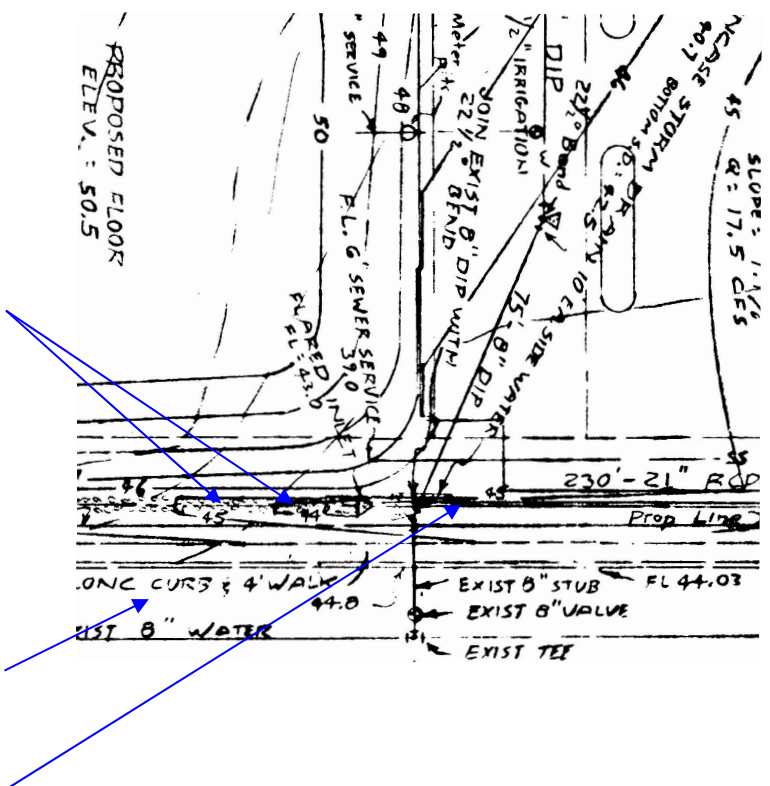
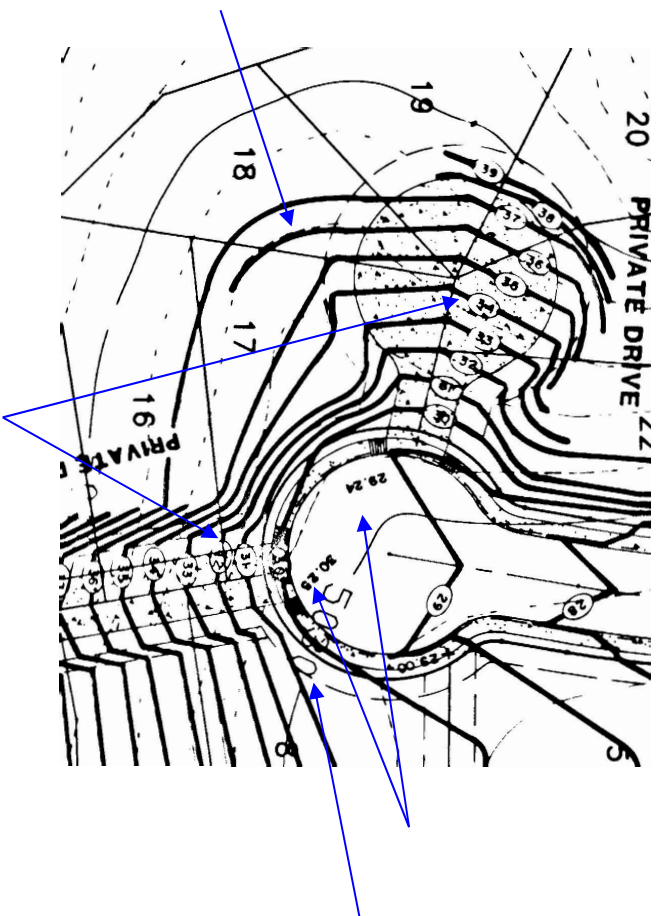


Figure 1.3.2 A – Poor overall layout; lines through text; text unreadable; line weight is too thick in some areas; hatching obscures text.



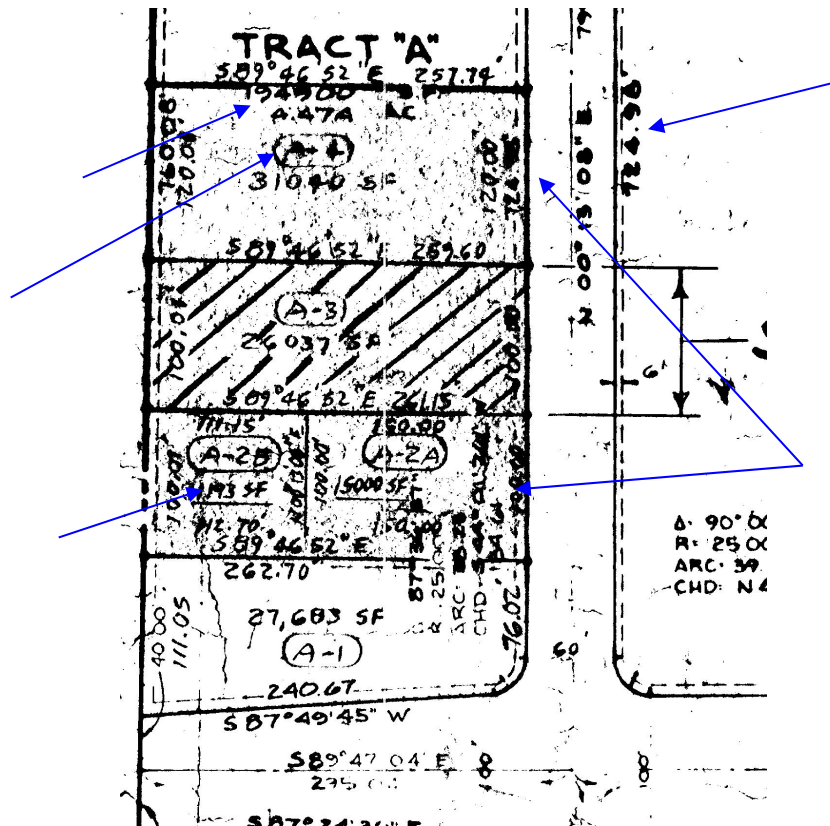


Figure 1.3.2 E – Poor use of shading; poor proportionality of text and line weight; difficult to read.

and rights-of-way now on re

Have caused the same to be
shown on this plat known as
Collins, Larimer County, Co
and for public use forever
out on this plat.

1. CURB LANDING SHALL BE CONCRETE COLORED WITH A LBS/ CONC. YARD DAVIS NO. 1117 (TILE RED
PIGMENT OR APPROVED EQUAL. DAVIS CLEAR SEALANT OR APPROVED EQUAL SHALL BE APPLIED ON
ALL COLORED CONCRETE SURFACES.

Figure 1.3.2 F – Poor examples of text quality; poor proportionality of text and pen weight; unreadable.

Applicant
Validation
N/A Included

Staff
Check

I. Cover Sheet

			A. ► Preamble title of "Utility Plans For..."
			B. ► Legal description below the project name
			C. ► Vicinity map including project location, nearest two Arterial Streets, existing street system, street names for collector and Arterial Streets, City limit lines, north arrow and major public facilities
			D. ► Index to all sheets contained within the Utility Plan placed on right side of sheet.
			E. The current date (month and year) under the legal description
			F. General Construction Notes, and if applicable, Standard Erosion Control Notes (see attached Appendix E-2) placed on left side of sheet
			G. ► Project Bench Marks referencing the City of Fort Collins' datum
			H. Reference to the updated or current soils investigation report
			I. Stamp and signature of a licensed Civil Engineer registered in the State of Colorado (on approved final development plan documents) in accordance with State Statutes and Board Rules.
			J. The following statement is annotated on the Cover Sheet: <i>I hereby affirm that these final construction plans were prepared under my direct supervision, in accordance with all applicable City of Fort Collins and State of Colorado standards and statutes, respectively; and that I am fully responsible for the accuracy of all design, revisions, and record conditions that I have noted on these plans.</i>
			K. ► Typical street section(s) provided for each street type being proposed. Sections include appropriate horizontal and vertical dimensions and cross slopes, type of curb and gutter and any deviations from standards. See Standard Drawings 7-1F thru 7-13F . (These sections may also be located on the plan/profile sheets or a separate sheet within the utility plan set.)

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	L. The names, addresses, phone numbers for the Developer(s), Owner(s), and Consultant Engineer are provided.
_____	_____	_____	M. Indemnification Statement provided and annotated as follows: <i>These plans have been reviewed by the Local Entity for concept only. The review does not imply responsibility by the reviewing department, the Local Entity Engineer, or the Local Entity for accuracy and correctness of the calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed in any reason as acceptance of financial responsibility by the Local Entity for additional quantities of items shown that may be required during the construction phase.</i>

II. Grading, Drainage & Erosion Control Plan

_____	_____	_____	A. ► Drainage report submitted
_____	_____	_____	B. ► Existing and proposed contours provided at 2' (min.) intervals and labeled.
_____	_____	_____	C. ► Contours extended a minimum of 50' offsite and tie into existing contours.
_____	_____	_____	D. Finish grade elevations provided for streets, lot corners, and finish floors/top of foundation of buildings for all lots.
_____	_____	_____	E. This statement provided: <i>"The top of foundation elevations shown are the minimum elevations required for protection from the 100-year storm. Minimum finished floor elevations above the 100-year water surface in streets, channels, ditches, swales, or other drainage facilities, as illustrated by a master grading plan are to be shown."</i>
_____	_____	_____	F. ► Drainage arrows are provided and show positive drainage to streets or to an approved drainage facility.
_____	_____	_____	G. Phasing of development and construction of all public improvements. All public improvements within each phase stand alone. Phases separated by a thick, ghosted line and identified by either numbers or letters.
_____	_____	_____	H. Temporary and long term erosion control devices are provided and labeled.
_____	_____	_____	I. ► Revegetation methods and specific notes are provided.

Applicant
Validation
N/A Included

Staff
Check

J. ► If the project proposes any construction in a floodplain, please pick up the separate "Preliminary Floodplain Submittal Requirements" available at the Stormwater Utility.

III. Overall Utility Plan Sheet(s)

A. Streets

1. ► R.O.W., property lines and easements with dimensions and labels.

2. ► Cross-pans

3. ► Access ramps

4. ► Curb and gutter

5. ► Sidewalks

6. ► Driveway locations

7. ► Medians, including flowline and lip of gutter

8. General location of signs (speed, stop, monument, etc.)

B. Phasing lines of development and construction of all public improvements. All public improvements within each phase stand alone. Phases separated by a thick, ghosted line and identified by either numbers or letters.

C. Water Facilities

1. ► Mains with sizes

2. ► Fire hydrant locations

3. ► Valves

4. Meter pits and curb stops

5. ► Manhole locations

6. ► Show service locations at preliminary, except for single family uses.

7. Waterline lowerings

8. Dimensioning of manholes and cleanouts from the centerline of the roadways.

<u>Applicant</u> <u>Validation</u>	<u>Staff</u> <u>Check</u>
<u>N/A</u>	<u>Included</u>

D. Sanitary Sewer Facilities

			1. ► Mains with sizes
			2. ► Manhole locations and numbering
			3. Length of segments between manholes
			4. Type of pipe
			5. Slopes
			6. Clean-outs
			7. ► Show services at preliminary, except for single family uses.

E. Storm Sewer Facilities

			1. ► General layout of stormsewers, channels and swales.
			2. ► Manhole locations
			3. ► Junction structures
			4. ► Clean-outs
			5. ► Type of pipe
			6. ► Sizes
			7. ► Slopes
			8. ► Length of segments between manholes
			9. Subdrains (where applicable)
			10. ► Manhole numbering
			F. ► Existing features shown for a minimum of 150' beyond the project limits
			G. ► Proposed utility connections with existing utilities.

IV. Street Plan and Profile Sheets (Horizontal Alignment)

			A. ► Largest possible curve radii used on Arterial and Major Arterial roadways. <i>Minimum curve radii used only where necessary. See Table 7-3.</i>
			B. ► Minimum tangent lengths at intersections. <i>See Table 7-3.</i>

Applicant Validation		Staff Check
<u>N/A</u>	<u>Included</u>	
		C. ► Crossing streets intersect at 90° (minor street can vary ±10°).
		D. ► Angle of departure of streets at intersections do not exceed 10° for the length of the required tangent. See Standard Drawing 8-12 .
		E. ► Minimum tangent between reverse curves provided. See Table 7-3 .
		F. ► Broken-back curves are separated by a length equal to 2 times the tangent length. See Table 7-3 .
		G. ► Compound curves: ratio value of ≤ 1.5 (Larger radius divided by the smaller radius).
		I. ► Minimum deflection angles for centerline arcs on curves used. See Table 7-5 .
		J. ► Curves with deflection angles of $\leq 5^\circ$ have an arc length (L_{cmin}) equal to 15 times the design speed. Length is increased 100' for every 1° reduction below 5°.
		K. Horizontal curves do not begin at the top of a crest curve or the bottom of a sag curve.
		L. ► Tapers and transitions: Refer to Figures in Chapter 8
		M. ► Sight distance triangles and easements: Shown on all plan & profile sheets. Sight distance easements dedicated on the Plat.
		N. ► Minimum Local Street widths provided per Table 7.1 and are consistent with the TIS.
		O. ► Access ramps and crosswalks provided. Crosswalk lengths are a maximum of 56' in length. See Chapter 16, Pedestrian Facilities Design and Technical Criteria . Mid-block access ramps located at all "T" intersections.
		P. ► Complete horizontal alignment includes, but is not limited to: centerline of roads, intersecting streets, driveway locations, and storm drainage facilities.
		Q. ► Existing and proposed Property and/or ROW lines, easements and/or tracts provided, dimensioned, and labeled clearly.
		R. Existing utilities and structures (shown as phantom line) included:
		1. ► Storm sewer and appurtenances

Applicant Validation		Staff Check	
<u>N/A</u>	<u>Included</u>		
			2. Fence lines and gates
			3. ► Water lines and appurtenances
			4. ► Ditches and swales
			5. ► Electric lines and appurtenances
			6. ► Curbs and gutters
			7. ► Sanitary Sewer lines and appurtenances
			8. ► Pavement limits
			9. ► Telephone lines and appurtenances
			10. ► Bridges and/or culverts
			11. ► CATV lines and appurtenances
			12. ► Guardrails
			13. Signs
			14. ► Gas lines and appurtenances
			S. Station, critical elevation, and dimension of all existing and proposed utility and/or drainage structures provided.
			T. Intersections show construction and lane details for new and existing facilities for a minimum of 150' beyond the limits of construction.
V. Street Plan and Profile Sheets (Vertical Alignment)			
			A. ► Maximum grades for streets comply. See Table 7-3.
			B. ► Maximum grades of cul-de-sacs are 3.0%.
			C. Continuance of grade and ground lines for all Local and Collector Streets that dead end (excluding cul-de-sacs) shown for 500' beyond the proposed construction.
			D. Continuance of grade and ground lines for Arterial Streets shown for 1000' beyond the proposed construction.
			E. ► Minimum crest and sag curve lengths for street classifications. See Standard Drawings 7-17 and 7-18. Lengths meet or exceed these minimums.
			F. Crest curves: street centerline, curb and gutter designed with vertical curves. See Table 7-3.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	G. Sag curves: street centerline designed with a vertical curve. See Standard Drawing 7-18 for minimum curve lengths.
_____	_____	_____	H. For grade changes <1.0%: gutter flowline are <u>not</u> designed with vertical curves.
_____	_____	_____	I. For grade changes >1.0%: both street centerline and curb and gutter are designed with vertical curves. See Standard Drawing 7-18 .
_____	_____	_____	J. ► Single point grade breaks do not exceed 0.40%.
_____	_____	_____	K. ► Series of grade breaks meet the vertical alignment criteria for the design speed of the roadways.
_____	_____	_____	L. ► Minimum centerline(*preliminary)/flowline (final compliance) grade for streets is 0.50%.
_____	_____	_____	M. Minimum flowline grade for cul-de-sacs is 1.0%.
_____	_____	_____	N. Minimum desirable grade around curb returns is 1.0%. Minimum allowable grade around curb returns is 0.50%.
_____	_____	_____	O. Curb return profiles (except medians) are provided.
_____	_____	_____	P. ► Centerline profiles through intersections provided.
_____	_____	_____	Q. Flowline profiles provided on both sides of Residential Local, Connector Local, and Collector Streets.
_____	_____	_____	R. Both flowlines and centerline profiles provided for Arterial Streets.
_____	_____	_____	S. ► Proposed (solid line type) and existing (dashed line type) ground lines provided and labeled.
_____	_____	_____	T. ► All proposed and existing vertical curves and grade breaks are dimensioned (Preliminary)/stationed and labeled clearly (Final compliance).

VI. Cross Slopes

_____	_____	_____	A. Minimum cross slope of new streets is 2.0%.
_____	_____	_____	B. Minimum cross slope of any reconstruction or overlay is 1.5%.
_____	_____	_____	C. Maximum allowable cross slope on all new streets is 3.0%.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
_____	_____	_____	D. Maximum allowable cross slope on any reconstruction or overlay of existing roadways is 4.0%.
_____	_____	_____	E. Street modifications (widening, turn-lane, etc): the widened portion is within the stated limits and is not less than the existing cross slope.
_____	_____	_____	F. When tying to existing cross slopes: Curb and gutter or centerline shall be designed such that the when the existing pavement is overlaid it results in a straight line cross slope grade that meets standards.
_____	_____	_____	G. Cul-de-sacs: See Standard Drawing 7-19 .

VII. Design Speed

_____	_____	_____	A. ► Roadways are designed according to their proper design speed. See Table 7-3 .
-------	-------	-------	---

VIII. Curb Return Radii

_____	_____	_____	A. Curb return radii used in accordance with Table 8-2 .
_____	_____	_____	B. Minimum desirable flowline grade around curb returns is 1%.
_____	_____	_____	C. Minimum allowable flowline grade around curb returns is 0.50%.

IX. Medians

_____	_____	_____	A. Provided as stated on Standard Drawings 7-1F thru 7-13F .
_____	_____	_____	B. ► Width of medians are no less than 4' wide.
_____	_____	_____	C. ► Turn Lane and Access: Left-turn lanes (where warranted) designed using criteria contained in Standard Drawings 8-2 and Figures 8-2& 8-3 .
_____	_____	_____	D. ► Landscaped medians include drainage facilities to handle sprinkler runoff and nuisance flows. Refer to Appendix C.
_____	_____	_____	E. ► Median(s) are designed with keyed curb or curb with outfall gutters (if gutters are not needed to handle drainage), or medians are designed with curb with inflow gutters (if gutters are needed to handle drainage).
_____	_____	_____	F. ► Nose of median(s) located such that vehicle turning movements comply with vehicle tracking templates. See Standard Drawing 7-23 .
_____	_____	_____	G. ► Transition points of medians do not have "angle points". A 100' minimum radius with

Applicant Validation		Staff Check
<u>N/A</u>	<u>Included</u>	
		minimum arc length of 50' is used at transition locations.
		H. ► Permanent structures within medians are a minimum of 5' from the closest travel lane.
		I. ► Pedestrian refuge areas are provided in the noses of medians. See Chapter 16, Pedestrian Facilities Design and Technical Criteria.
		X. Cul-de-sacs
		A. ► Provided only on Local Streets (except on Narrow Residential Local Streets). See Standard Drawings 7-19 & 7-24.
		B. ► Maximum length of 660' (1320' max.) if fire sprinkler systems are installed in structures.
		C. ► Minimum radii used. See Standard Drawing 7-24.
		XI. Eyebrows
		A. ► Provided only on Local Streets. See Standard Drawing 7-25.
		B. ► Spaced in conformance with the requirements in Chapter 9, Access Requirements and Criteria.
		C. ► Minimum length of eyebrow(s) is 25' and maximum length is 100'.
		XII. Dead-end Streets
		A. ► Temporary dead-end streets provided only on streets that do not have direct access from adjoining property.
		B. ► Temporary turnarounds with a minimum radius of 40' provided for permitted dead-end streets. See Standard Drawing 7-28.
		C. Temporary access easements dedicated on the Plat.
		XIII. Driveways
		A. Where curb cuts are provided, concentrated runoff from adjoining properties does not discharge across the sidewalk.
		B. ► Spacing of curb cuts conform to spacing requirements. See Standard Drawing 9-1 and Table 7-3.
		C. Drive approaches slope toward the street.

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
			D. ► Driveways intersect streets at 90° ±10° for a minimum of 25' measured perpendicular to the street from the curb edge or EOA.
			E. ► All access/driveway approaches are paved with Portland cement from the street to the ROW.
			1. Residential Approaches
			a. ► Minimum width of driveway(s) is 12' and the maximum width is 24'. See Standard Drawing 7-29 .
			b. ► Sidewalks are continuous through driveways. See Standard Drawing 16-1 .
			c. When pedestrian accessible driveways are required in lieu of mid-block access ramps, the slope of the driveway is ≤ 1:12 and spaced at 300' intervals on both sides of the street.
			2. High Volume Driveway
			a►*. Commercial driveways accessing Arterial or Collector Streets conform with Standard Drawing 7-30 .
			b►*. Maximum width is 36'. If wider, a median separates the inbound and outbound traffic.
			3. ► Multi-Family Dwelling Unit Driveways
			Minimum width of driveway(s) is 24'. Minimum of 28' for driveways serving 12 units or more with maximum width of 36'.

XIV. Grading In The ROW

			A. Maximum slope for all areas within the ROW is 4:1.
			B. Maximum slope outside of the ROW affecting public improvements is 4:1.
			C. Retaining walls provided where slopes exceed 4:1. Retaining walls designed in accordance with Chapter 11, Structures .
			D. Minimum slopes in non-roadway areas is 2.0%

<u>Applicant Validation</u>		<u>Staff Check</u>	
<u>N/A</u>	<u>Included</u>		
			XV. Sub-drains
_____	_____	_____	A. Engineered sub-drain systems meet criteria set forth in Section 7.7.3.
_____	_____	_____	B. Hydrologic study submitted.
			XVI. Cross-pans
_____	_____	_____	A. Cross-pans adjacent to Local Streets are a minimum of 6' wide and 7/8" deep.
_____	_____	_____	B. Cross-pans adjacent to Collector Streets are a minimum of 8' wide and 1 1/8" deep.
_____	_____	_____	C. Cross-pans adjacent to Arterial Streets are a minimum of 10' wide and 1 1/2" deep.
_____	_____	_____	D. Mid-block cross-pans are a minimum of 12' in width and 1 3/4" in depth.
_____	_____	_____	E. Minimum grade of cross-pans are 0.50%.
_____	_____	_____	F. Pavement transitions approaching cross-pans designed using the design speeds in Table 7-3 and meet the requirements in Standard Drawing 7-33 .
_____	_____	_____	G. Spot elevations provided as shown on Standard Drawing 7-32A .
			XVII. Inlets
_____	_____	_____	A. ► Inlets are not located within the curb returns.
			XVIII. Bus Bays
_____	_____	_____	A. ► Bus bays are 11' wide.
_____	_____	_____	B. ► Bus bays are constructed with concrete in accordance with Chapter 22, Construction Specifications .
_____	_____	_____	C. ► Approach Leg Minimum Criteria: Bays are at least 50' long with 60' to 80' of transitions distance. Curves have a radius of 100' and separated by a 10' tangent distance. See Standard Drawing 7-35 dimensions.
_____	_____	_____	D. ► Departure Leg Minimum Criteria: Bays have a 50' long loading area and 40' to 60' of transition distance. 25' to 50' radius curve used at the initial exit, followed by a short tangent and a 50' to 100' radius curve on entry to street. See Standard Drawing 7-35 dimensions.

Applicant Validation		Staff Check	
<u>N/A</u>	<u>Included</u>		
			E. ► Mid-Block Bays: See Standard Drawing 7-35 dimensions.
			F. ► Pullout(s) designed >50' from an intersection curb return.

XIX. Intersections

			A. ► Travel lanes are aligned through intersection(s) (a 2' shift is allowed in hardship cases only).
			B. ► Intersections cross at 90° ±10°.
			C. ► Horizontal alignment of streets thru intersections are designed in accordance with Table 7-3 .
			D. ► Exclusive left-turn lanes provided where required. See Section 8.2.5, Exclusive Left Turn Lanes .
			E. ► Exclusive right-turn lanes provided where required. See Section 8.2.6, Exclusive Right Turn Lanes .
			F. ► Adequate turning radii used for each type of intersection. See Section 8.2.8, Turning Radius .
			G. ► ROW is dedicated as shown on Standard Drawing 8-7 .
			H. ► Additional ROW dedicated for right and left turn lanes.
			I. ► Sight distances comply with Standard Drawing 7-16 .
			J. ► Street grades approaching intersections shall be between 0.50% (min.) and 4.0% (max) for a distance equal to the tangent length of the street classification. See Table 7-3)
			K. ► Profile grades within the intersection do not exceed 3%

XX. General Requirements

			A. Phased improvements shown clearly.
			B. Phases within the project limits stand alone and do not leave necessary improvements to future projects.
			C. ► Design of State streets meet the requirements presented in the State Highway Access Code Manual .
			D. ► North arrows and the appropriate bar/graphic scale(s) are provided.

<u>Applicant Validation</u>		<u>Staff Check</u>
<u>N/A</u>	<u>Included</u>	
		E. ► Existing features adjacent to this development are shown in a ghosted or alternate line weight.
		F. The City's signature block is provided in the lower right corner of each sheet contained within the utility plan set. Each signature block measures 3½" high by 4½" wide.
		G. ► Ditch company approval block is provided.
		H. ► Water and Sanitary District approval block is provided.
		I. County approval block is provided.
		J. CDOT approval block is provided.
		K. ► Title block is provided on each sheet of the utility plan set and includes the project name, sheet name, engineer's name, address, telephone number and fax number, sheet numbering, and revision block.
		L. ► The utility plans correlate with the Site and Landscape Plans
		M. Spot elevations at all intersections provided as shown on Standard Drawings 7-32A and 7-32B.
		N. ► Proposed construction within the Property boundary drawn with solid lines and existing features shown with hidden or dashed lines.
		O. Stations and elevations provided at all PC's, driveway intersections and roadway intersections in both plan and profile views.
		P. Flowline curve table provided on each plan and profile sheet that includes radius, angle, arc length, and tangent length.
		Q. Centerline stationing is used except at cul-de-sacs, where flowline stationing is used (Station equations provided.).
		R. ► Street names provided on all sheets.
		T. ► All easements shown in the plan views.
		U. ► Match-lines provided in both plan and profile. Page number, station and elevation included.
		V. The scale of all sheets are as follows:
		1. ► Horizontal - 1" = 20', 30', 40', or 50'
		2. ► Vertical - 1" = 5' or 10'

<u>Applicant Validation</u>		<u>Staff Check</u>
<u>N/A</u>	<u>Included</u>	
		3. ► Overall Plan - 1" = 100'
		W. ► All private improvements, including but not limited to, roadways, driveways, utilities, etc. are clearly shown and labeled as such.
		X. ► A legend is provided on each sheet identifying the symbols used on that particular sheet.
		Y. ► Key map is provided on the plan and profile sheets (for utility plans having 3 or more plan and profile sheets).
		XXI. ► Street Cross Sections (Preliminary = typical for each street)
		A. Cross sections for Arterial Streets and Collector Streets are provided at 50' intervals. Cross also required where special conditions warrant the need (i.e. widening of an existing street). The interval may be adjusted where site topography is unique.
		1. Information Provided on each Cross Section
		a. ► Curb & gutter, existing(f) and proposed(*)
		b. ► Roadway surface, existing and proposed
		c. ► Sidewalk, existing and proposed
		d. ► Cross slopes, existing(f) and proposed(*)
		e. ► ROW, existing and proposed
		f. Side slopes, existing and proposed, 15' beyond the proposed ROW
		g. Stations
		h. Proposed flowline and centerline elevations
		i. Utility crossings
		j. ► Dimensions
		k. Areas of overlay, milling, pavement removal and/or reconstruction

Staff
Check

Plat

- A. ►** Maintenance Guarantee, Repair Guarantee, Notice of Other Documents notes.
- B. ►** Planning & Zoning Board/Hearing Officer certification statement (to be signed at final compliance).
- C. ►** Surveyor certification statement (to be signed at final compliance)
- D. ►** Statement(s) of land ownership
- E. ►** Statement(s) of ownership and/or maintenance of all tracts.
- F. ►** Statement(s) of the dedication of any easements, ROW, tracts, and other public areas.
- G. ►** Vicinity Map: Project location, nearest 2 Arterial Streets, street names, City limits, major public facilities.
- H.** Curve data complete for all curves.
- I. ►** 2 ties to aliquot corners.
- J. ►** All existing and proposed easements and ROW clearly defined.
- K. ►** Adjoining properties labeled.
- L. ►** Scale, graphic scale, north arrow, date of preparation, complete title w/ location.
- M. ►** Boundary legal description closes.
- N. ►** Lot lines.
- O. ►** Designation of areas subject to flooding, including floodplain, floodway, and product corridors. (Elevation Datum must be referenced to City of Fort Collins datum.)

Appendix E-4

City of Loveland

Requirements for Public Improvements – Civil Construction Plans

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information. For City of Loveland Only please see the following link for the latest form:

<https://www.lovgov.org/services/development-services/current-planning/applications-fees>

Appendix E-5

City of Fort Collins - Engineering Inspection STOP WORK ORDER



**NOTE: Appendix Forms and Information are for Reference
Only. Contact Local Entity Engineer for
Original Forms and Current Information.**

Job location: _____

I have inspected this structure and these premises and have found the following violations
of City laws.

You are hereby notified that no more work shall be done until the above violations are
corrected.

Date

Inspector

The above signed certifies that a copy of this order was posted on the premises and duly
served upon the below signed.

Acknowledged:

Date

DO NOT REMOVE THIS TAG

Please contact the Engineering Department at 281 North College Avenue, (970) 221-6605

Appendix E-6

City of Fort Collins Engineering Department Electronic Document Criteria

NOTE: Appendix Forms and Information are for Reference Only. Contact Local Entity Engineer for Original Forms and Current Information.

1.1.1 GENERAL INFORMATION

In 2000, the City of Fort Collins Engineering Department began converting all Engineering documents into electronic images. The initial conversion included documents such as Subdivision Plats, Utility Plans, Site and Landscape Plans, and Building Elevation Plans. The Colorado Public Records Act states that electronic images must be of a manner and scale to accurately reproduce the original and be of high quality and usable for the customer. To ensure all documents submitted and added to the Engineering Department Document Management System adhere to this act, this set of basic criteria has been developed.

This document is not intended to cover every possible situation that may arise. If you have questions regarding these criteria, please contact the Engineering Department Document Retrieval System Team Leader.

1.1.2 General Submittal Criteria

All final submittals for development projects and City capital projects are required to conform to the criteria set out in this document. This includes all development and capital projects within the jurisdiction of Fort Collins, including those projects soon to be annexed within the Growth Management Area boundaries.

All information shall be clear, concise and legible for final document acceptance. A visual evaluation will be performed on every plan sheet submitted. All sheets, or portions of sheets, found not in conformance with these criteria will be returned to the submitter for correction and resubmittal.

1.2 SUBMITTAL CONTENT REQUIREMENTS

1.2.1 General Requirements

- Adhesive material on mylar shall not be allowed.

- All sheets shall be uniform in contrast, scale, and proportionality to ensure readability.
- An enlarged diagram or detail sheet shall be provided when the details, including short lines, dimensions, and text cannot be clearly shown or read in the body of the plans.
- If an area is congested with a lot of detail, the text information should be located in an open area and referenced back to the point of origin.
- All non-black color will be rejected.
- CAUTION: Photocopied mylars of poor quality will be rejected.

1.2.2 Text and Lettering

The readability of text, lettering and numeric symbols is often obscured when the proportionality between the character and line weight is in conflict. We encourage a design approach that adjusts line weight to the size of the lettering. Smaller text, particularly text that is next to a line, symbol, or other text, is generally unreadable when plotted with a heavier line weight. Therefore these criteria require a proportional line weight to character or letter size to prevent “bleeding” or poor readability.

- The minimum recommended character and/or letter shall be equivalent to a height of 2 mm and a line weight of .25 mm.
- Uppercase lettering is preferable, however, lower case lettering is allowable as long as proper proportionality is used.
- No text, symbols, and/or lines shall be placed on top of other such information to impair readability.

1.2.3 Lines

Line weights have significant impact upon the quality of images. When lines are too thick or close to other information the readability is compromised.

- A minimum recommended grayscale color for any information depicting existing features shall be 252.
- Lines indicating existing facilities and utilities shall be dashed.
- Lines throughout a document shall not be inserted through text, symbols, or numbers. A line should be broken to ensure readability of information.

1.2.4 Shading and Hatching Patterns

When using shading or a hatching pattern to identify areas, the text and other information is often unreadable due to the darkness of the shading or when the thickness of a hatch pattern obscures the underlying information.

- No text, symbols, numbers or other information shall be covered by shading or hatching patterns.

1.2.5 Scale

An appropriate scale shall be used for all engineering drawings and details. Refer to the Larimer County Urban Area Street Standards, Section 3.2.7.

1.3 FIGURES/EXAMPLES

Arrows are provided to draw attention to the specific detail and are not tied to specific words in the caption description.

1.3.1 GOOD EXAMPLES

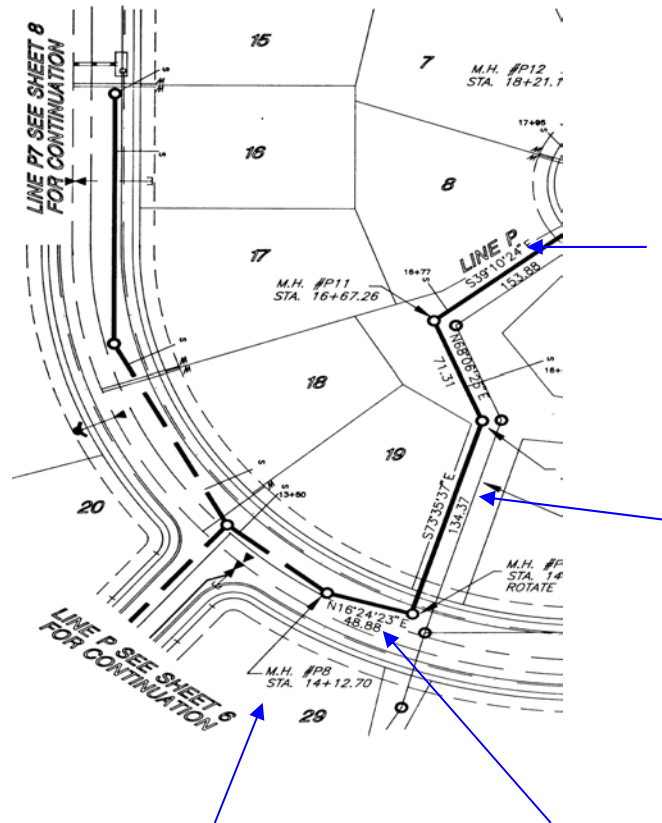


Figure 1.3.1 A – Good overall layout; text is readable; no lines through text or symbols; reduced clutter by using arrows; average proportionality on text.

LINE	DIRECTION	DISTANCE
L1	S 34°37'43" E	34.00'
EL1	N 74°17'10" E	26.69'
EL2	N 15°42'50" W	14.05'
EL3	N 00°17'05" W	14.23'
EL4	N 90°00'00" E	30.24'
EL5	S 89°50'00" E	17.00'

Figure 1.3.1. B - Good proportional text style and pen weight. Round and closed letters are readable.

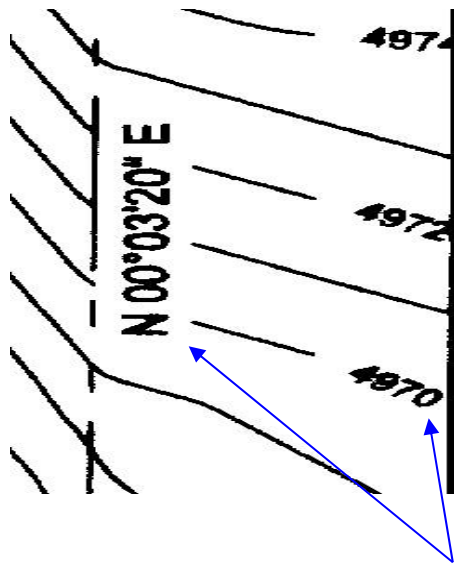


Figure 1.3.1 C – Good line/text usage; line is broken to insert text.

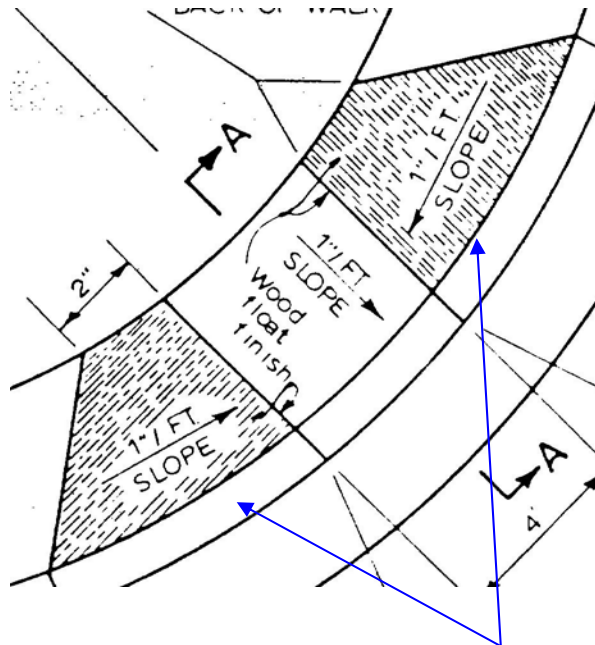


Figure 1.3.1 D – Good hatch pattern; pattern cleared for text.

1.3.2 – Poor Examples

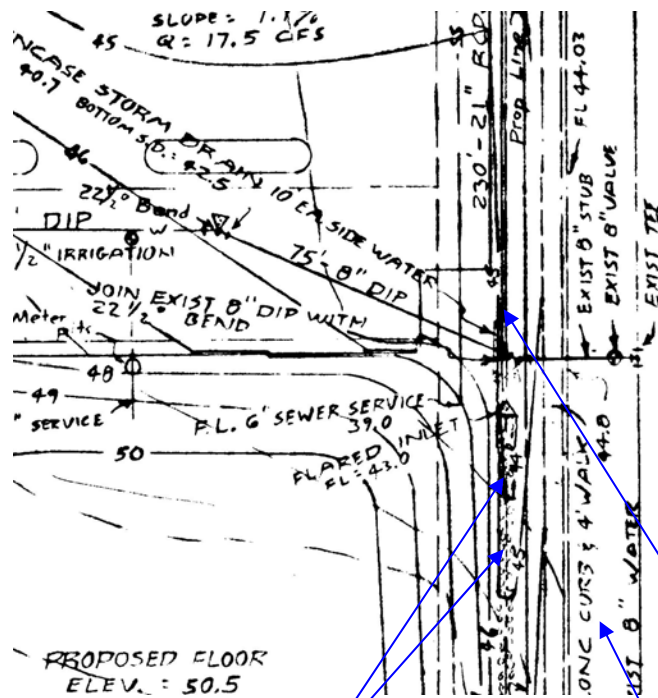


Figure 1.3.2 A – Poor overall layout; lines through text; text unreadable; line weight is too thick in some areas; hatching obscures text.

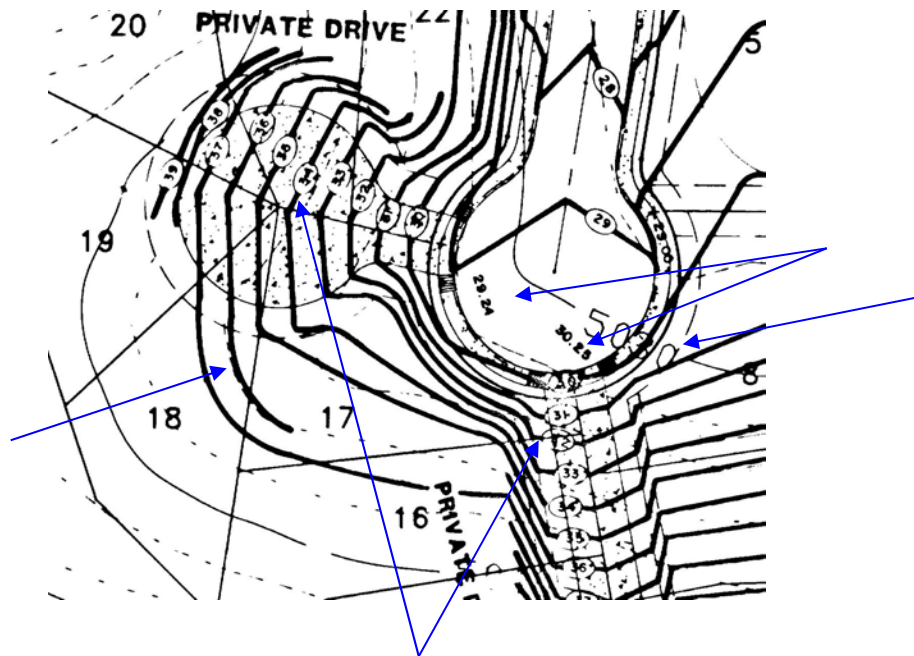


Figure 1.3.2 B – Poor proportionality with text and pen weight; thick lines, hatching conflict with text ; text/numbers without reference point.

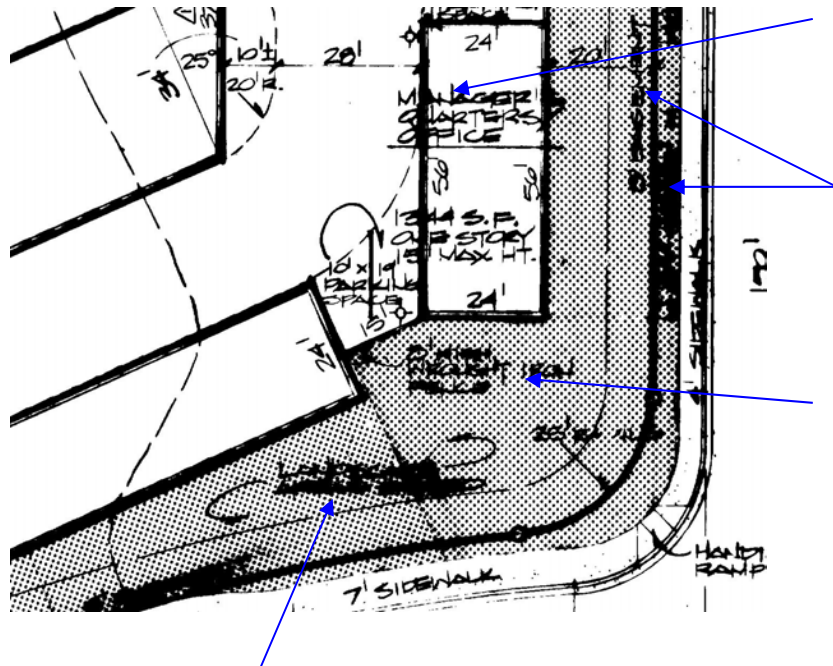


Figure 1.3.2 C – Poor hatching/text; poor proportionality of text and pen weight; poor text style; lines through text.

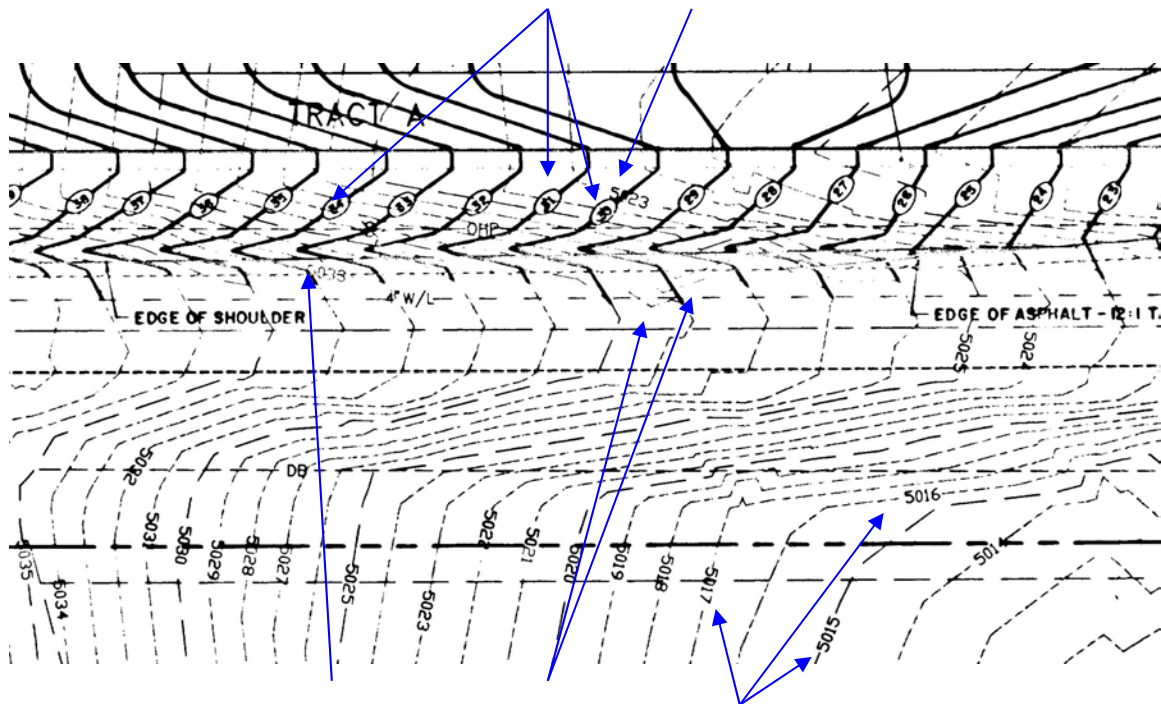


Figure 1.3.2 D – Poor use of lines through text; text going in opposite directions; loss of lines and information; poor proportionality between text and pen weight.

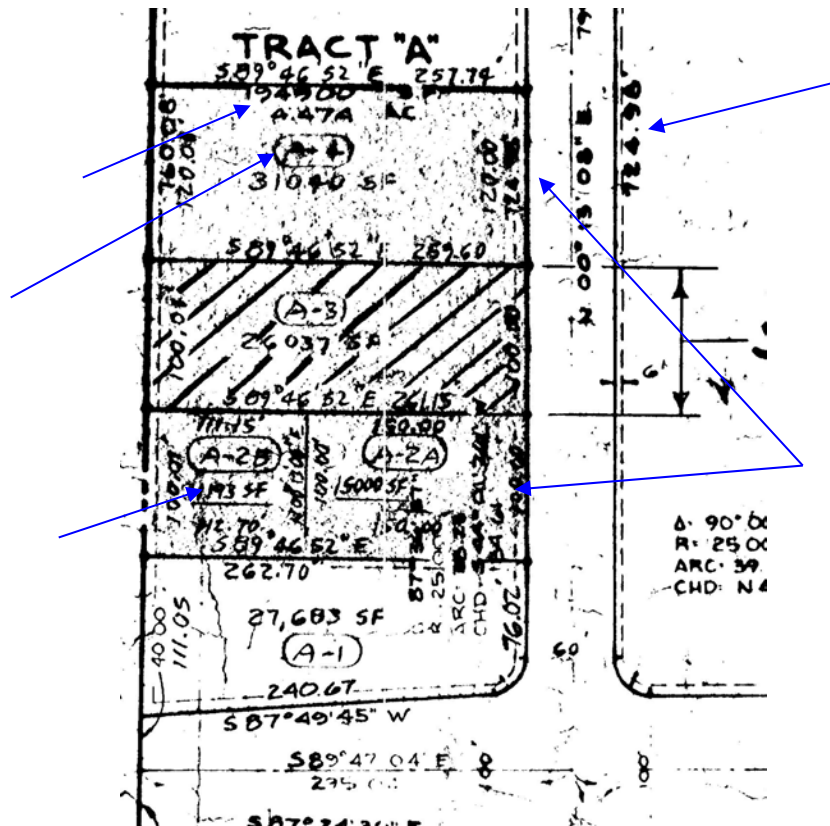


Figure 1.3.2 E – Poor use of shading; poor proportionality of text and line weight; difficult to read.

and rights-of-way now on re-

Have caused the same to be shown on this plat known as Collins, Larimer County, Co and for public use forever out on this plat.

1. CURB LANDING SHALL BE CONCRETE COLORED WITH 4 LBS/ CYCLO YARD DAVIS NO. 1117 (TILE NEED PIGMENT OR APPROVED EQUAL. DAVIS CLEAR SEALANT OR APPROVED EQUAL SHALL BE APPLIED ON ALL COLORED CONCRETE SURFACES.

Figure 1.3.2 F – Poor examples of text quality; poor proportionality of text and pen weight; unreadable.

Appendix F

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Fort Collins Traffic Operations Manual
(City of Fort Collins Only)

Appendix G

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Policy and Standards for Maintenance and
Improvement of Annexed Infrastructure
(City of Fort Collins only)

Appendix H

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Fort Collins Multimodal Transportation
Level of Service Manual
(City of Fort Collins only)

Appendix I

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current
Information.**

Appendix I shall be used as a reference for Roundabout Design within the City Limits of Fort Collins and Loveland, and within Larimer County GMAs.



Roundabout Design Manual

LCUASS Appendix I

City of Loveland
City of Fort Collins
Larimer County

August 1, 2021



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A. Introduction

These guidelines are to be used, along with information from other sources and engineering judgment, in the design of all roundabouts. Where conflicting information exists, this manual shall govern, or the local entity can provide clarification.

When designing roundabouts, there are several characteristics that can be standardized, such as signing and marking; while others must be adapted to fit the demands of the location, such as approach angles and right of way restrictions. This manual has been created to allow engineers sufficient flexibility to design a roundabout to fit a particular site, while still maintaining consistency with other roundabouts within the Local Entity in order to enhance driver expectancy.

All roundabout designs will be required to follow a four-stage process (scoping meeting, conceptual design, preliminary design, and final design), and these stages shall run concurrently with the overall development review process:

- The Roundabout Scoping meeting will deal specifically with any proposed roundabout intersections, and will be scheduled within two weeks of the Local Entity's receipt of a completed *Roundabout Scoping Form* and any ancillary information necessary to determine the parameters of the proposed roundabout. The intent of the scoping meeting is to clearly define the expectations for design of the proposed roundabout and to discuss particular site-specific challenges.
- The conceptual design is intended to vet the general capacity issues, and performance of a roundabout, conceptual location/layout, and pedestrian / bicycle safety issues based upon direction given in the scoping meeting.
- Submission of a preliminary design that meets design criteria listed herein, or as modified in accordance with guidance provided by the Local Entity during the scoping or conceptual design stages of review. Horizontal design of the proposed roundabout shall be finalized prior to approval of the preliminary design. The preliminary design may be incorporated into the Preliminary Public Improvement Construction Plans (PICP's), or processed separately, as necessary.
- Submission of a final design shall include all: construction details, signing and striping plans, and proposed construction phasing (if applicable). The final design shall be incorporated in to the Final PICP submittal.

The final approval of any platting application and/or Final PICP's will not occur until the final design plans for the roundabout are also ready for approval.

TABLE 1: ROUNDABOUT CATEGORIES

MULTI LANE ROUNDABOUTS	GENERAL USE DESCRIPTION	REFERENCE
4-Lane by 4-Lane Arterial	Residential/Commercial major arterial intersection	Figure 10
2-Lane by 4-Lane Arterial	Residential/Commercial greenfield development access to existing major arterials	Figure 11
2-Lane by 4-Lane with by-pass lane	Residential/Commercial greenfield development to existing major arterials with heavy right-turn from minor road entry	Figure 12
SINGLE LANE ROUNDABOUTS		
2-Lane by 2-Lane Arterial	Residential/Commercial greenfield development; Arterial-Arterial or Arterial-Collector	Figure 13
Collector	Residential/Commercial greenfield development; Collector-Collector or Collector Residential	Figure 14
Mini	Commercial retro-fit, 2-lane road w/o center lane to facilitate traffic processing and pedestrian safety in place of 4-way stop control or signal	Figure 15
Residential Compact	Residential Traffic Calming	Figure 16

B. General Design Criteria

1. Appropriate Roadways/Locations

Roundabouts should only be used where physical conditions, such as approach grades and adequate right of way, allow for proper entry alignment. Roundabouts are generally limited for use on a roadway with four or fewer through lanes, resulting in no more than two circulatory lanes. They are not appropriate where their use is expected to produce greater vehicle delay or significantly increased difficulty for pedestrians without the need for special accommodation measures. Selection of a roundabout intersection should be proposed and accepted for consideration at the conceptual level for a proposed development.

The design of the approach roadways must provide adequate visibility from a distance that will allow approaching drivers to see the roundabout under daytime and nighttime conditions. This decision sight distance (DSD) is the minimum distance required which will allow deceleration from the 85th percentile travel speed (or posted speed limit, whichever is greater) to the maximum allowable entry speed of 25 MPH (single lane) or 30 MPH (multilane) at the Point of Entry (POE) without exceeding a deceleration rate of 11.2 ft/s/s. The POE shall be considered the point of curvature of the entry curve (R1). The DSD shall be based on Avoidance Maneuver B from Table 3-4 of the AASHTO Green Book. The length of the maneuver shall be measured along the vehicle path(s) to the conflict point as shown on Figure 4.

2. Approach & Circulatory Speeds

The approaching roadway lanes should generally be shifted to the left of center of the proposed roundabout, producing a “left-loaded” entry design. This should be accomplished by flattening the exit curvature to the maximum extent possible, and/or realigning the entry lanes through the use of a chicane. This may, or may not incorporate shifting of the central island or approach roads to achieve the best left-loaded entry for the predominant entry movements. Approach alignments to the center or slightly right of center will not be acceptable, unless the fast path criteria and truck turning movements can be met without compromising other design criteria.

As a general rule, roundabouts may have three or four approaches. A fifth approach leg or driveway may be approved by variance, as long as it can be shown that the additional leg will not significantly degrade the operation or safety of the roundabout. Increasing the number of approach legs will generally require a larger inscribed diameter to accommodate the additional leg. A three-leg roundabout should be configured as a tee intersection to minimize fast right-turn movements. All approaches on a three-leg roundabout shall be left loaded to provide adequate slowing for the entry movements.

Approach roadways may be designed as:

- single-lane
- single-lane with a flare-out to provide an added entry lane
- partial right-turn bypass lane at the circulating roadway
- single-lane with a right-turn by-pass lane
- two lanes
- two lanes with a right-turn by-pass lane

The configuration selection shall be based on the turning movement volumes and pedestrian considerations. Right turn by-pass lanes should not be considered where significant conflicting pedestrian crossings are expected, unless special treatments such as rapid flashing beacons or HAWK (High intensity Activated crossWalk) type signals are proposed. Right-turn by-pass lanes shall not be considered unless the capacity analysis indicates one is necessary to meet level of service (LOS) requirements.

The approach roadway section is defined to include the length of roadway from the point where an approaching vehicle begins to decelerate, to the yield line, where the vehicles enter the inscribed circle (see Figure 1 for an explanation of the various roundabout elements). For design purposes, this section shall extend to the limits of the decision sight distance, as defined in Exhibit 3-4, Chapter 3, of the AASHTO Green Book, using the “Avoidance maneuver B: Stop on urban roadway” distance. The central island shall be visible from a minimum distance equal to the stopping sight distance both day and night (with standard street lighting).

Operating speed maximums are controlled by the “fast path” (FP) as noted in Figure 2. The fast path is the minimum radius of an arc that is 65 feet in length, fit to the fast path spline and measured along the vehicle path (not along the curb flowline). Increasing the inscribed diameter, coupled curves, landscaping, roadway narrowing,

and other forms of psychological speed reduction measures may be required where approach speeds are higher due to design constraints.

Design speed limitations and their respective radii through the roundabout are shown on Figures 2 & 3, included in section C – Specific / Geometric Design Elements, identified as R0, R1, R2, R3, R4 and R5. The maximum radius and respective speeds at various locations on the travel path through the roundabout are critical to the safe operation of the roundabout. Curb & gutter, splitter islands and the central island placement control the fastest vehicle path, but are not the same radii. In addition to the overall speed limitation for operation, the maximum speed differential between any two vehicles of the traveled path is 12 MPH to reduce the potential for rear-end type accidents for vehicles turning left or exiting. The fast path shall be modeled in accordance with methods described in NCHRP 572, Appendix G.

All alignment parameters, including sight distance restrictions for landscaping, shall be included in the preliminary design drawings. See Figure 4 for sight distance triangle restrictions.

3. Design Vehicle

All single-lane roundabouts shall be designed to allow single passenger cars, pickups, single unit (SU) trucks and fire trucks (B-40, BUS-45 AND WB-45) to proceed without requiring the use of the truck apron. For two-lane roundabouts, the design shall accommodate a WB-50 vehicle without the use of the truck apron. It is expected that larger trucks will require the use of the truck apron, especially on single-lane roundabouts. In addition to the aforementioned requirements, all roundabouts shall be designed to accommodate the passage of a WB-67 vehicle. In the determination of vehicular travel/turning paths, the gutter pans may not be considered as part of the traveled way, and vehicles shall not be proposed to utilize these areas while negotiating the roundabout. As such, the designer shall assume a two-foot (2') offset from the face of curb when defining acceptable truck paths.

The design of Mini roundabouts shall allow for longer trucks (B-40, BUS-45, WB-45, WB-50, and WB-67) to traverse the central and splitter islands. Therefore, the central and splitter islands on Mini roundabouts shall remain free of signage and other non-mountable obstructions.

In areas where high truck volumes exist or are anticipated, additional design accommodations may be required as determined by the Local Entity Engineer. Similarly, it may be necessary to model special vehicles through a roundabout that is located along a route that is, or may be, used for the transport of oversized equipment, such as, large transformers, wind turbine parts, heavy military equipment, manufactured housing, etc. Some of these delivery trailers have adjustable hitches or have steerable rear axles that will need to be considered in the design. If any, special delivery needs along the proposed route will need to be defined at the conceptual submittal stage. In all cases, the design vehicle shall be defined and accepted prior to preliminary design.

The adequacy of all roundabouts in regard to the design vehicle shall be evaluated using a Local Entity-approved truck turning software package to show the appropriate wheel paths for right, through, and left turn movements from each entry of the roundabout, and shall be submitted with preliminary design. Truck positioning on entry to a multi-lane roundabout may assume that the truck will occupy both entry lanes and utilize both circulatory lanes during the traverse of the roundabout. For all truck turning evaluations, the minimum vehicle speed shall be 10 miles per hour.

4. Pedestrian / Bicycles

All roundabouts shall be designed to allow pedestrian crossings whenever sidewalks are existing or planned. Pedestrian crossings shall be provided with appropriate pavement markings, as outlined in Figure 4. Supplemental signage may also be required for pedestrian crosswalks located along a school route, bordering a park or shopping area, or any other area where high pedestrian activity is expected. Crosswalk lighting shall be designed in accordance with the National Cooperative Highway Research Program publication 672 (NCHRP 672). The designer shall work with the local power provider to facilitate the necessary power connections. The light standard placement shall be a minimum of four feet (4') from the back of curb.

In areas of high potential for vehicle/pedestrian conflict, supplemental active warning devices, such as flashing beacons or LED supplemented signage, may be required. The warning devices may be activated either manually by the user or automatically by a Local Entity-approved detection / actuation technology.

Except in residential compact roundabouts or where otherwise precluded due to site constraints, all sidewalks and multi-use paths in the area of a roundabout shall be detached from the curb by a minimum distance of 10 feet.

If the roundabout is on a street with approaching bike lanes or on a roadway with planned bike lanes, the approach shall provide for a connection from the bike lane to the multi-use path, as illustrated on Figure 7. The intent is to allow the bicyclist the choice to either proceed through the roundabout as a vehicle, or exit the roadway prior to the roundabout onto the detached multi-use path. The on-street bike lane should terminate at the point where the bike lane exits from the roadway using a 40' taper as shown on Figure 7.

Figures 4 thru 9 provide design details for construction, signage, and pavement markings for pedestrians and bicyclists. Details of site-specific markings and signage shall be included with the preliminary design submittal for all proposed roundabouts.

5. Design Software

Local Entity-approved design software shall be used to ensure proper design and capacity for any new roundabouts. For Local Street or Minor Collector intersections where the 20-year projected link volumes are expected to be less than 500 AADT, a capacity analysis is not required unless the roundabout will experience high peak volumes for vehicles and/or pedestrians (such as near a school).

At the conceptual level, intersections with collector or higher roadway classifications shall be evaluated with the Roundabout Capacity Evaluation Spreadsheet 1A.1 and the 2010 Highway Capacity Manual methodology or RODEL/ARCADY. At the Preliminary Design level, all roundabout intersections will require analysis by methods detailed in current versions of: RODEL, ARCADY or VISSIM to analyze the roundabout for level of service (LOS) and queue concerns in relation to the Local Entity's Adequate Community Facilities (ACF) Ordinance. The City of Fort Collins may require SIDRA INTERSECTION software for roundabout evaluation. Designers should contact the Local Entity Engineer for guidance on required analysis and input parameters.

For roundabouts proposed at the intersections with Major Collector, Minor Arterial, or Major Arterial roadways, the use of RODEL or ARCADY analysis software is required for capacity analysis and evaluation of geometric design variables. The specific RODEL or ARCADY parameters shall be developed based on the recommendations of their respective instruction manuals. Additionally, VISSIM analysis may also be required for verification of the RODEL or ARCADY results. A lane use diagram showing origin-destination turning movement volumes will be a requirement of preliminary design review. For unbalanced entry and circulation modeling in multi-lane roundabouts, the analysis software chosen shall consider the key individual conflict zone as determined by the proposed geometry and striping.

The following guidance is given for the RODEL effective entry width parameter "E", assuming a striped roundabout entry:

A. Single-Lane Entry -

1. E shall be a **minimum** of 3.0m (9.84ft)
2. E shall be a **maximum** of 4.5m (14.76ft) if the approach feeds a single circulating lane
3. E shall be a **maximum** of 5.5m (18.05ft) if the single lane approach feeds 2 (or more) circulating lanes

B. Multi-Lane Entry -

1. The **minimum** lane width shall be 3.0m (9.84ft)
2. The **maximum** lane width shall be 4.0m (13.12ft)

Based on the above, a two-lane entry can be 6m - 8m (19.69ft – 26.25ft) wide

The Kimber roundabout capacity equations used in the RODEL and ARCADY analysis programs show capacity increases on a smooth curve related to input parameters that do not consider roadway striping. Where striping is proposed with the roundabout design, the E values must be input based on the effective width as detailed above and in the RODEL manual consisting of different lane width sizes. For example, if the measured design entry width E is 10m in the model, this represents three 3.33m lanes, not two 5m lanes as the entry width E exceeds the maximum lane width. The effective width should be set in the model to the maximum for two lanes at 8m even though the measured width is 10m.

If any lanes are designed wider than 4.0m in order to accommodate trucks, they should be considered to be 4.0m wide when summing the lane width to get E for use in RODEL. Usually, entry lanes have equal width, but a two-lane approach may have a 3.60m lane and a 5m lane, the latter made over-wide for trucks. For RODEL, the input would be $E = 3.6 + (4.0) = 7.6\text{m}$, not $E = 3.6 + (5.0) = 8.6\text{m}$

All preliminary designs shall be accompanied by AM and PM peak hour turning movement counts for existing and build-out conditions and traffic growth projections for both 10 and 20-year horizons. The RODEL or ARCADY output shall also be provided at this time, when required. Where the roundabout is near a school, shopping center or other major traffic generator, the peak hour for local traffic with the traffic generator fully developed shall be used and may be different from standard a.m. or p.m. peak times. In addition to the RODEL or ARCADY output file, a diagram graphically depicting the input parameters similar to that shown on Figure 1, shall be provided. The horizontal roundabout layout shall be provided to the Local Entity in CAD format that is compatible with Autodesk version 11.0 to allow for review of input parameters.

6. Utilities & Drainage

Design of underground and overhead utilities shall be included with the Preliminary Design. Design of water, sewer, and electric shall meet the appropriate Local Entity's standards, or the standards of any applicable special district. The placement of manholes and valve risers shall consider maintenance safety issues as well as their location relative to wheel path in order to minimize surface ride issues. Street lighting shall follow the Local Entity's standards for pole, light fixture and type of lighting. In general, lighting shall be designed to illuminate any pedestrians within the crosswalks without causing a backlighting effect. Lighting shall also be situated to help the driver identify the general shape of the intersection and to highlight conflict points or areas of entry and exit from a distance equal to, or greater than the stopping sight distance as identified in Figure 4.

Drainage design shall comply with the Local Entity's storm drainage standards. Roundabouts should be generally designed to slope away from the central and splitter islands with drainage inlets located on the outer curb line of the approach roadways and away from the pedestrian crossings. Inlets within the roundabout circulatory roadway shall be constructed with CDOT Type R inlets with sufficient capacity to limit the encroachment into the circulating area to a maximum depth of 4-inches for the 10-year event. Placement of any inlets shall also consider the vehicle's wheel path when traveling through the roundabout.

7. Landscaping

Landscaping is an important part of the design, especially in the central island, as it provides visual awareness of the roundabout. Landscaping designs must consider pedestrian and vehicle safety, providing year-round amenities for the roundabout users without causing sight distance problems. This is especially important on approaches to pedestrian crossings.

All final designs shall include a landscaping design sheet identifying plant types, height from the top of the mature plant to the roadway surface (including the height of planter area), and the minimum pruning height for the lower branches of any trees to be planted. See Figures 4 and 6 for areas where plant height is restricted for sight distance reasons. Within the central island, but outside of the required stopping sight distance line, the use of larger plant materials is encouraged to improve the driver's perception of the roundabout location and shape. Care should be taken to avoid distracting displays, such as signs, intricate sculptures, animated items, glare from lighting, or any other features that could increase the potential for driver distraction. In no case should anything be placed within the central island which would encourage pedestrians to access the central island.

8. Other

Other design criteria include but are not limited to:

- The departure width of the roundabout shall be no narrower than the width of the circulatory roadway and include a transition to the departure lane width cross-section, exclusive of on-street parking and bike lanes (Figure 7). The roadway shall then taper out to its full width (bike-lane or parking) as shown on Figure 6.
- Transit stops should be located downstream of the roundabout, clear of the exit area, and a minimum of 50 feet downstream of the bicycle re-entry ramp (Figure 7). The transit stops shall be built with a LCUASS standard pullout or combined with the on-street parking area.

All unusual or location-specific design issues shall be resolved prior to the submission of final design plans.

C. Specific / Geometric Design Elements

1. Critical Geometry

The roundabout advantage is its ability to move large volumes of traffic at a slow deliberate rate of speed that processes the necessary turning movements into the through movements with less potential for high speed accidents. The efficient use of the intersection area is created and controlled by the geometry of the roundabout and specifically the approach road entry. Roundabout design is a balance between competing objectives and thus requires a context sensitive approach to meet the design objectives. The design guidance described below is a standardized approach intended to produce a reasonable, first-cut horizontal design. Intersections with specific rights-of-way constraints or traffic needs will have to be addressed with a context sensitive approach.

2. Roundabout Design Approach

Once a preliminary roundabout lane configuration has been developed based on projected traffic turning movements and capacity evaluations, the designer should develop a rough horizontal layout by using the applicable Figures in this manual as a guide.

The approach roadway design elements include curb alignment, median width and transition, approach flare, crosswalk location, horizontal and vertical alignment of the approach lane(s), intersection and stopping sight distance calculations, approach speed, fast path radii, and other associated elements identified in Figures 1 through 7. Minimum / maximum design standards are as follows:

Fast Path (FP)		Single Lane (ICD 115-155)		Multi-lane (ICD 150 - 215)	
Designation	Movement	FP Radius Range (ft)	FP Max Speed	FP Radius Range (ft)	FP Max Speed
R1	Entry	120 – 160	25	175-275	30
R2	Circulating	90 – 115	25	175-215	25
R4	Left Minimum	40-60	15	70	15
R5	Right Turn	120 -160	25	175-215	25

*R4 has a minimum requirement to reduce rear end accidents caused by excessive speed differential

Note – radii are given as a range for various superelevation rates from 0% to 4%, positive for R1, R3 & R5, and negative for R2 and R4. Calculations for each specific roadway segment and corresponding cross slope shall follow the AASHTO Green Book.

Maximum vertical grade (approach) 2% for 200' on minor and principal arterials
4% for 100' on minor and major collectors
4% for 50' on local streets

Approach Decision Sight Distance 400' for 25 MPH or less
("DSD" on Figure 4 - measured from 490' for 30 MPH
the yield line) 596' for 35 MPH
690' for 40 MPH
800' for 45 MPH
910' for 50 MPH

Note – Approach Decision Sight Distance, DSD, is the distance at which the driver is aware of the change in alignment caused specifically by the roundabout. If the required DSD is not available due to topographic limitations, advance warning signs shall be required. Vertical alignment must be checked as well as horizontal alignment for restrictions to DSD.

Minimum Approach Tangent 300' on principal arterial
(approach centerline to yield line) 200' on minor arterial
100' on all collectors
50' on local access

Min. distance to nearest access (distance from splitter island)	600' on principal arterial 300' on minor arterial 100' on all collectors 30' on local access
--	---

3. Circulating Roadway

The circulating roadway, that portion of the roundabout between the central island and the inscribed circle diameter (ICD), is the portion of the roadway used by vehicular traffic. In Loveland (city limits only), the circulating roadway within all proposed roundabouts shall be concrete pavement, unless otherwise approved by the Local Entity Engineer. The ICD of the roundabout, which encloses the circulating roadway, shall be large enough to accommodate all road users without exceeding the fast path maximum radii. Generally, the design of the inscribed circle will be from 140' to 215' for multilane roundabouts, and from 90' to 155' for single lane roundabouts and 50' to 90' for Mini and Residential Compact roundabouts. The outside edge of the circulating roadway is within and generally the same size as the inscribed circle.

The circulating roadway shall be from 1.0 to 1.2 times the maximum approach roadway width at the widest entry to the roundabout. Super-elevation for the circulatory road should generally be no greater than 2%, although a super-elevation of up to 4% may be approved if conditions warrant. Adverse super elevation is preferred for the circulatory road as it provides a smoother transition for motorists, better drainage, and keeps circulating speeds to an acceptable level.

Roundabouts may be designed and built in stages, with the initial size of the inscribed circle large enough for a multilane roundabout, with an oversized central island that restricts the circulating roadway to one lane. In this case, it is likely that an oversized truck apron will be needed.

Dedicated bypass lanes should be avoided if possible, due to the difficulty for pedestrians to cross three roadway segments instead of the usual two in other roundabouts. If the capacity analysis with RODEL indicates that the existing and shorter range projected volumes will operate at LOS D or better, the roundabout should be built without a bypass. If the 20 year projected volumes show the need for a bypass, adequate right of way shall be included to accommodate the future expansion and the bypass will be built when the operating LOS exceeds level C.

4. Sight Distance

Stopping Sight Distance (SSD) is the distance between a roadway obstruction and the approaching driver, measured along the vehicle path. It is used to assess safety for vehicle to vehicle, vehicle to pedestrian or bicycle, and vehicle to other object hazards. Every conflict point at the intersection must be checked, based on fast path vehicle speed near the conflict area for obstructions of the required visibility area – see Figure 4.

SSD for the approach and yield at the roundabout shall be based on current AASHTO Green Book standards for urban roadways.

5. Splitter Islands

Splitter islands are necessary to provide proper deflection of vehicular traffic for speed control and to provide pedestrian refuge areas. For multi-lane roundabout entries, the alignment of the splitter island curb shall incorporate an extension of the splitter island that is tangential to the outside flow line of the central island (Figure 1). For arterial roundabouts, splitter islands shall be a minimum of 150' in length (300' preferred). See Figures for minimum splitter island lengths for other types of roundabouts.

Splitter islands shall be designed with a minimum 6' x 6' (8' x 8' preferred) pedestrian refuge. Crosswalks shall be located 25' from the yield line for all roundabouts unless otherwise approved by the Local Entity Engineer (Figure 5). Crosswalks shall also be designed to be radial to the traveled roadway in order to improve visibility for pedestrians.

The splitter island curb layout shall be designed in accordance with Figure 6.

The central island diameter for a multilane roundabout shall be determined in a manner that assures that the deflection for entering vehicles will result in a design that meets the maximum fast path requirements. Generally, the central island diameter will fall between 115' and 175' for a multilane roundabout and between 95' and 135' for single lane roundabouts and 35' to 75' for Mini roundabouts.

Truck aprons are required and may not exceed 5% superelevation. They shall be constructed of concrete and be contrasting in texture and color from the surrounding roadway, easy to maintain, and able to withstand the loadings of turning trucks (i.e. minimum 6" thick, decorative, contrasting colored concrete, etc.). In no case should a truck apron resemble a sidewalk. Brick, cobblestone or other individually placed paving materials may be considered when set on an adequately designed concrete supporting shelf. Additionally, truck aprons shall be provided with a monolithic 4" mountable perimeter curb that is back-sloped at a 45 degree angle with a rounded top. See Figure 5 for additional truck apron design information.

Elevation drawings of the central island shall be included with the preliminary plans. Except for Mini and Residential Compact roundabouts, the central island, exclusive of the truck apron and any sight distance restricted areas, shall be a minimum of 2' above the surrounding roadway, and shall be of contrasting texture and colors to the roadway and surrounding areas. The interior surfacing of the central island shall also be designed for low maintenance, discouraging the use of sod or other high maintenance plantings/materials.

7. Signing & Marking

All signs and pavement markings shall conform to the current *Manual on Uniform Traffic Control Devices* (MUTCD) as amended, and by these design standards.

1. Signing - See Figure 9 for sign locations.

- Yield signs shall be placed on the right side of the approach roadway, at the point where vehicles are required to yield when entering the roundabout. With the exception of Mini and Residential Compact roundabouts, yield signing will also be required in the splitter islands. Supplemental "YIELD" pavement markings may also be required where field observation warrants.
- Lane assignment signs, depicting the lanes maneuvering around the roundabout, shall be provided on all multi-lane approaches (Figure 8). This requirement shall also be applied to single-lane approaches with auxiliary turn lanes.
- Street name signs with minimum 8" lettering shall be placed on the splitter islands and oriented toward traffic on the circulatory roadway (Figure 8).
- Flag type guide signs, indicating the correct directional exit for service, recreational and cultural destinations are required for major destination routes.
- Advanced guide signs (Figure 9) shall be required for roundabouts with two or more circulating lanes or five or more legs.
- Pedestrian crossing signage shall be required where high pedestrian usage is expected, or as otherwise determined by the City.

2. Marking – Pavement markings shall consist of pre-formed, hot-applied thermoplastic material. All linear pavement markings, including crosswalks, shall be grooved in using approved grinding process after the concrete has cured and installed even with the surface of concrete paving. All pavement markings can be installed directly on top mat of asphalt without being recessed. Where installed on concrete paving, all markings (lines, symbols, etc.) shall be outlined in black for increased visibility. Use CDOT specifications, section 627.08 (7a) for inlaid lines, symbols will not be inlaid. See Figures 10-15 for typical pavement marking types and locations.

- Lane use pavement markings, including arrows and solid or dashed lines shall be used on all multilane roundabouts. See Figure 5 for their correct spacing and placement.

- Lane use pavement markings, including arrows and solid or dashed lines shall be used on all multilane roundabouts. See Figure 5 for their correct spacing and placement.
- Yield lines and “YIELD” pavement markings shall be used to mark the location at which drivers must yield to circulating traffic. The yield lines shall be curved along the outline of the circulatory roadway and shall be oriented toward approaching drivers as depicted on Figures 10-15. Placement and orientation of “YIELD” pavement markings will also be required as indicated on Figure 5. “Shark’s Teeth” type yield markings will not be permitted.
- Yellow edge lines shall be placed along the left edge of the approach roadway and along the edge of the splitter islands. For multilane roundabouts, white edge lines are required along the right side of the splitter island outlining the circulating roadway.
- Pedestrian crossings shall be marked with “Denver” or “Continental” style markings, consisting of 1.5’ x 9’ bars located in a manner that avoids the projected wheel path.
- Retroreflective raised pavement markers (RRPM) may be required on the central island and splitter island curbs where sight distance and/or other concerns indicate that additional warning is necessary for improved nighttime operational safety.

8. Landscaping Design Elements

In general, landscaping and design elements shall:

- Be aesthetically pleasing
- Fit within the context of the surrounding area
- Not create a distraction for drivers
- Not interfere with pedestrian safety
- Not attract pedestrians into the central island

Splitter islands shall either be hardscape or contain low level vegetation with a maximum height at maturity, of 30” above the roadway (Figure 6).

In order to reduce approach speeds, and with the exception of Residential Compact and Mini roundabouts; the central island shall contain vertical features that are visible to approaching traffic under daylight and nighttime conditions. All vertical features, however, shall be located outside of the stopping sight distance restriction area.

New roundabouts with landscaping shall be subject to a maintenance agreement with the local homeowners Association (HOA), providing for maintenance of all proposed landscaping. In the alternative, guaranteed funding for maintenance of the landscaping by other private organizations such as Metro Districts, Property Management Agencies, etc., may be acceptable. Retrofit roundabouts shall have low-maintenance landscaping or a maintenance agreement similar to new roundabouts.

D. Definitions

AASHTO Green Book – The current version of the American Association of State Highway and Transportation Officials publication “A Policy on Geometric Design of Streets”.

Central Island - the raised area in the center of a roundabout around which traffic circulates.

Circulating Volume -the total vehicular volume on the circulatory roadway immediately prior to an exit, measured over a specified period of time.

Circulatory Roadway – the roadway portion of a roundabout which circles the central island.

Circulatory Roadway Width - the distance between the outer edge striping of the circulatory roadway and the outer margin or lip of gutter of the central island, exclusive of aprons.

Deflection - the change in trajectory of a vehicle imposed by geometric features of the roadway.

Departure Width - the downstream width of the roadway used by vehicles departing the roundabout.

Design Vehicle - the largest vehicle that can reasonably be anticipated to use a facility.

Entry Flare - the widening of an approach upstream of the yield line in order to provide additional capacity.

Entry Path Radius (R1) - the minimum arc radius, fitted to the fast path, that occurs prior to the yield line (See Figures 2 & 3).

Entry Radius - the minimum radius of curvature of the outside (right) edge stripe, or lip of gutter, of the roundabout entry.

Entry Speed - the speed of a vehicle as it crosses the yield line.

Entry Width - the width of the roundabout approach where it meets the inscribed circle, measured perpendicularly from the right edge of the entry to the point of intersection of the left edge line and the inscribed circle (see Figure 1).

Exit Path Radius (R3) - the minimum arc radius, along the fast path, that extends from the roundabout exit (see Figures 2 & 3).

Exit Width - the width of a roundabout exit where it meets the inscribed circle, measured perpendicularly from the right edge of the exit to the point of intersection of the left edge line and the inscribed circle (see Figure 1).

Fast Path (FP) - a hand or spline-drawn representation of a vehicle's path through a roundabout which would allow the least deflection and thus, the highest travel speed given the geometric constraints. The method of determining the FP is detailed in NCHRP Publication 572, with further clarification available in Appendix G of that Publication.

Fast Path Radius - the minimum radius on the fastest through path around the central island measured 5' from any vertical face and 3' from center striping, as shown on Figures 2 & 3.

Inscribed Circle - used to define the size of a roundabout, it is the diameter of the largest circle that can be fit within the outer edges of the circulating roadway.

Local Entity Engineer - The Engineering Division Manager, City Engineer, or another Local Entity representative authorized to act on behalf of the Local Entity.

Mini-Roundabout - a small, retrofit roundabout intended process traffic volumes greater than 3500 AADT combined intersection traffic, which is intended to fit into locations with significant right-of-way constraints.

Multilane Roundabout - a roundabout that has a circulatory roadway that can accommodate at least 2 vehicles traveling side-by-side.

Partial Right-Turn Bypass Lane - a channelized right-turn lane that does not share the same entrance to the roundabout as the other entering lanes but yields to exiting vehicles due to the lack of an additional downstream merge lane.

Residential Compact Roundabout - a new construction, residential roundabout intended for traffic calming in situations with less than 3500 AADT combined intersection traffic.

Right-Turn Bypass Lane - a lane provided adjacent to, but separate from, the circulatory roadway, that allows right-turning vehicles to bypass the roundabout. Also known as a right-turn slip lane, this lane must be able to accommodate the design vehicle.

Roundabout - an intersection with 3 or more approach legs, generally circular in shape where continuous flow of traffic is facilitated through the use of yielded entry and defined lane use.

Sight Triangle - an area required to be free of obstructions in order to ensure visibility between conflicting movements.

Single-Lane Roundabout - a roundabout that has one circulatory lane.

Splitter Island - a raised area on an approach designed to separate entering and exiting traffic, deflect and slow entering traffic, and provide a refuge area for pedestrians crossing the approach.

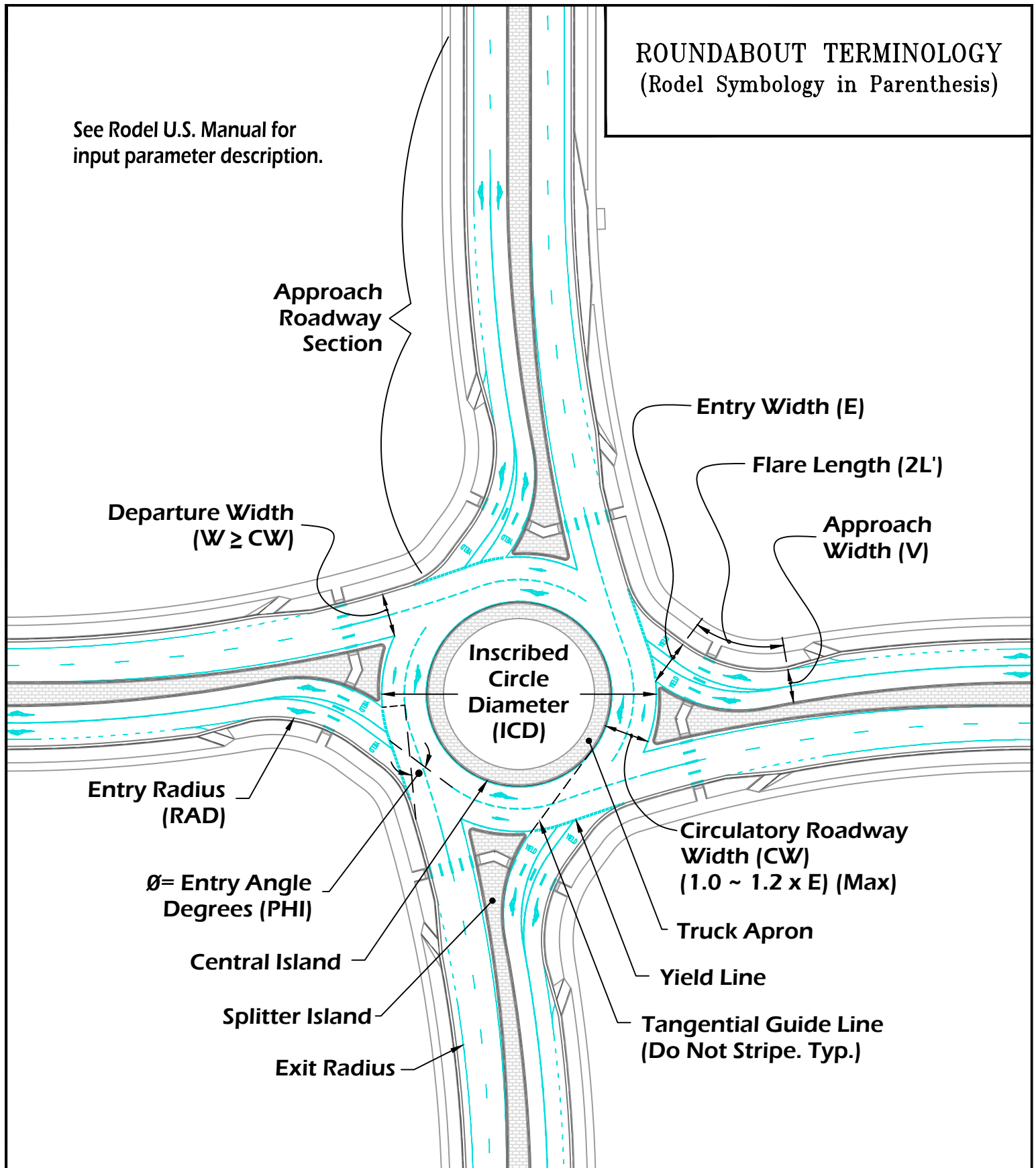
Stopping Sight Distance - the distance, measured along the centerline of travel, along a roadway that is required for a driver to perceive an object in the roadway, react, and brake to a complete stop prior to reaching that object.

Truck Apron – a raised, colored and/or textured concrete surface, adjacent to the central island curbing, that is designed to allow large vehicles to proceed through the roundabout with their rear wheels leaving the circulating roadway and riding onto the apron area.

Two-Stage Crossing - a process in which pedestrians cross a roadway by crossing one direction of traffic at a time, waiting in a pedestrian refuge between the two traffic streams if necessary before completing the crossing.

ROUNABOUT TERMINOLOGY (Rodel Symbology in Parenthesis)

See Rodel U.S. Manual for
input parameter description.



4 LANE/4 LANE ROUNABOUT DESIGN



CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

DETAIL
DRAWING

APPROVED: JTK

DATE: 3/14/16

DRAWN BY: SRA

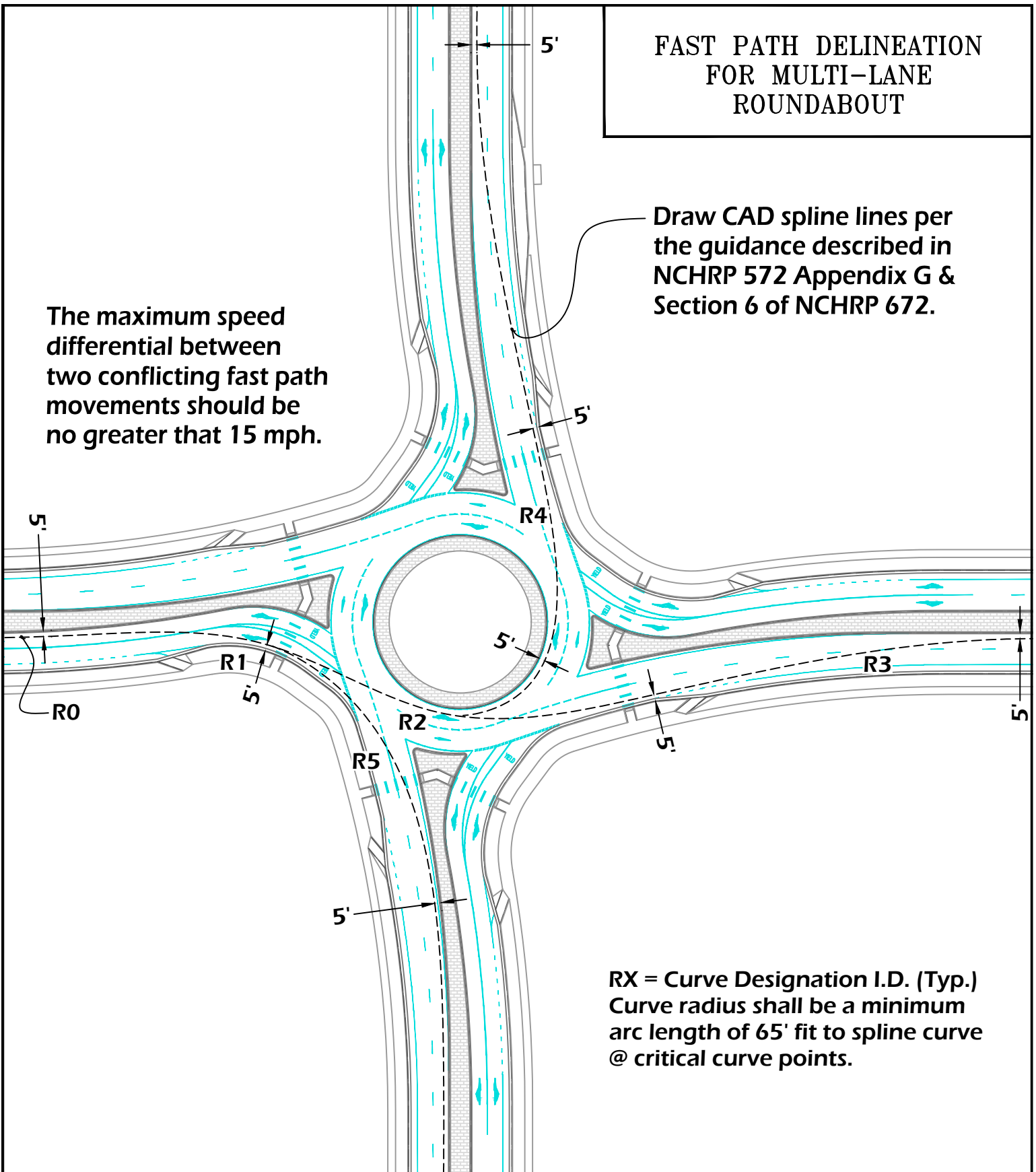
FIGURE

1

FAST PATH DELINEATION FOR MULTI-LANE ROUNABOUT

The maximum speed differential between two conflicting fast path movements should be no greater than 15 mph.

Draw CAD spline lines per the guidance described in NCHRP 572 Appendix G & Section 6 of NCHRP 672.



RX = Curve Designation I.D. (Typ.)
Curve radius shall be a minimum
arc length of 65' fit to spline curve
@ critical curve points.

4 LANE/4 LANE ROUNABOUT DESIGN



CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

DETAIL
DRAWING

APPROVED: JTK

DATE: 3/14/16

DRAWN BY: SRA

FIGURE

2

**FAST PATH DELINEATION
FOR SINGLE-LANE
ROUNDBOUT ENTRY**

The maximum speed differential between two conflicting fast path movements should be no greater than 15 mph.

Draw CAD spline lines per the guidance described in NCHRP 572 Appendix G & Section 6 of NCHRP 672.

RX = Curve Designation I.D. (Typ.)
Curve radius shall be a minimum arc length of 65' fit to spline curve @ critical curve points.

**FAST PATH DELINEATION
FOR SINGLE-LANE
ROUNDBOUT ENTRY**

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**FAST PATH DELINEATION
FOR SINGLE-LANE
ROUNABOUT ENTRY**

The maximum speed differential between two conflicting fast path movements should be no greater than 15 mph.

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RX = Curve Designation I.D. (Typ.)
Curve radius shall be a minimum arc length of 65' fit to spline curve @ critical curve points.

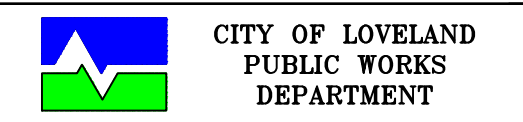
**FAST PATH DELINEATION
FOR SINGLE-LANE
ROUNABOUT ENTRY**

The maximum speed differential between two conflicting fast path movements should be no greater than 15 mph.

Draw CAD spline lines per the guidance described in NCHRP 572 Appendix G & Section 6 of NCHRP 672.

RX = Curve Designation I.D. (Typ.)
Curve radius shall be a minimum arc length of 65' fit to spline curve @ critical curve points.

2 LANE/4 LANE ROUNDABOUT DESIGN



<p align="center">DETAIL DRAWING</p>	APPROVED: JTK
	DATE: 3/14/16
	DRAWN BY: SRA

<p align="center">DETAIL DRAWING</p>	APPROVED: JTK
	DATE: 3/14/16
	DRAWN BY: SRA

<p align="center">DETAIL DRAWING</p>	APPROVED: JTK
	DATE: 3/14/16
	DRAWN BY: SRA

<p align="center">DETAIL DRAWING</p>	APPROVED: JTK
	DATE: 3/14/16
	DRAWN BY: SRA

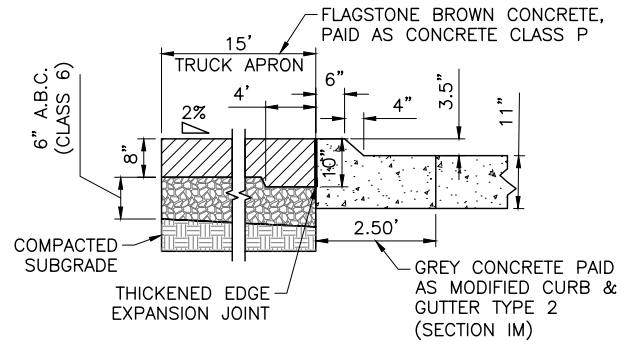
FIGURE
3

FIGURE
3

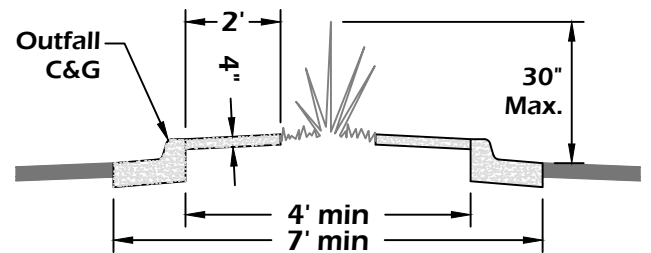
A cross-sectional diagram showing a truck apron installed on a road surface. The apron is a sloped concrete structure. A vertical dimension line on the left indicates a height of 30" Max. from the road surface to the top edge of the apron. The road surface is depicted with a woven fabric reinforcement layer. The apron is labeled "Truck Apron".

4

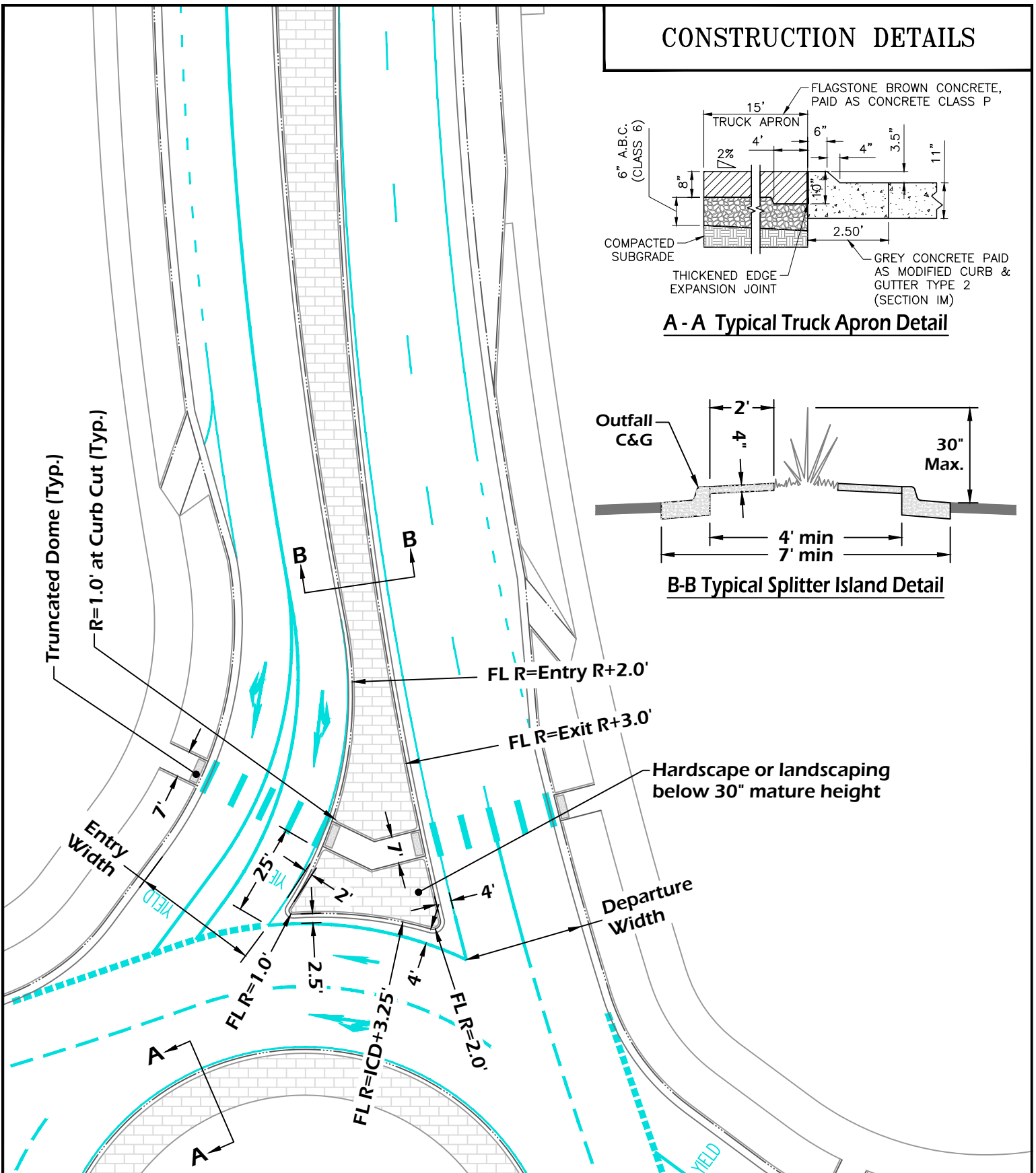
CONSTRUCTION DETAILS



A - A Typical Truck Apron Detail



B-B Typical Splitter Island Detail



4 LANE/4 LANE ROUNDABOUT DESIGN



CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

DETAIL
DRAWING

APPROVED: JTK

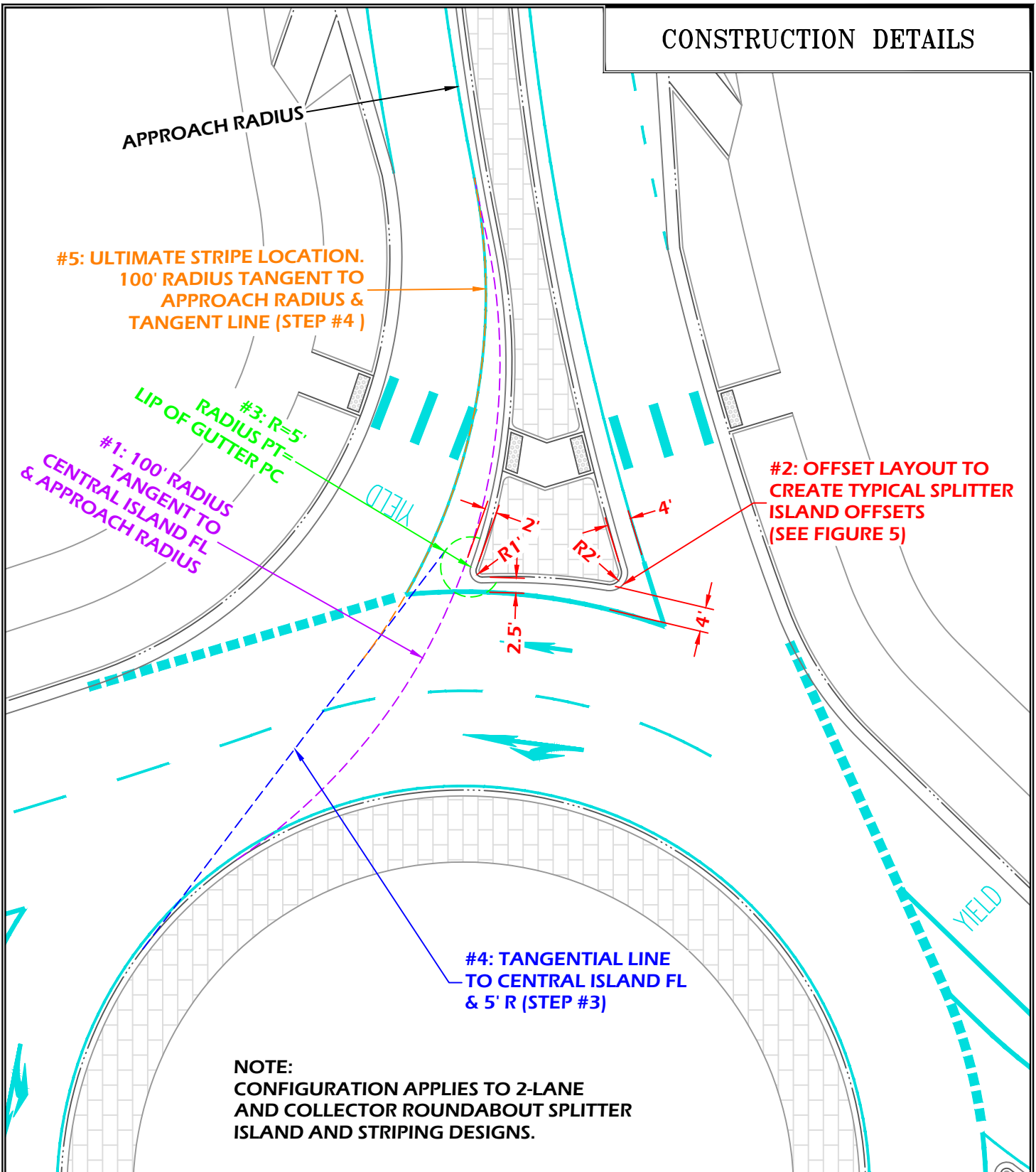
DATE: 8/1/21

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FIGURE

5

CONSTRUCTION DETAILS



2 LANE LANE SPLITTER ISLAND DESIGN



CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

DETAIL
DRAWING

APPROVED: JTK
DATE: 4/19/12
DRAWN BY: SRA

FIGURE
6

BICYCLE PATH AND RAMP DETAIL

Notes:

1. If bicyclist does not use multi-use path, cyclist is encouraged to become a vehicle and take full lane.
2. Multi-use paths will not be included in mini and residential compact designs. Cyclist shall become a vehicle under these designs.

BUS BAY
PER LCUASS
DRAWING #711

BEGIN TAPER @
STRIPING FLARE P.C.

6:1 Slope
6" Vertical
Curb

40'
TAPER

7'
35°

40'
TAPER

50'
FROM
HINGE

6:1 Slope
6" Vertical
Curb

25'

11'
10'

4 LANE/4 LANE ROUNDABOUT DESIGN

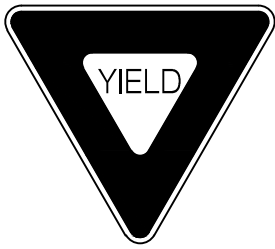


CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

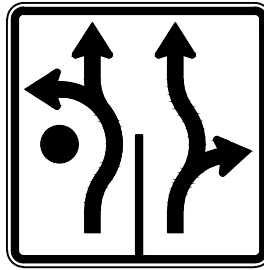
DETAIL
DRAWING

APPROVED: JTK
DATE: 3//14/16
DRAWN BY: SRA

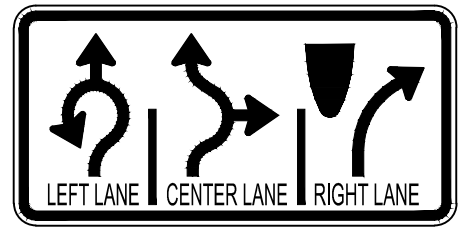
FIGURE
7



R1-2
36" x 36" x 36" (A)
(Red on White)



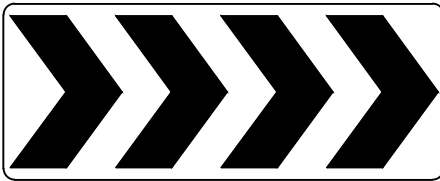
R3-8
36" x 36" (E) **
(Black on White) **MAY BE REQUIRED AT MULTIPLE LOCATIONS.



R3-8a
48" x 30" (E) **
(Black on White)



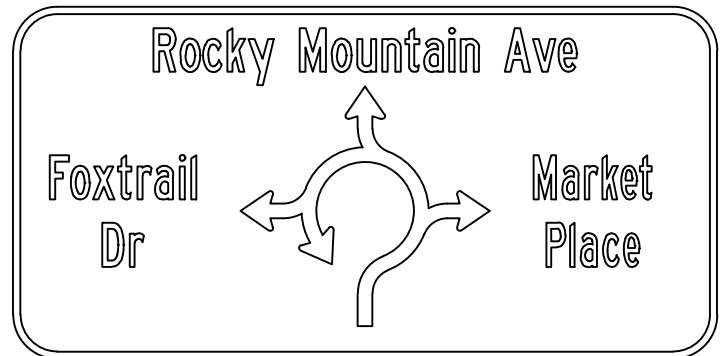
R6-4b (Reduced)
36" x 12" (B)
(Black on White)



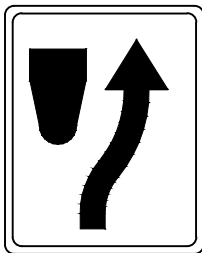
R6-4b
60" x 24" (B)
(Black on White)



R3-7R
30" x 30" (F)
(Black on White)

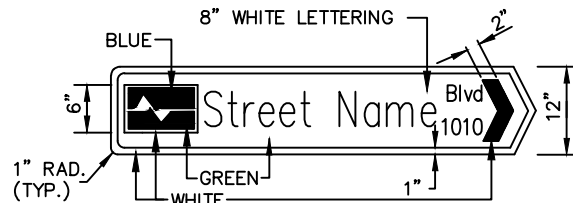


D1-5
48" x 96" (G)
(White on Green)



R4-7
24" x 30" (C)
(Black on White)

See the FHWA Roundabout Guidelines and the MUTCD for additional signing details.



D1-1, Street Name Detail Sign

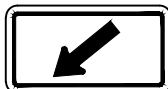
Loveland Only
60" x 12" (H)

This street name sign should only be used on Urban Roundabouts, mounted directly to sign post with rivets and nylon washers; 4 each per installation. End of blank is cut to match angle of chevron, retaining 1" white border.

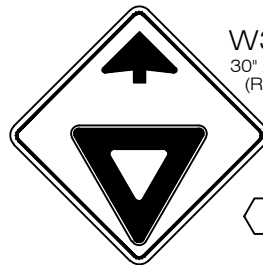


W11-2a
30" x 30" (D) *
(Black on Yellow)

*OPTIONAL AS DIRECTED BY LOCAL ENTITY ENGINEER.



W16-7P
24" x 12"
Black on Yellow



YIELD AT
ROUNDBOULT

W3-2
30" x 30"
(Red, Black, White on Yellow)



30" x 12"
(Black on Yellow)



R3-17
24" x 18" (J)
(White on Black)

R3-17bP
24" x 8"
(Black on White)

(SEE FIGURES 9A AND 9B FOR SIGN PLACEMENT)

ROUNDBOULT DESIGN STANDARD SIGNING



CITY OF LOVELAND
PUBLIC WORKS
DEPARTMENT

DETAIL
DRAWING

APPROVED: JTK

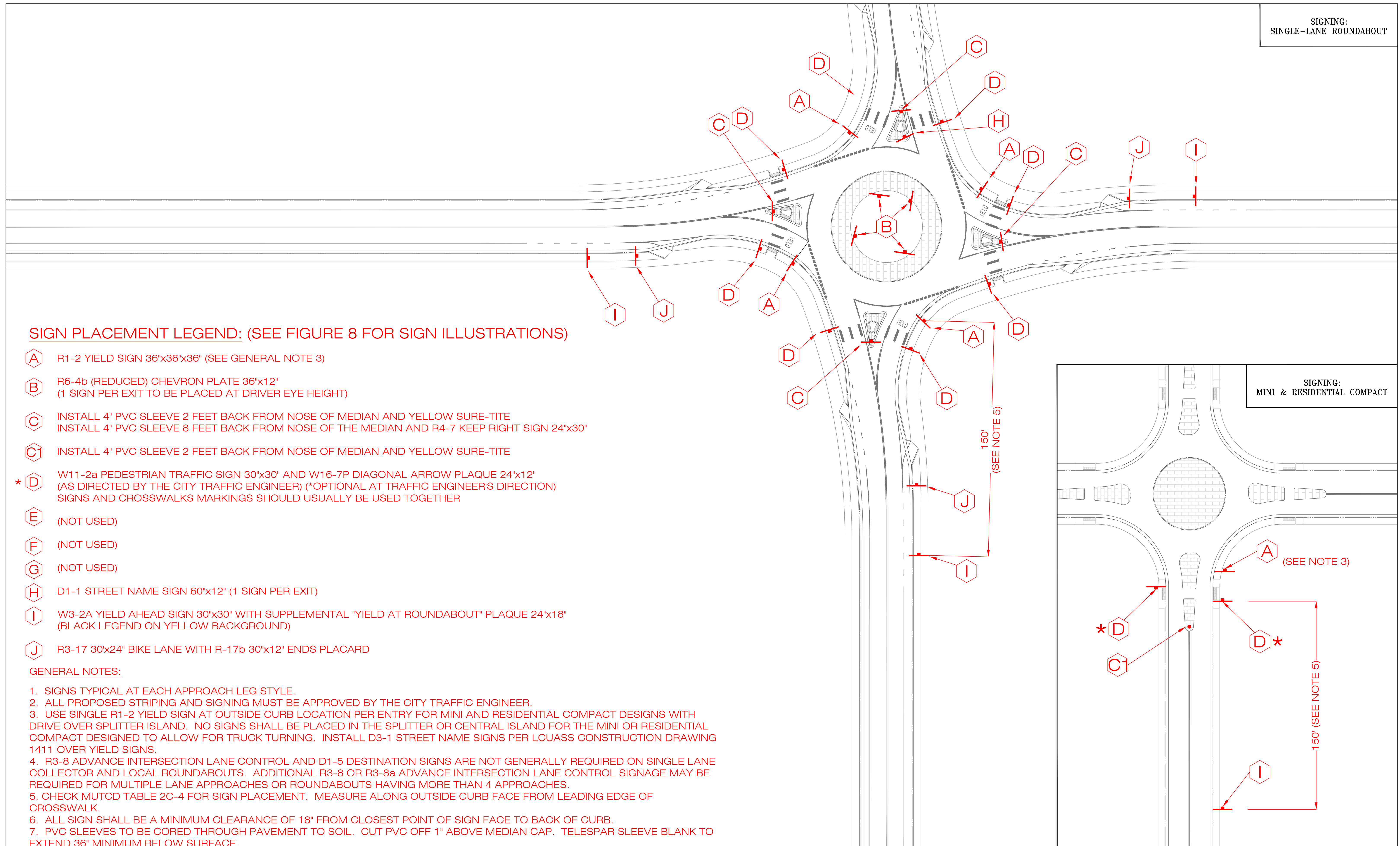
DATE: 8/19/19

DRAWN BY: SRA/NAB












FIGURE
8

Computer File Information				Sheet Revisions				 CITY OF LOVELAND	PUBLIC WORKS TRAFFIC OPERATIONS 105 West Fifth Street Loveland, Colorado 80537 Phone: (970) 962-2535 FAX: (970) 962-2908 www.cityofloveland.org/publicworks/traffic	As Constructed		FIGURE 9A STANDARD SIGNING				Project No./Code	
Creation Date: 5/27/11 Initials: SRA				8/19/19	Updated for 2020 LCUASS		NAB			No Revisions:							
Last Modification Date: 8/19/19 Initials: NAB										Revised:		Designer: JTK	Structure				
Full Path: V:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits										Void:		Detailer: SRA	Numbers				
Drawing File Name: Figure-8&9.dwg												Sheet Subset:		Subset Sheets:		Sheet Number	
Acad Ver. C3D11 Scale: 1"=30' Units: ENGLISH																1	

SIGNING:
SINGLE-LANE ROUNDABOUT



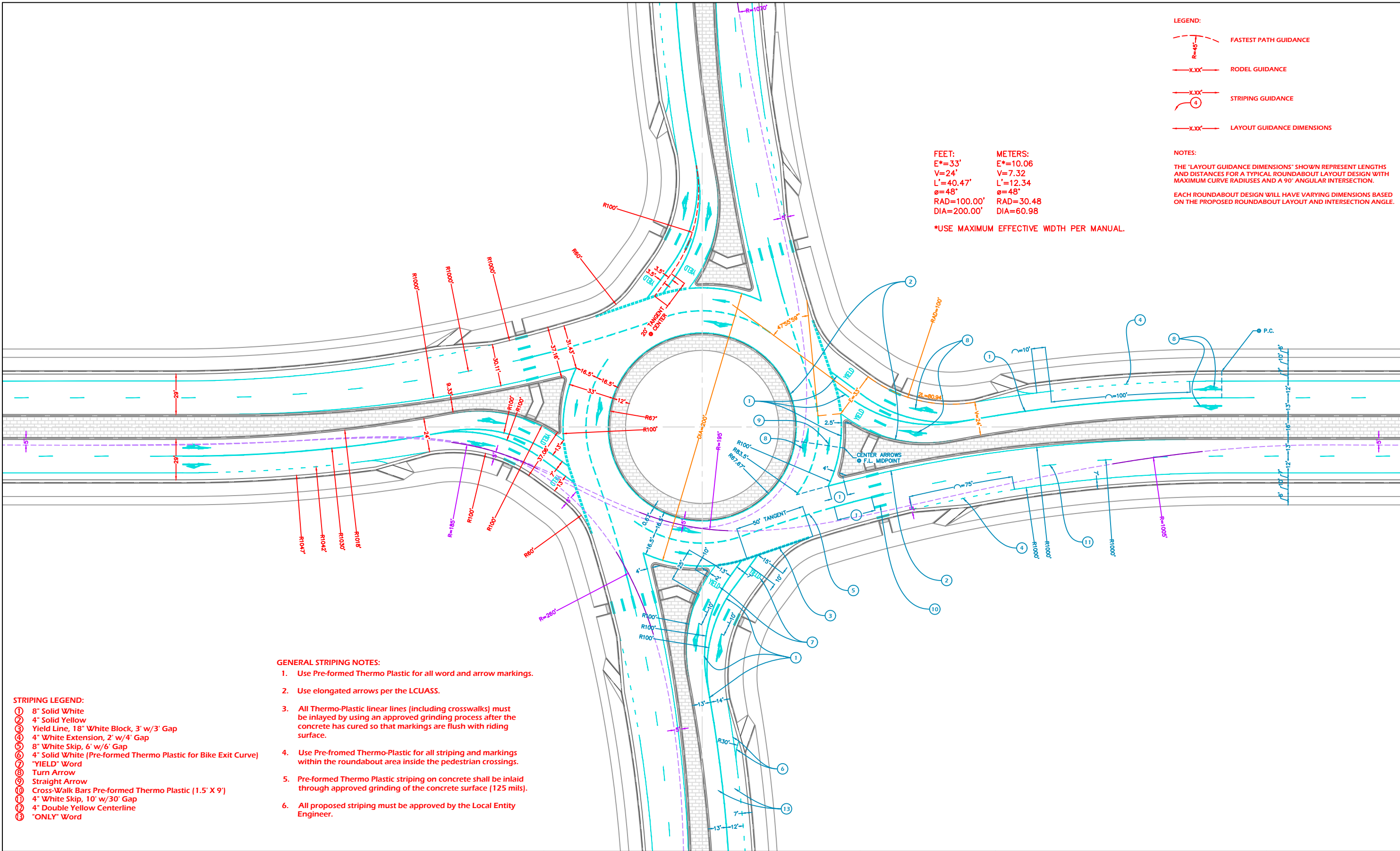
SIGN PLACEMENT LEGEND: (SEE FIGURE 8 FOR SIGN ILLUSTRATIONS)

- | | |
|---|--|
|  | R1-2 YIELD SIGN 36"x36"x36" (SEE GENERAL NOTE 3) |
|  | R6-4b (REDUCED) CHEVRON PLATE 36"x12"
(1 SIGN PER EXIT TO BE PLACED AT DRIVER EYE HEIGHT) |
|  | INSTALL 4" PVC SLEEVE 2 FEET BACK FROM NOSE OF MEDIAN AND YELLOW SURE-TITE
INSTALL 4" PVC SLEEVE 8 FEET BACK FROM NOSE OF THE MEDIAN AND R4-7 KEEP RIGHT SIGN 24"x30" |
|  | INSTALL 4" PVC SLEEVE 2 FEET BACK FROM NOSE OF MEDIAN AND YELLOW SURE-TITE |
| *  | W11-2a PEDESTRIAN TRAFFIC SIGN 30"x30" AND W16-7P DIAGONAL ARROW PLAQUE 24"x12"
(AS DIRECTED BY THE CITY TRAFFIC ENGINEER) (*OPTIONAL AT TRAFFIC ENGINEER'S DIRECTION)
SIGNS AND CROSSWALKS MARKINGS SHOULD USUALLY BE USED TOGETHER |
|  | (NOT USED) |
|  | (NOT USED) |
|  | (NOT USED) |
|  | D1-1 STREET NAME SIGN 60"x12" (1 SIGN PER EXIT) |
|  | W3-2A YIELD AHEAD SIGN 30"x30" WITH SUPPLEMENTAL "YIELD AT ROUNDBABOUT" PLAQUE 24"x18"
(BLACK LEGEND ON YELLOW BACKGROUND) |
|  | R3-17 30"x24" BIKE LANE WITH R-17b 30"x12" ENDS PLACARD |

GENERAL NOTES:

1. SIGNS TYPICAL AT EACH APPROACH LEG STYLE.
2. ALL PROPOSED STRIPING AND SIGNING MUST BE APPROVED BY THE CITY TRAFFIC ENGINEER.
3. USE SINGLE R1-2 YIELD SIGN AT OUTSIDE CURB LOCATION PER ENTRY FOR MINI AND RESIDENTIAL COMPACT DESIGNS WITH DRIVE OVER SPLITTER ISLAND. NO SIGNS SHALL BE PLACED IN THE SPLITTER OR CENTRAL ISLAND FOR THE MINI OR RESIDENTIAL COMPACT DESIGNED TO ALLOW FOR TRUCK TURNING. INSTALL D3-1 STREET NAME SIGNS PER LCUASS CONSTRUCTION DRAWING 1411 OVER YIELD SIGNS.
4. R3-8 ADVANCE INTERSECTION LANE CONTROL AND D1-5 DESTINATION SIGNS ARE NOT GENERALLY REQUIRED ON SINGLE LANE COLLECTOR AND LOCAL ROUNDABOUTS. ADDITIONAL R3-8 OR R3-8a ADVANCE INTERSECTION LANE CONTROL SIGNAGE MAY BE REQUIRED FOR MULTIPLE LANE APPROACHES OR ROUNDABOUTS HAVING MORE THAN 4 APPROACHES.
5. CHECK MUTCD TABLE 2C-4 FOR SIGN PLACEMENT. MEASURE ALONG OUTSIDE CURB FACE FROM LEADING EDGE OF CROSSWALK.
6. ALL SIGN SHALL BE A MINIMUM CLEARANCE OF 18" FROM CLOSEST POINT OF SIGN FACE TO BACK OF CURB.
7. PVC SLEEVES TO BE CORED THROUGH PAVEMENT TO SOIL. CUT PVC OFF 1" ABOVE MEDIAN CAP. TELESPIR SLEEVE BLANK TO EXTEND 36" MINIMUM BELOW SURFACE.

Computer File Information				Sheet Revisions				 CITY OF LOVELAND	PUBLIC WORKS		As Constructed		FIGURE 9B STANDARD SIGNING			Project No./Code				
Creation Date: 5/27/11		Initials: SRA		8/19/19		New for 2020 LCUASS			NAB		TRAFFIC OPERATIONS					No Revisions:				
Last Modification Date: 2/3/20		Initials: NAB									105 West Fifth Street		Revised:		Designer: JTK		Structure Numbers			
Full Path: V:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits											Loveland, Colorado 80537				Detailer: SRA					
Drawing File Name: Figure-8&9.dwg											Phone: (970) 962-2535		Void:		Sheet Subset:		Subset Sheets:		Sheet Number 1	
Acad Ver. C3D11		Scale: 1"=30'		Units: ENGLISH							FAX: (970) 962-2908									
										www.cityofloveland.org/publicworks/traffic										



LEGEND:

FASTEST PATH GUIDANCE

RODEL GUIDANCE

STRIPING GUIDANCE

LAYOUT GUIDANCE DIMENSIONS

NOTES:

THE "LAYOUT GUIDANCE DIMENSIONS" SHOWN REPRESENT LENGTHS AND DISTANCES FOR A TYPICAL ROUNDABOUT LAYOUT DESIGN WITH MAXIMUM CURVE RADIISES AND A 90° ANGULAR INTERSECTION.

EACH ROUNDABOUT DESIGN WILL HAVE VARYING DIMENSIONS BASED ON THE PROPOSED ROUNDABOUT LAYOUT AND INTERSECTION ANGLE.

FEET:
E*=33'
V=24'
L'=40.47'
e=48"
RAD=100.00'
DIA=200.00'

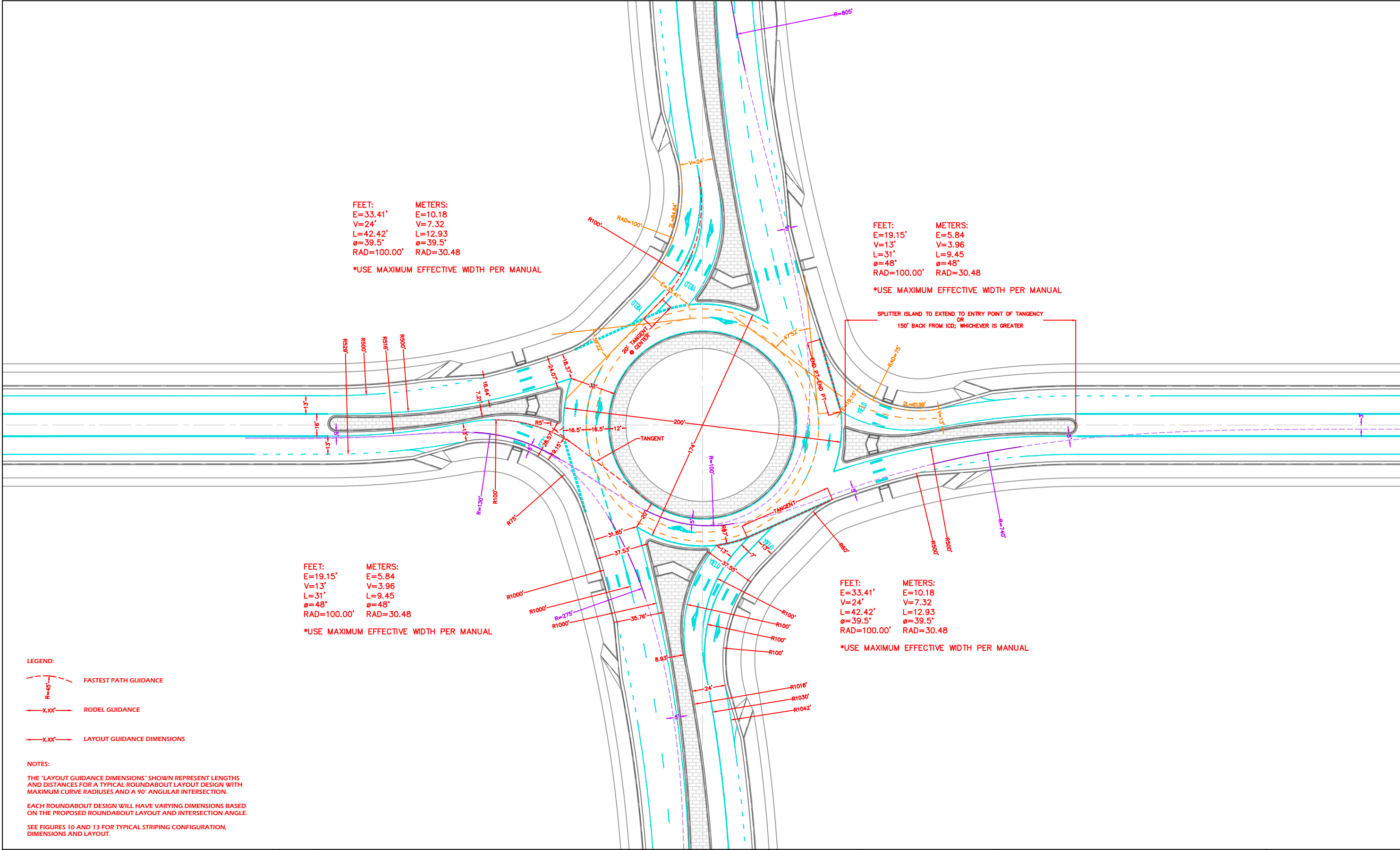
METERS:
E*=10.06
V=7.32
L'=12.34
e=48"
RAD=30.48
DIA=60.98

*USE MAXIMUM EFFECTIVE WIDTH PER MANUAL.

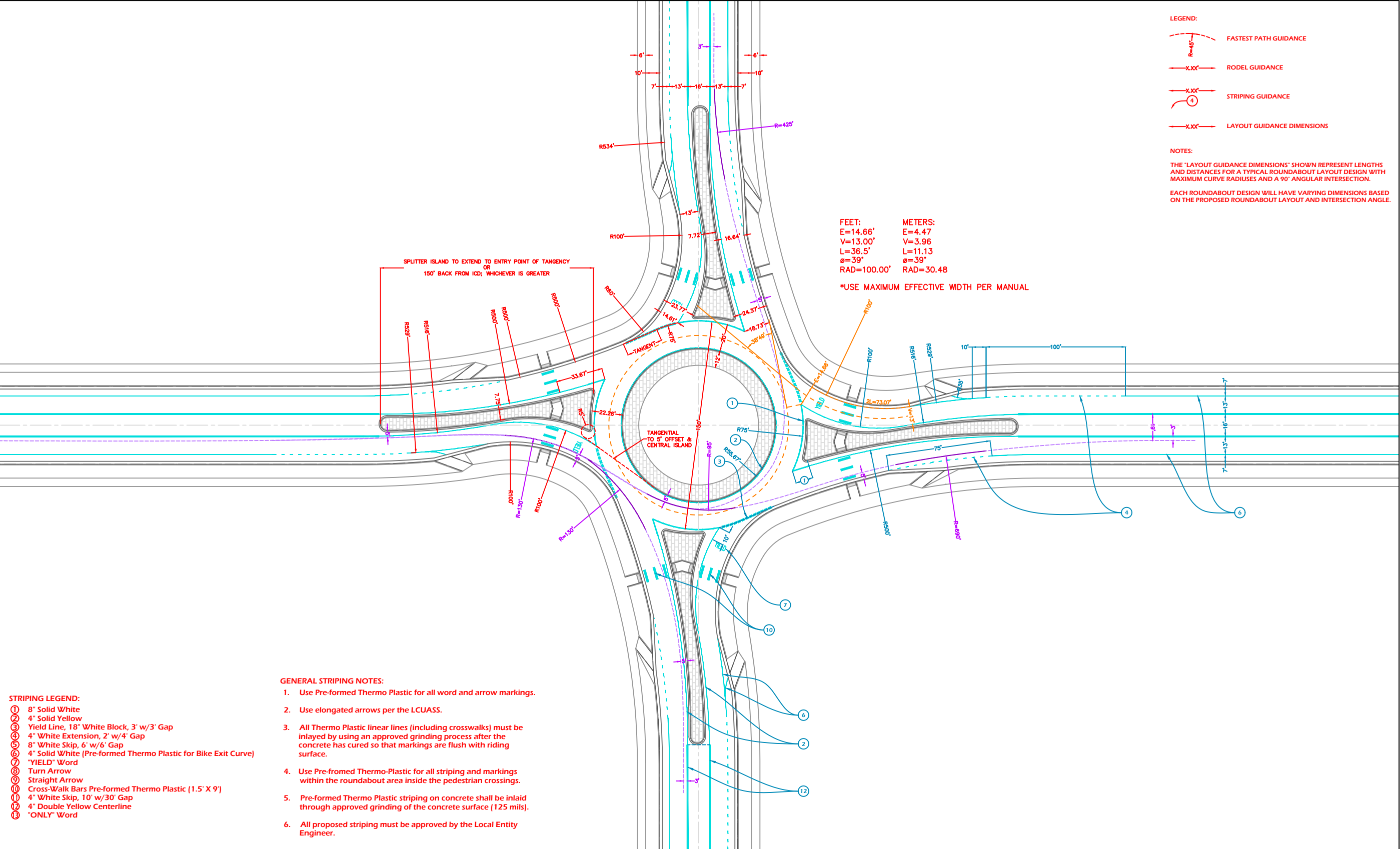
- GENERAL STRIPING NOTES:
1. Use Pre-formed Thermo Plastic for all word and arrow markings.
 2. Use elongated arrows per the LCUASS.
 3. All Thermo-Plastic linear lines (including crosswalks) must be inlaid by using an approved grinding process after the concrete has cured so that markings are flush with riding surface.
 4. Use Pre-formed Thermo-Plastic for all striping and markings within the roundabout area inside the pedestrian crossings.
 5. Pre-formed Thermo Plastic striping on concrete shall be inlaid through approved grinding of the concrete surface (125 mils).
 6. All proposed striping must be approved by the Local Entity Engineer.

- STRIPING LEGEND:
- 1 8" Solid White
 - 2 4" Solid Yellow
 - 3 Yield Line, 18" White Block, 3' w/3' Gap
 - 4 4" White Extension, 2' w/4' Gap
 - 5 8" White Skip, 6' w/6' Gap
 - 6 4" Solid White (Pre-formed Thermo Plastic for Bike Exit Curve)
 - 7 "YIELD" Word
 - 8 Turn Arrow
 - 9 Straight Arrow
 - 10 Cross-Walk Bars Pre-formed Thermo Plastic (1.5' X 9')
 - 11 4" White Skip, 10' w/30' Gap
 - 12 4" Double Yellow Centerline
 - 13 "ONLY" Word





Computer File Information				Sheet Revisions				 CITY OF LOVELAND	PUBLIC WORKS ENGINEERING 410 East Fifth Street Loveland, Colorado 80537 Phone: (970) 962-2627 FAX: (970) 962-2908 www.cityofloveland.org/publicworks	As Constructed		FIGURE 10 4-Lane by 4-Lane Arterial				Project No./Code	
Creation Date:	5/27/11	Initials:	SRA	<input checked="" type="radio"/> R-1	8/1/21	2021 LCUASS	NAB			No Revisions:							
Last Modification Date:	8/1/21	Initials:	NAB	<input type="radio"/>						Revised:	Designer:	JTK	Structure				
Full Path:	V:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits			<input type="radio"/>							Detailer:	SRA	Numbers				
Drawing File Name:	4-lane-arterial_4-lane-arterial.dwg			<input type="radio"/>						Void:	Sheet Subset:		Subset Sheets:		Sheet Number		
Acad Ver.	C3D11	Scale:	1"=30'	Units:	ENGLISH										1		



Computer File Information				Sheet Revisions			FIGURE 11				Project No./Code	
Creation Date:	5/27/11	Initials:	SRA	<input type="checkbox"/>			As Constructed		2-Lane by 4-Lane Arterial			
Last Modification Date:	8/1/21	Initials:	NAB	<input type="checkbox"/>			No Revisions:					
Full Path:	V:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits			<input type="checkbox"/>			Revised:		Designer:	JTK	Structure	
Drawing File Name:	2-lane-arterial_4-lane-arterial.dwg			<input type="checkbox"/>			Void:		Detailer:	SRA	Numbers	
Acad Ver.	C3D11	Scale:	1"=30'	Units:	ENGLISH				Sheet Subset:		Subset Sheets:	
											Sheet Number	1



LEGEND:

-  FASTEST PATH GUIDANCE
-  RODEL GUIDANCE
-  STRIPING GUIDANCE
-  LAYOUT GUIDANCE DIMENSIONS

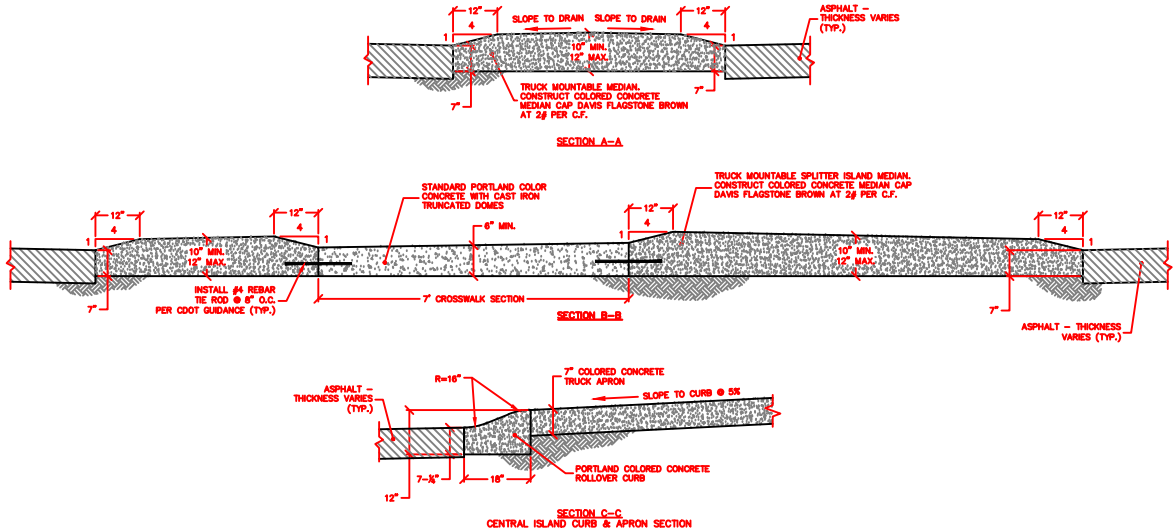
NOTES:

THE "LAYOUT GUIDANCE DIMENSIONS" SHOWN REPRESENT LENGTHS AND DISTANCES FOR A TYPICAL ROUNDABOUT LAYOUT DESIGN WITH MAXIMUM CURVE RADIIUSES AND A 90° ANGULAR INTERSECTION.

EACH ROUNDABOUT DESIGN WILL HAVE VARYING DIMENSIONS BASED ON THE PROPOSED ROUNDABOUT LAYOUT AND INTERSECTION ANGLE.

FEET:
E=11.46'
V=10'
L=15.81'
ø=60'
RAD=100.00'

METERS:
E=3.49
V=3.05
L=4.82
ø=60°
RAD=30.48



GENERAL STRIPING NOTES:

1. Use Pre-formed Thermo Plastic for all word and arrow markings.
2. Use elongated arrows per the LCUASS.
3. All Thermo Plastic linear lines (including crosswalks) must be inlayed by using an approved grinding process after the concrete has cured so that markings are flush with riding surface.
4. Use Pre-fomed Thermo-Plastic for all striping and markings within the roundabout area inside the pedestrian crossings.
5. Pre-formed Thermo Plastic striping on concrete shall be inlaid through approved grinding of the concrete surface (125 mils).
6. All proposed striping must be approved by the Local Entity Engineer.

STRIPING LEGEND:

- ① 8" Solid White
- ② 4" Solid Yellow
- ③ Yield Line, 18" White Block, 3' w/3' Gap
- ④ 4" White Extension, 2' w/4' Gap
- ⑤ 8" White Skip, 6' w/6' Gap
- ⑥ 4" Solid White (Pre-formed Thermo Plastic for Bike Exit Curve)
- ⑦ "YIELD" Word
- ⑧ Turn Arrow
- ⑨ Straight Arrow
- ⑩ Cross-Walk Bars Pre-formed Thermo Plastic (1.5' X 9')
- ⑪ 4" White Skip, 10' w/30' Gap
- ⑫ 4" Double Yellow Centerline
- ⑬ "ONLY" Word

Computer File Information

Creation Date:	5/27/11	Initials:	SRA
Last Modification Date:	8/1/21	Initials:	NAB
Full Path:	V:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits		
Drawing File Name:	4-lane-arterial_4-lane-arterial.dwg		
Acad Ver.	C3D11	Scale:	1"=30' Units: ENGLISH

(R-1)

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Sheet Revisions

8/1/21	2021 LCUASS	NAB



PUBLIC WORKS ENGINEERING
410 East Fifth Street
Loveland, Colorado 80537
Phone: (970) 962-2627
FAX: (970) 962-2908
www.cityofloveland.org/publicworks

As Constructed

No Revisions:

Revised:

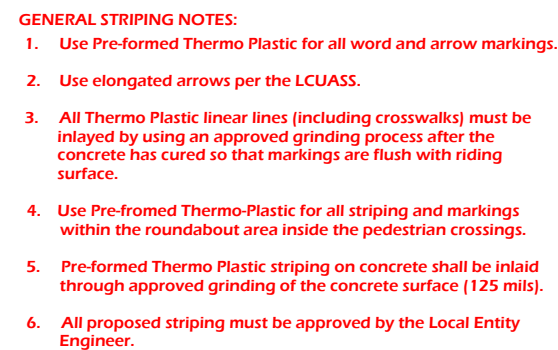
Void:

FIGURE 15
Mini


Designer:	JTK	Structure	
Detailer:	SRA	Numbers	
Sheet Subset:		Subset Sheets:	

Project No./Code

Sheet Number 1



- STRIPING LEGEND:**
- ① 8" Solid White
 - ② 4" Solid Yellow
 - ③ Yield Line, 18" White Block, 3' w/3' Gap
 - ④ 4" White Extension, 2' w/4' Gap
 - ⑤ 8" White Skip, 6' w/6' Gap
 - ⑥ 4" Solid White (Pre-formed Thermo Plastic for Bike Exit Curve)
 - ⑦ "YIELD" Word
 - ⑧ Turn Arrow
 - ⑨ Straight Arrow
 - ⑩ Cross-Walk Bars Pre-formed Thermo Plastic (1.5' X 9')
 - ⑪ 4" White Skip, 10' w/30' Gap
 - ⑫ 4" Double Yellow Centerline
 - ⑬ "ONLY" Word

Computer File Information				Sheet Revisions				 CITY OF LOVELAND	PUBLIC WORKS ENGINEERING 410 East Fifth Street Loveland, Colorado 80537 Phone: (970) 962-2627 FAX: (970) 962-2908 www.cityofloveland.org/publicworks	As Constructed		FIGURE 16 RESIDENTIAL COMPACT				Project No./Code		
Creation Date: 5/27/11 Initials: SRA				(R-1)	8/1/21	2021 LCUASS				NAB	No Revisions:							
Last Modification Date: 8/1/21 Initials: NAB											Revised:		Designer: JTK		Structure			
Full Path: Y:\Public Works\Civil Engineering\Design Tools\Roundabout Info\Design Manual\Exhibits													Detailer: SRA		Numbers			
Drawing File Name: residential-compact.dwg											Void:		Sheet Subset:		Subset Sheets:		Sheet Number 1	
Acad Ver. C3D11 Scale: 1"=30' Units: ENGLISH																		

Appendix J

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Fort Collins Bus Stop Design Standards and Guidelines
(City of Fort Collins only)

Appendix K

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Loveland Pavement Markings Layout Standards
(City of Loveland only)

PAVEMENT MARKINGS LAYOUT STANDARDS



*City of Loveland
Traffic Operations*

Shared Left Turn (Suicide) Lanes **Longer than 94'**

1) Shared Left Turn (Suicide) Lanes are used by vehicles to make Left turns from opposite flows of traffic.

2) Refer to the diagrams for understanding steps that follow.

3) If measurements from point A to B are longer than 94' the 12' Arrows are placed 25' out from the center of the lane.

4) Using the measuring wheel measure how long the lane is from A to B. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram #1*

5) Starting with the 12' Arrow in front of the thermo truck, from the center marks measure out 25' on both sides of the lane and mark with chalk. *diagram #1*

6) From those 25' marks measure out 12' on both sides of the lane and mark with chalk. *diagram #1*

6) Blow off the 12' area (*where the Arrow will be placed*) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

7) Using the 25' chalk marks measure across the lane (*inside of solid yellow lines*), and mark the center with a vertical and horizontal chalk mark. (*This is where the #2 top thermo piece goes*) *diagram #1*

8) Using the 12' chalk marks measure across the lane (*inside of solid yellow lines*), and mark the center with a vertical and horizontal chalk mark.

9) At that center point measure 18" over and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (*this is where the #6 bottom thermo piece goes*) refer to *diagrams #2 or #3*

10) Now the 12' Arrow thermo pieces can be laid down. *diagrams #2 or #3*

11) When lined up properly burn to the pavement. While thermo is still hot spread reflective glass beads down. Doing a section at a time.

12) Repeat the above steps for the other 12' Arrow behind the thermo truck. Pay close attention to where the 18" offset is for the bottom of the arrow.



Public Works Department
Traffic Engineering & Operations
Maintenance & Operations Center



Over 80' RIGHT turnbay

When the Turn Bay is over 80' lay (2) 12' Rev. Turn Arrows and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

If measurements from point A to B (8" white turn line) are over 80' the 12' Arrows are placed 10' in from the ends of the lane and the ONLY in the center.

When doing layout for RIGHT turnbay, all measurements, marks and chalk lines are done on the paved road. Not on the concrete pan at the edge of the lane next to the curb. diagram #1

Using the measuring wheel measure how long the lane is from A to B with the 8" white turn line as a guide. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram #1*

12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram #1*

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) *diagram #1 & #2*

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a small chalk mark.

At that center point measure 18" over to the Left and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) *diagrams #1 & #2*

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. *diagrams #1 & #2*

Note: When doing a RIGHT turnbay flip the Premark thermo pieces on the other side. This will make the Arrow point in the RIGHT direction.

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

Move the thermo truck back toward the bottom of the turn lane and repeat the above steps for the bottom 12' Arrow.

The only change is the bottom of the 12' Arrow is layed out on the 10' line across the lane. This is where the 18" offset is layed out,

ONLY

The (2) 12' Arrows are done. Now time for the layout of the ONLY.

Move the thermo truck up past the center marks of the Left turnbay lane.

The chalk marks at the center of the Turnbay lane have already been marked. This is the starting point for the ONLY layout.

Using the 2 center chalk marks measure down 49" & up 49" (8'2"). Mark with chalk on both sides of the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan).

Blow off the 8' area (where the ONLY will be placed).

Using the 49" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) Mark the center on both chalk lines.

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

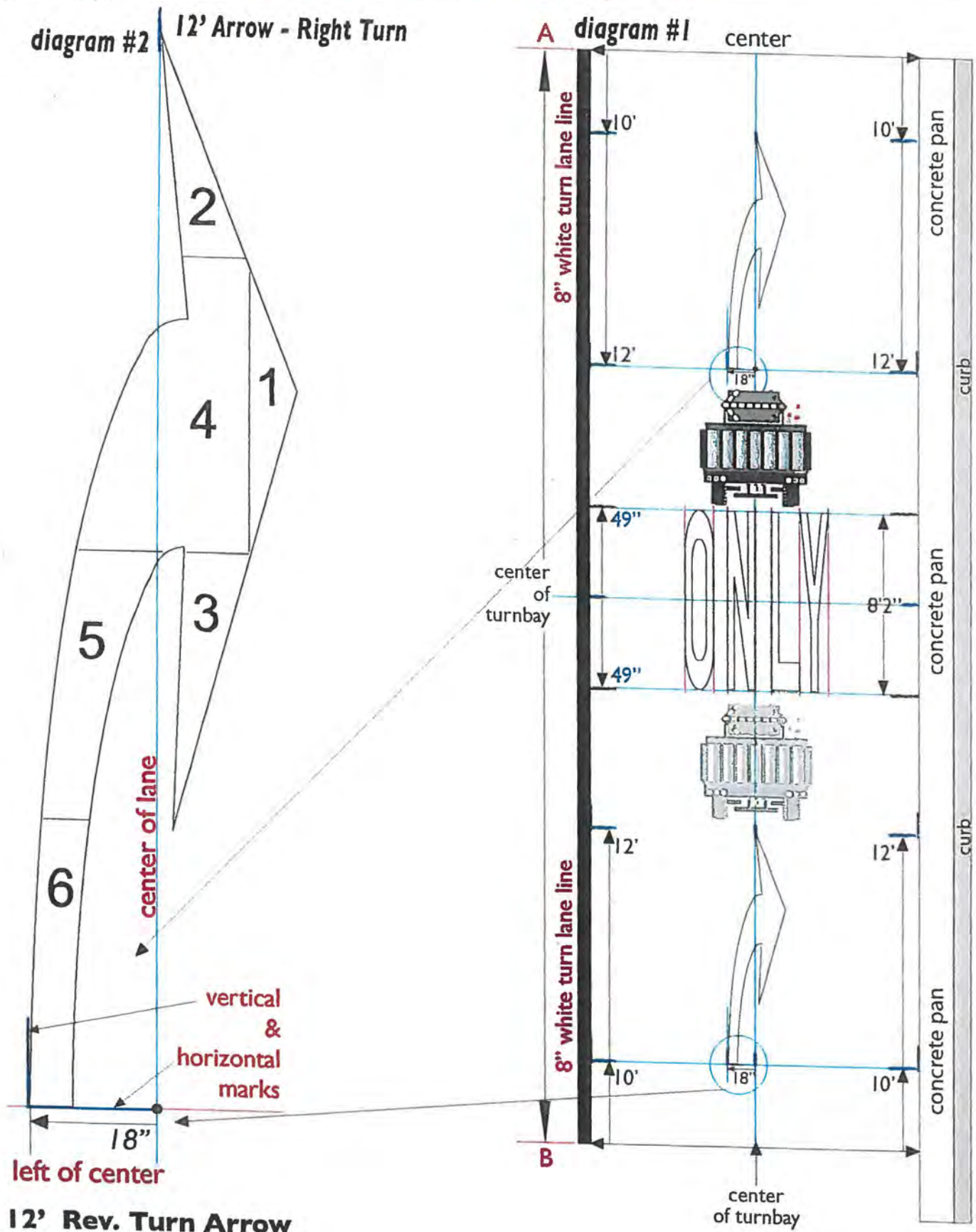
Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3*

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.



Over 80' RIGHT turnbay layout





Public Works Department
Traffic Engineering & Operations
Maintenance & Operations Center



Over 80' LEFT turnbay

When the Turn Bay is over 80' lay (2) 12' Rev. Turn Arrows and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

If measurements from point A to B (8" white turn line) are over 80' the 12' Arrows are placed 10' in from the ends of the lane and the ONLY in the center.

Using the measuring wheel measure how long the lane is from A to B with the 8" white turn line as a guide. Find the center on both sides of the lane using the measuring wheel and mark with chalk. *diagram #1*

12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram #1*

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of solid yellow line & 8" white turn line) and mark the center with a vertical chalk mark. (where the top, #2 thermo piece should line up to) *diagram #1 & #2*

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a small chalk mark.

At that center point measure 18" over to the right and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) *diagrams #1 & #2*

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. *diagrams #1 & #2*

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

Move the thermo truck back toward the bottom of the turn lane and repeat the above steps for the bottom 12' Arrow.

The only change is the bottom of the 12' Arrow is layed out on the 10' line across the lane. This is where the 18" offset is layed out, where the #6 thermo piece goes. *diagram #1 & #2*

ONLY

The (2) 12' Arrows are done. Now time for the layout of the ONLY.

Move the thermo truck up past the center marks of the Left turnbay lane.

The chalk marks at the center of the Turnbay lane have already been marked. This is the starting point for the ONLY layout.

Using the 2 center chalk marks measure down 49" & up 49" (8'2"). Mark with chalk on both sides of the lane (inside of solid yellow lines & 8" white turn line).

Blow off the 8' area (where the ONLY will be placed).

Using the 49" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of solid yellow lines & 8" white turn line) Mark the center on both chalk lines.

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3*

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.

diagram #1



**12' Arrow
Left Turn**





50' - 80' RIGHT turnbay

When the Turn Bay is from 50' - 80' lay (1) 12' Rev. Turn Arrow and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

Use the measuring wheel.

If measurements from point A to B (8" white turn line) are from 50' - 80' the 12' Arrow is placed 10' in from the top end of the turnbay lane and the ONLY is placed 10' in from the bottom of the turnbay lane.

When doing layout for RIGHT turnbay, all measurements, marks and chalk lines are done on the paved road. Not on the concrete pan at the edge of the lane next to the curb.

12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram #1*

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) *diagram #1*

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) and mark the center with a small chalk mark.

At that center point measure 18" over to the Left and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) *diagrams #1 & #2*

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. *diagrams #1 & #2*

Note: When doing a RIGHT turnbay flip the Premark thermo pieces on the other side. This will make the Arrow point in the RIGHT direction.

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down.
Continue this process for the entire Arrow.

ONLY

The (1) 12' Arrow is done. Now time for the layout of the ONLY.

Move the thermo truck back towards the bottom of the Left turnbay lane. *diagram #1*

From the bottom of the turnbay lane measure in, first 10' and then 8' 2" and mark with chalk on both sides of the lane. *diagram #1*

Blow off the 8' area (where the ONLY will be placed).

Using the 10' and 8' 2" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan). *diagram #1*

Measure across the lane (inside of the 8" white turn line and the edge of the pavement, not the concrete pan) on both the snapped chalked lines and mark the center with a small vertical chalk mark. *diagram #1*

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces, *diagram 3*

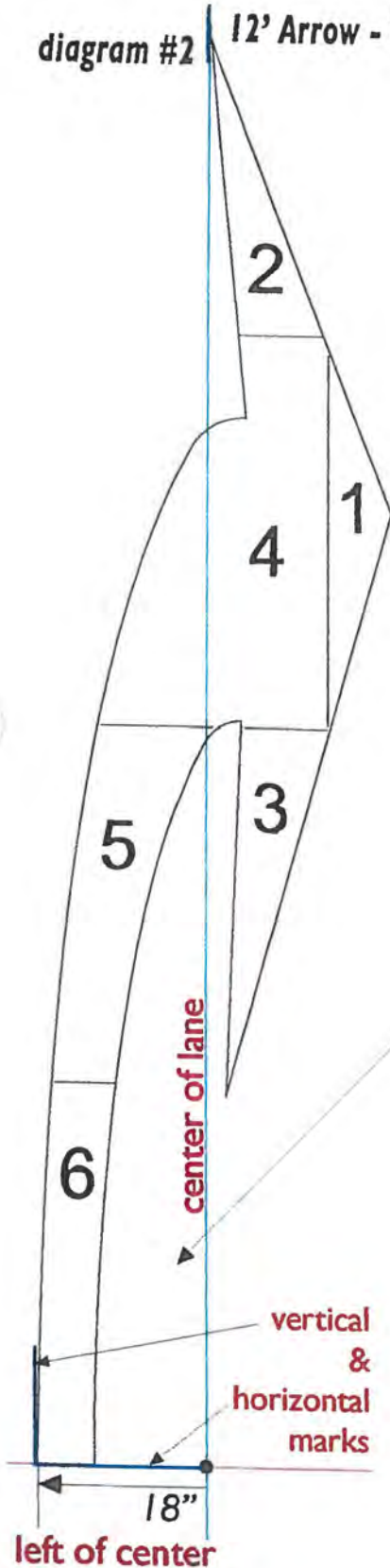
When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down.
Continue this process for all the ONLY letters.



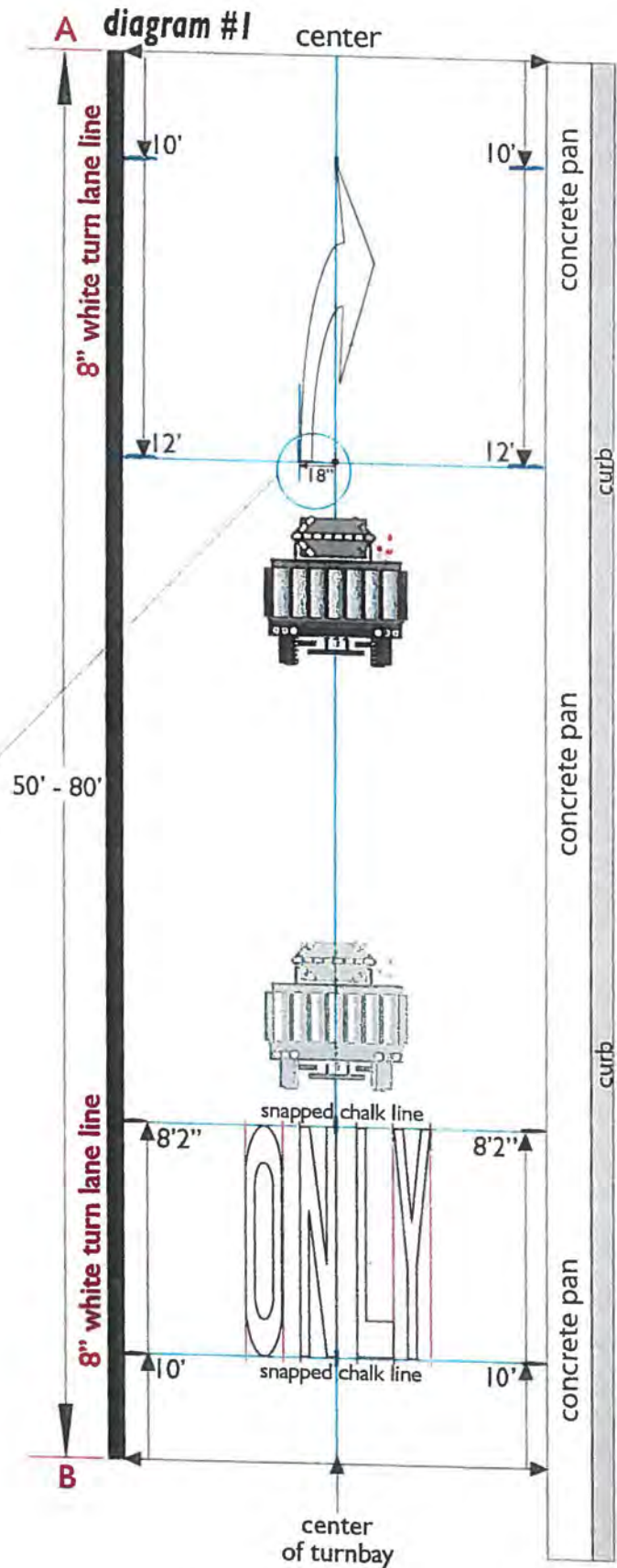
50' - 80' RIGHT turnbay layout

diagram #2 12' Arrow - Right Turn



12' Rev. Turn Arrow

diagram #1





50' - 80' LEFT turnbay

When the Turn Bay is from 50' - 80' lay (1) 12' Rev. Turn Arrow and (1) ONLY.

Refer to the diagrams for understanding steps that follow.

Use the measuring wheel.

If measurements from point A to B (8" white turn line) are from 50' - 80' the 12' Arrow is placed 10' in from the top end of the turnbay lane and the ONLY is placed 10' in from the bottom of the turnbay lane.

12' Rev. Turn Arrow

Starting with the 12' Arrow at the top of the Turnbay lane in front of the thermo truck, on both sides of the lane measure in 10', mark with chalk on both sides. Then measure in 12' on both sides of the lane starting from the 10' marks and mark with chalk. *diagram #1*

Blow off the 12' area (where the Arrow will be placed) you'll be working in with the leaf blower. This gets all the dirt and rocks off the surface before layout and burning.

Using the 10' chalk marks measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a vertical chalk mark. (this is where the top, #2 thermo piece should line up to) *diagram #1 & #2*

Using the 12' chalk marks snap a chalk line across the lane.

Measure across the lane (inside of solid yellow lines & 8" white turn line) and mark the center with a small chalk mark.

At that center point measure 18" over to the right and make a horizontal and vertical chalk mark. The bottom of the Arrow is offset. (this is where the #6 bottom thermo piece goes) *diagrams #1 & #2*

Lay down the 12' Arrow thermo pieces, line up straight & burn to the pavement. *diagrams #1 & #2*

As a section of the Arrows have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for the entire Arrow.

Move the thermo truck back toward the bottom of the turnbay lane and prepare to layout the ONLY.

ONLY

The (1) 12' Arrow is done. Now time for the layout of the ONLY.

Move the thermo truck back towards the bottom of the Left turnbay lane. *diagram #1*

From the bottom of the turnbay lane measure in, first 10' and then 8' 2" and mark with chalk on both sides of the lane. *diagram #1*

Blow off the 8' area (where the ONLY will be placed).

Using the 10' and 8' 2" chalk marks on both sides of the lane snap 2 horizontal chalk lines across the lane (inside of solid yellow lines & 8" white turn line). *diagram #1*

Measure across the lane (inside of solid yellow lines & 8" white turn line) on both the snapped chalked lines and mark the center with a small vertical chalk mark. *diagram #1*

On both chalk lines from the center do the layout as seen on the Premark ONLY insert or *diagram 3* marking the 16" & 8" increments with chalk.

Snap vertical chalk lines using all the 16" & 8" increments marks. The ONLY thermo letters will fit inside these spaces. *diagram 3*

When lined up properly burn to the pavement.

As a section of the letters have been burned to the pavement, while still hot spread some reflective glass beads down. Continue this process for all the ONLY letters.

50' - 80' LEFT turnbay layout

diagram #1

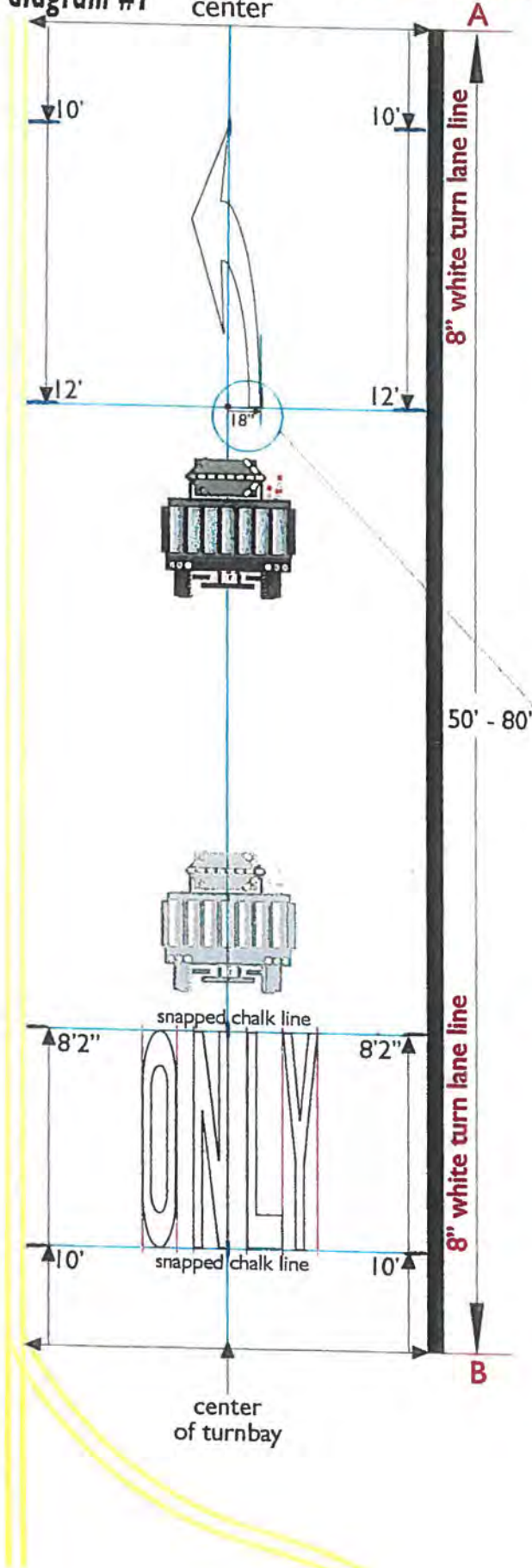
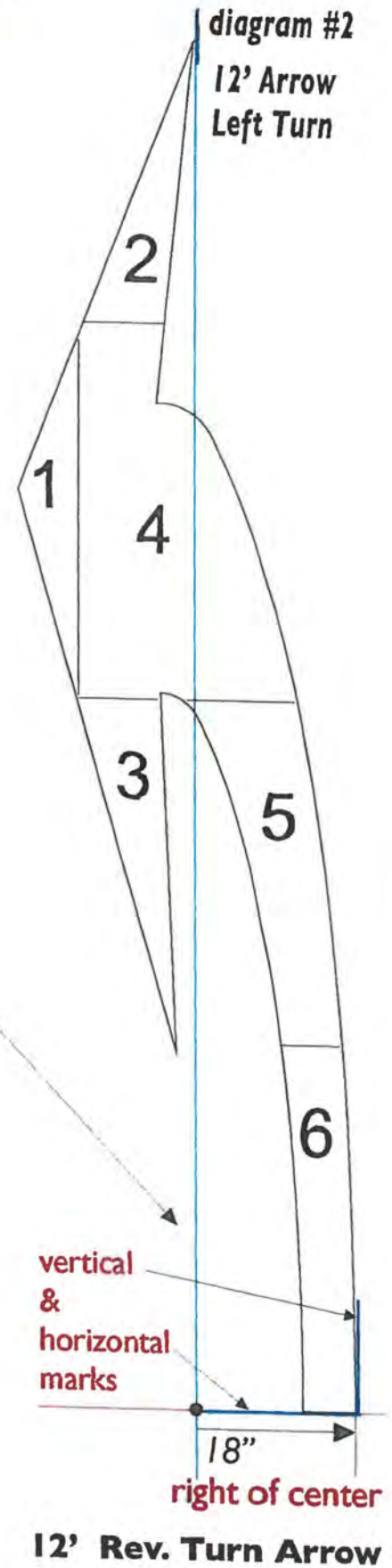


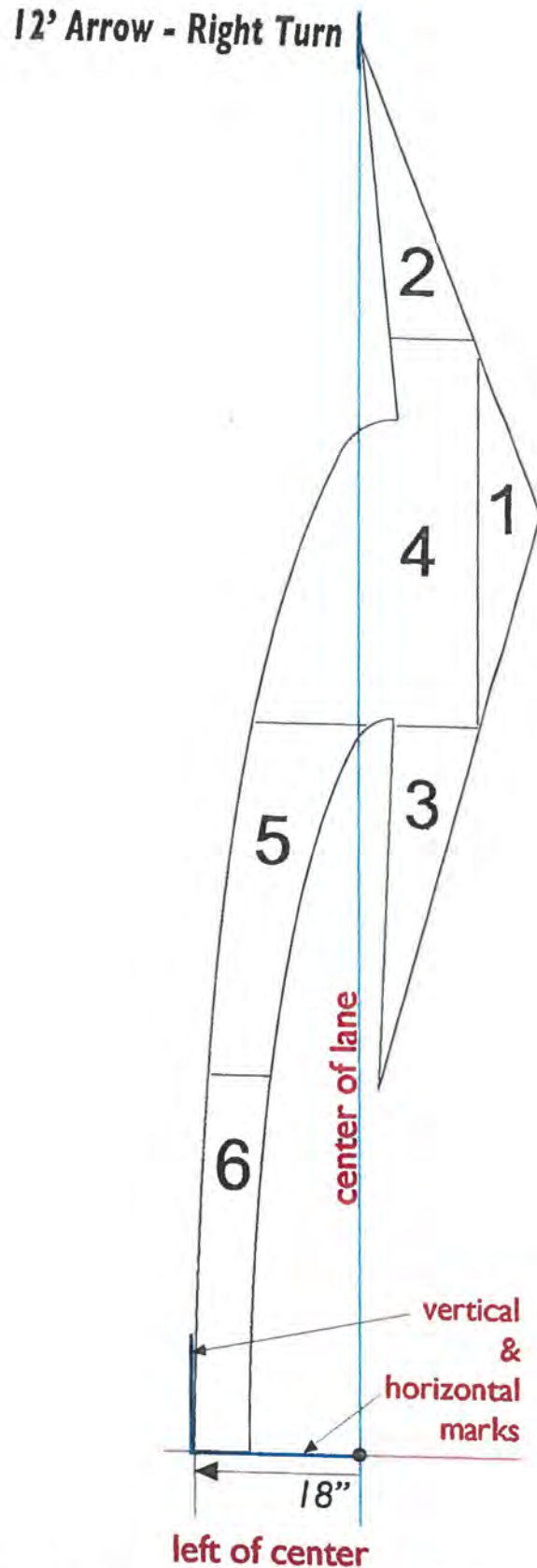
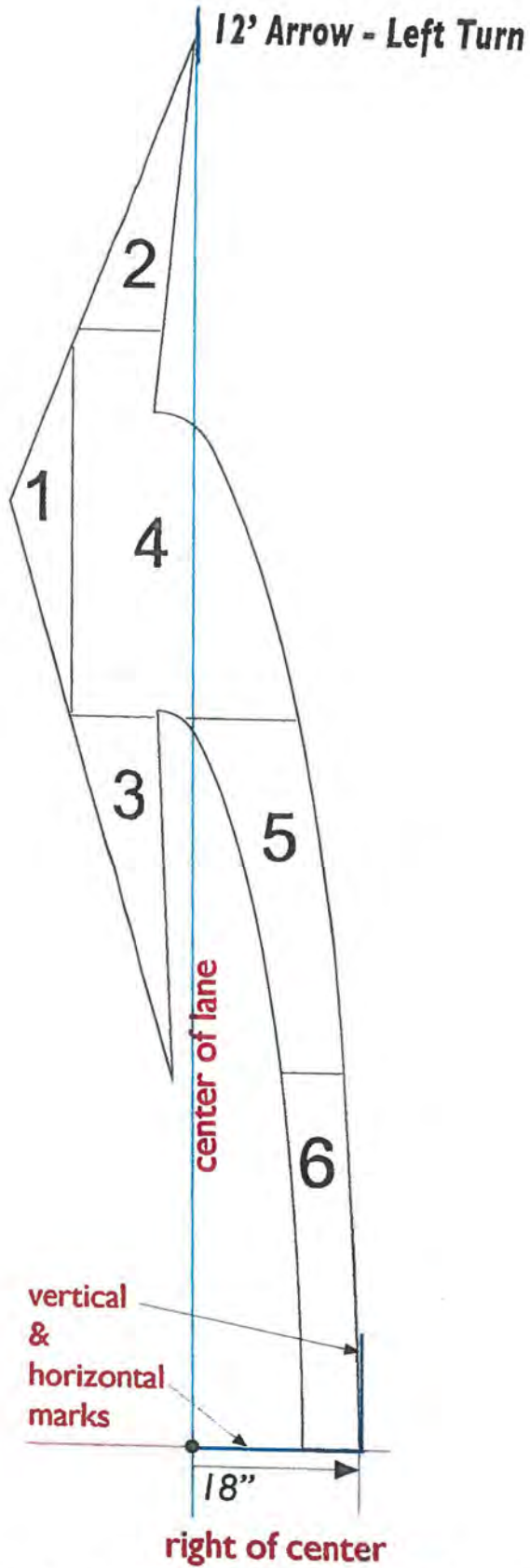
diagram #2

12' Arrow
Left Turn





12' Rev. Turn Arrow



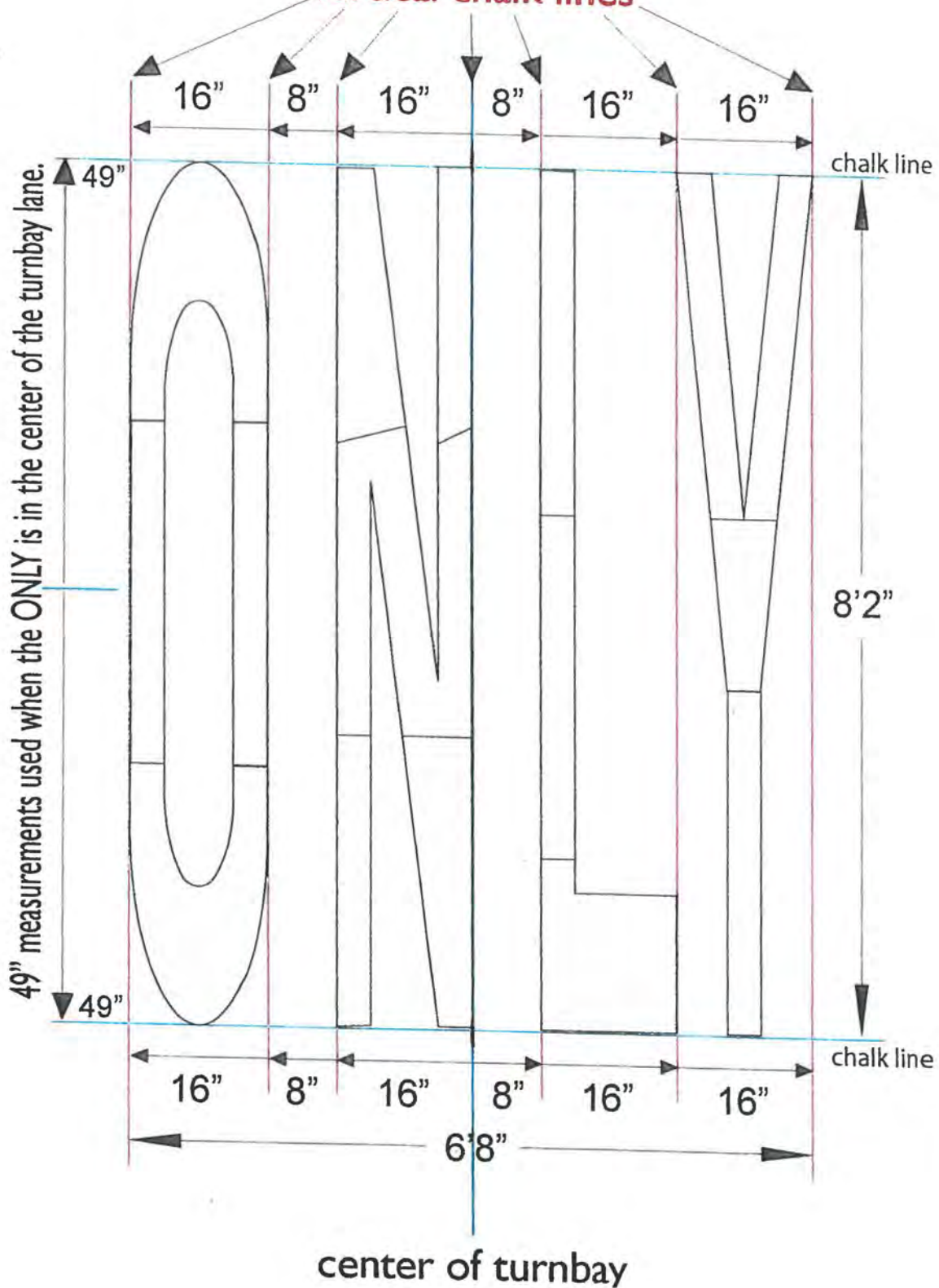
Note: When doing a RIGHT turn, the arrow should be placed to the right of the center of the lane.



8' ONLY

diagram #3

vertical chalk lines



Bikers & 6' Arrow Layout

Refer to the illustration on this page as you read.

Layout for Biker symbol & 6' arrow are done **ONLY** on paved Asphalt or Chip Seal, NEVER on the concrete pan at the edge near the curb.

At the beginning end of the Bike Lane measure up 10' mark with chalk. Then measure up 4' and mark with chalk.

Measure across the Bike Lane at that 10' mark and mark with chalk the middle of the lane. (from inside the white line to inside the other white line or from inside the white line to the edge of the Asphalt).

From the 10' mark snap a chalk line across the Bike Lane, (this will be the bottom of the Biker Symbol).

From the middle of the lane mark measure 12" each way and mark vertical lines with chalk about 10".

From that same 10' mark again measure up 4' and mark with chalk just like the 10' chalk mark.

From the 4' mark measure across the lane and mark the middle with a vertical & horizontal line (+). (the horizontal line will be the top of the Biker symbol)

Now layout the thermo pieces as seen on the Premark Design sheet in the box. Use the head piece with the helmet.

When the thermo pieces are set now is time to burn the thermo to the Asphalt with the propane torch.

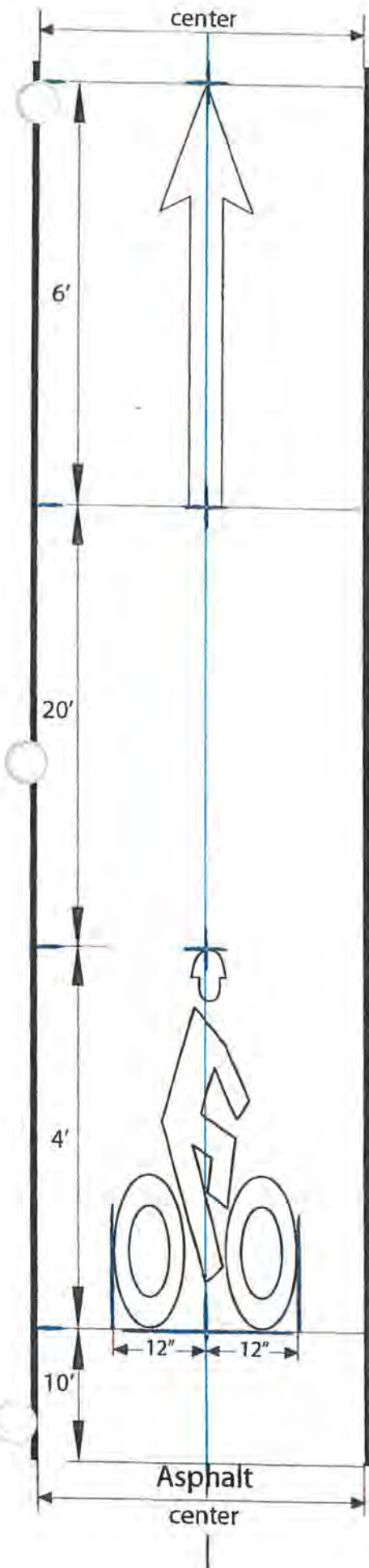
When burning with the propane torch remember to spread the reflector Glass Beads over a section at a time while the thermo is still hot & soft.

When done with the Biker measure up from the 4' mark 20' & 6' and mark with chalk.

Measure across the lane at the 20' & 6' marks and mark the middle vertical & horizontal (+).

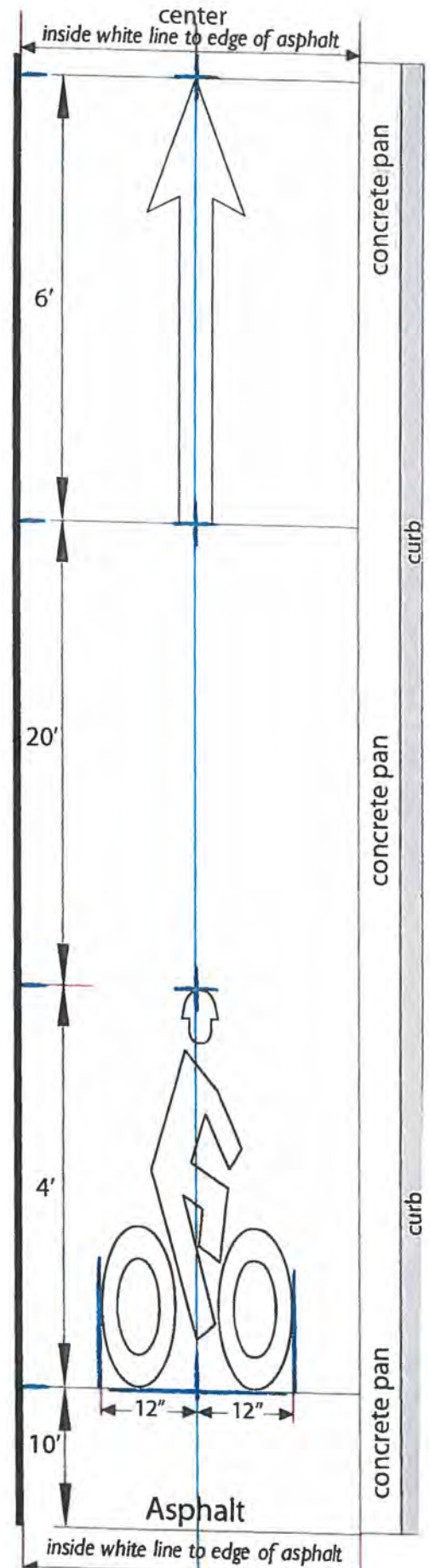
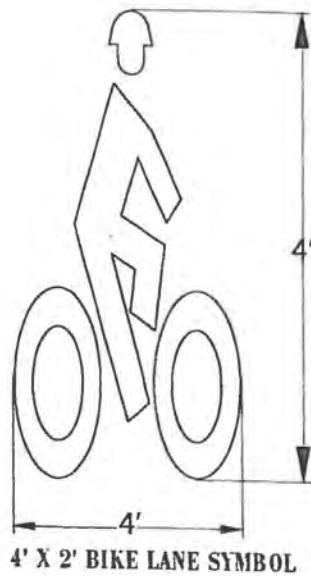
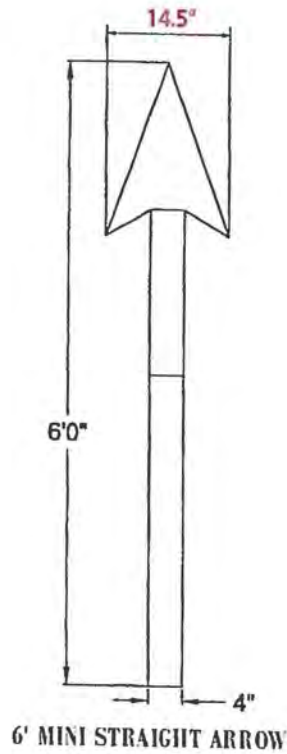
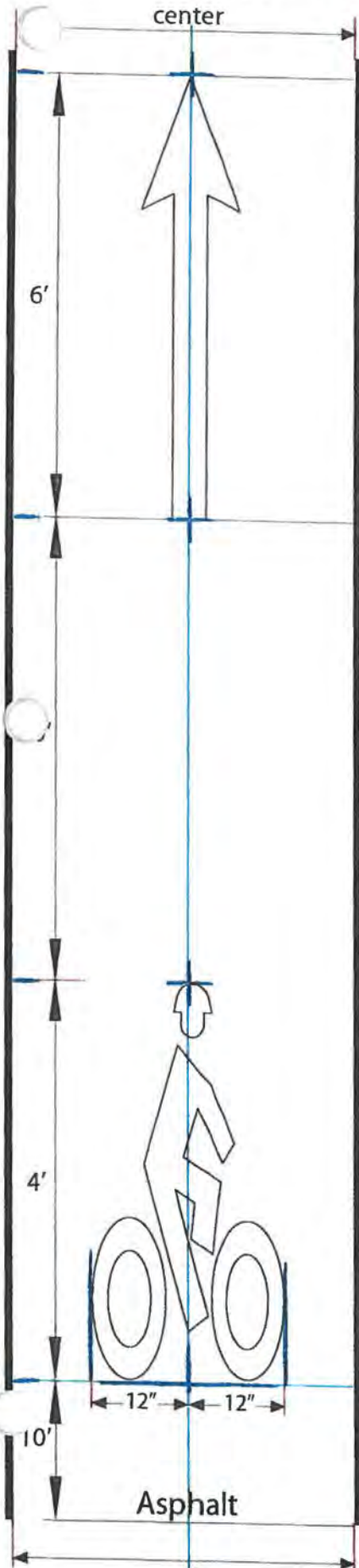
Layout the 6' arrow thermo pieces.

When centered & straight burn to the pavement with the propane torch. (spread reflector Glass Beads)



Biker & 6' Arrow Layouts (A)

ALL street variations of Biker symbols & 6' Arrows are these two (2) layouts. They will either be between two (2) white lines or between one (1) white line and the curb at the right side edge of the street.



Railroad Crossing Marking Layout

16' & 20' Railroad Xing & RR

refer to page with diagrams A & B

1) When laying down RR X on (1) lane flow of traffic, traffic control using Flaggers is necessary unless there is a Shared Lane between the opposite flows of traffic.

Stop Bar

2) Start with the "Stop Bar" which must be layed a minimum of 5' from the RR Drop Arm. Measure 5' from the Drop Arm and snap a chalk line horizontal across the lane. (diagram A)

3) Blow off the stop bar area. Lay down the 36" x 18" thermo pieces along and BEHIND the chalk line. Start laying pieces down from the 4" edge line to the double yellow lines. Cut to fit if necessary. When set burn to the pavement. (diagram A)

4) As a section of the Stop Bar is being burned to the pavement, while still hot spread some reflective glass beads down on the hot thermo. Continue this process for the entire Stop Bar. (diagram A)

Prep

5) Next step is to layout the (2) thermo borders, X & RR. The bottom thermo border will line up with the RXR sign. (diagram A & B)

6) Blow off the entire area where the (2) thermo borders, X & RR are to be layed down (roughly a 54' area from top to bottom). (diagram A)

Bottom Thermo Border

7) Start with the bottom thermo border snapping a chalk line across the lane that is lined up with the RXR sign. Repeat the steps of the Stop Bar. Only difference the thermo border goes from the inside of the 4" edge line to the inside of the double yellow lines and BEHIND the horizontal chalk line. (diagram A)

X

8) Measure up 25' from the bottom thermo border chalk line on both sides of the lane and mark with chalk. Snap a horizontal chalk line across the lane using the (2) chalk marks. (diagram A & B)

9) Make a vertical chalk mark at the center of that snapped chalk line measuring across the lane from inside the 4" edge line to the inside of the double yellow lines. This is where the center piece of the X will be placed. (diagram A & B)

10) Lay down the X thermo pieces starting with the center piece. When all pieces are laid down and lined up vertical & horizontal, start burning to the pavement. While burning thermo pieces and still hot spread some reflective glass beads down on the hot thermo. (diagram A & B)

RR

11) When X is finished snap a horizontal chalk line at the bottom legs of the X. Lay down RR pieces 10" apart on the inside and centered in line with the X. Line both RRs pieces vertical with the X. Once lined up burn to the pavement spreading reflective glass beads while still hot. (diagram B & A)

Top Thermo Border

12) Last is the top thermo border. Measure up 25' from the X center chalk line on both sides of the lane and mark with chalk. Snap a chalk line across the lane. Lay down the thermo pieces from inside the 4" edge line to the inside of the double yellow lines. Lay the pieces ABOVE the horizontal line. (diagram A)

13) When top thermo border pieces are layed down start burning to the pavement spreading reflective glass beads a section at a time while still hot. (diagram A)

Railroad Crossing Marking Layout 16' & 20' Railroad Xing & RR

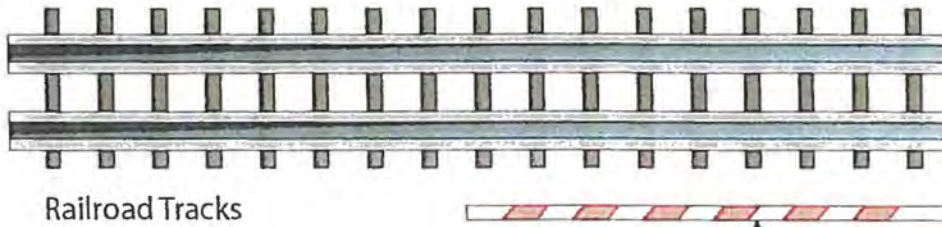


diagram B

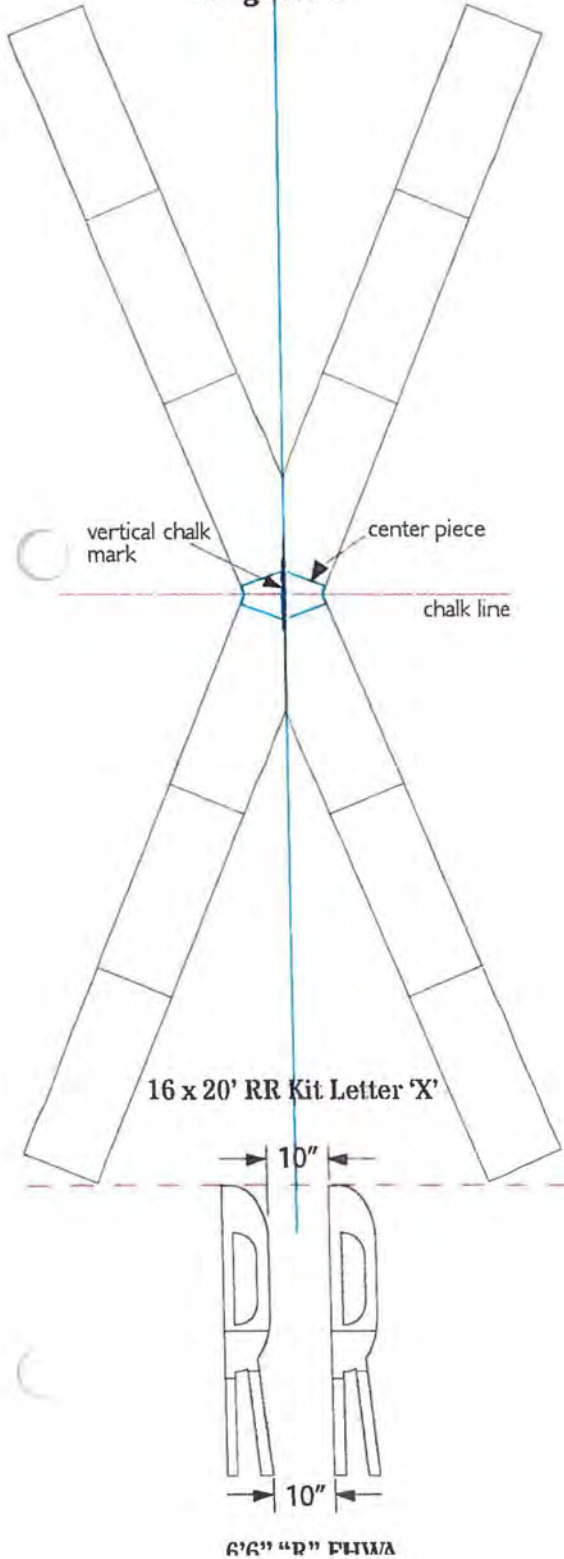
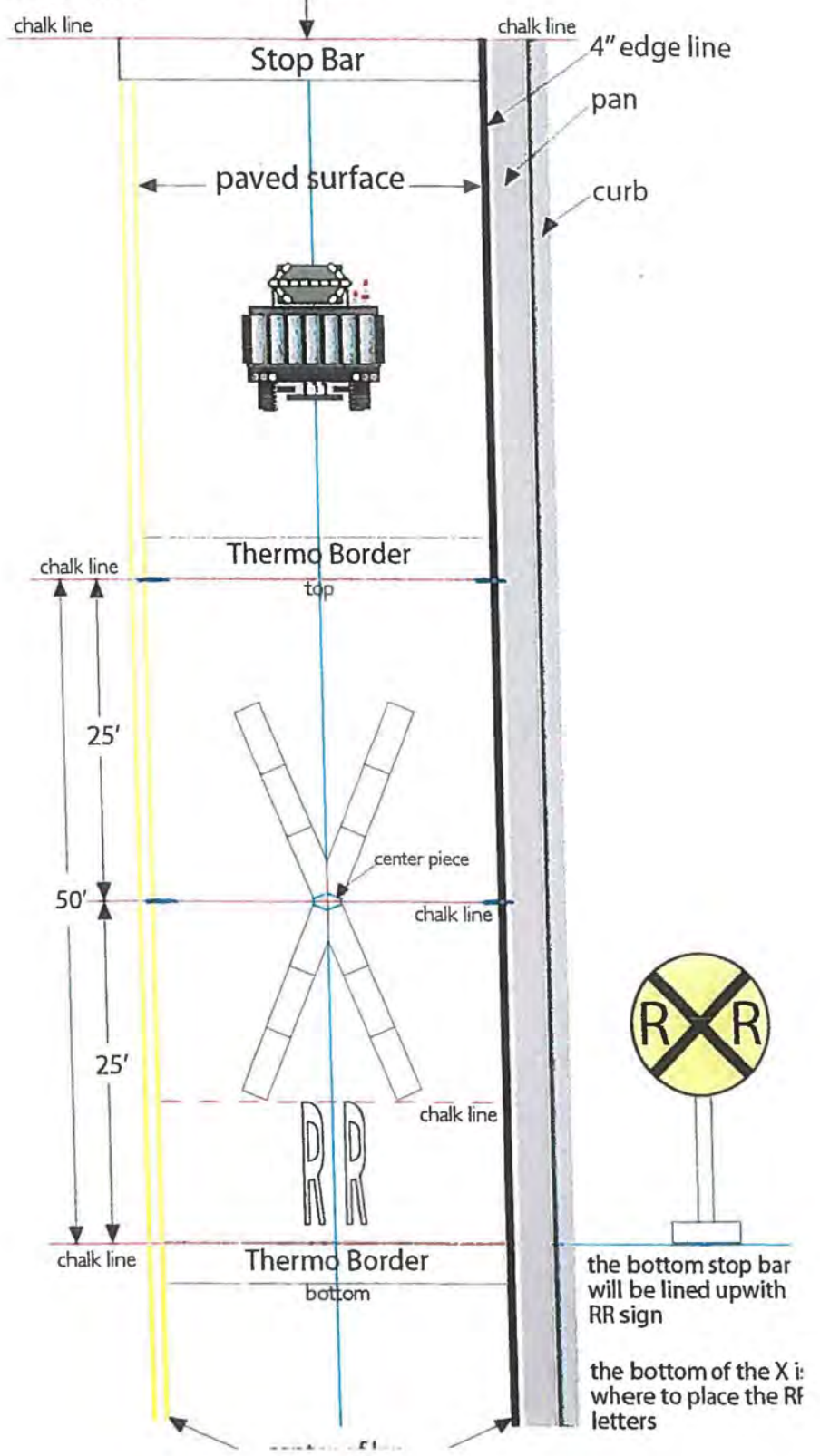


diagram A



Appendix L

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for Current Information.**

Loveland Thermoplastic Standards
(City of Loveland only)

2013 THERMOPLASTIC STANDARDS



TRAFFIC OPERATIONS

CITY OF LOVELAND

RYAN BIERMANN 970-685-8007
DAVID GOODMAN 970-567-1243

PAINT MARKING STANDARDS



TRAFFIC OPERATIONS

CITY OF LOVELAND
RYAN BIERMANN 970-685-8007
DAVID GOODMAN 970-567-1243

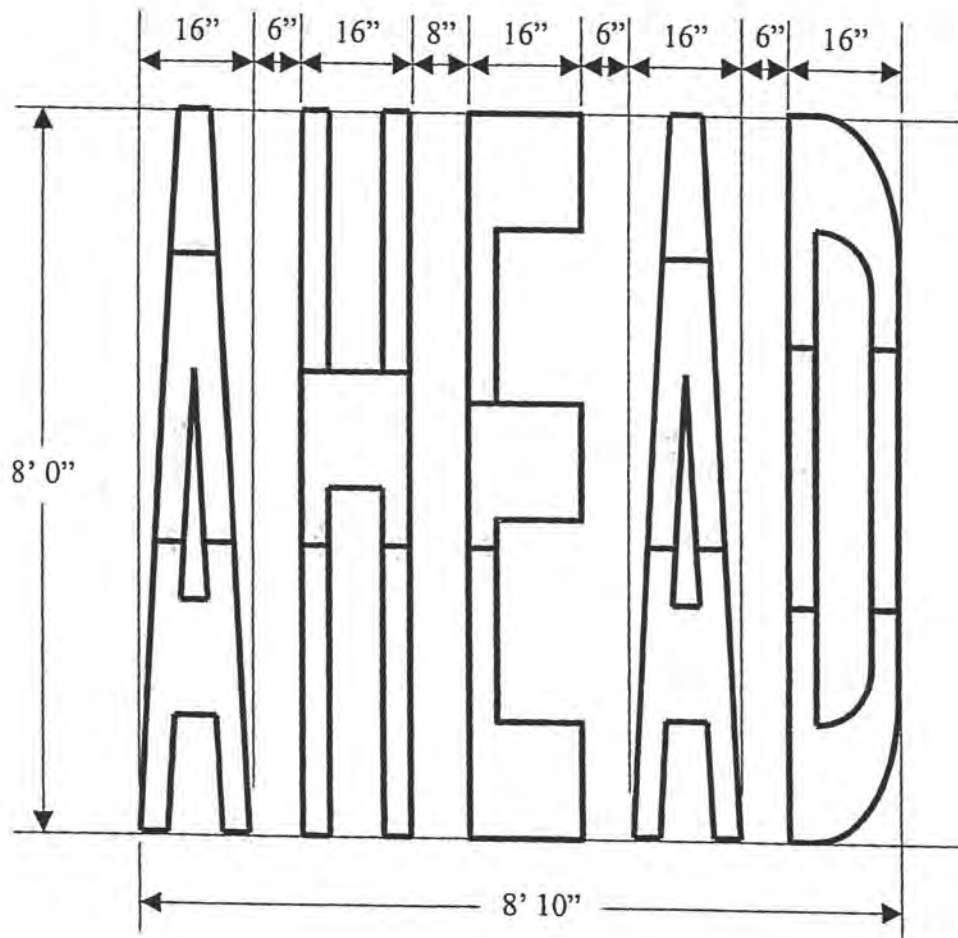
THERMO DIMENSION ORIGINALS



City Of Loveland
Traffic Operations

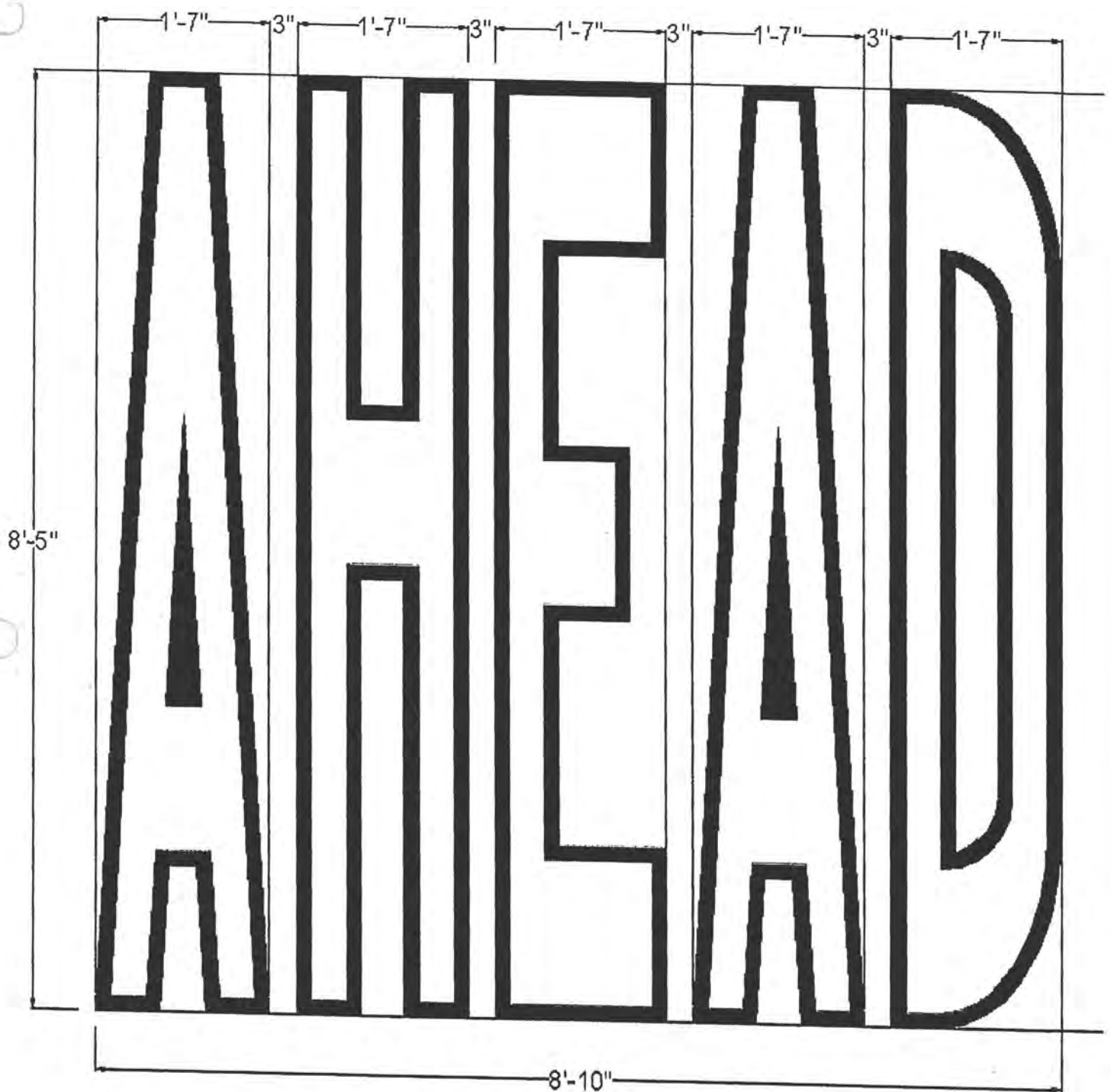
1/17/13

FLINT TRADING, INC.



8' "AHEAD"

Premark Design Number 130106

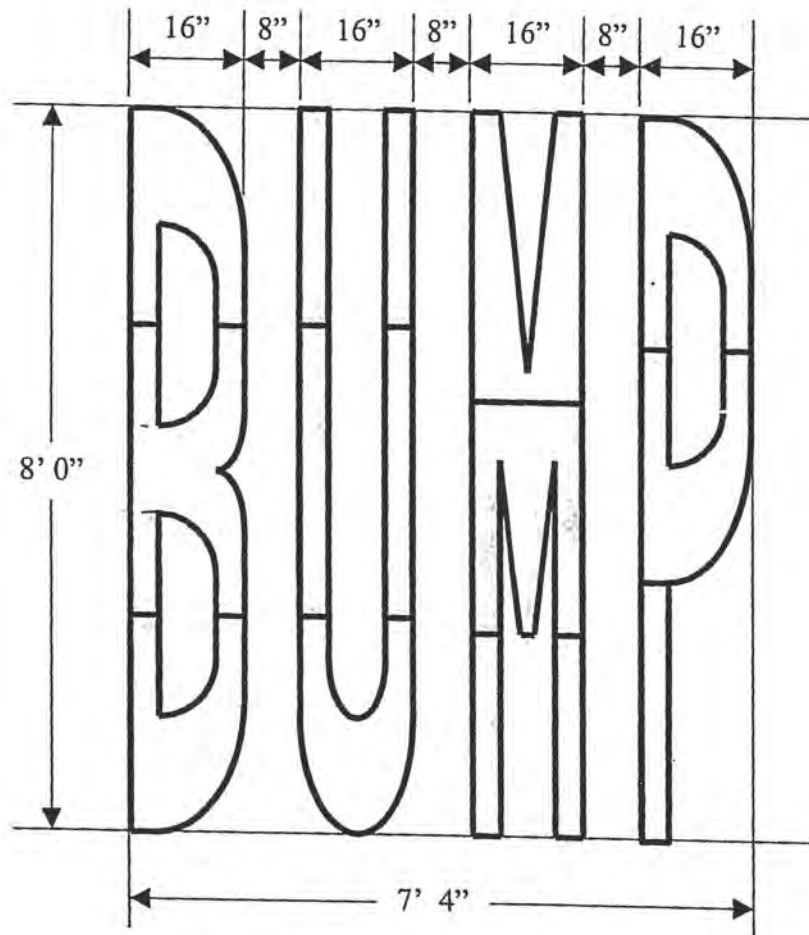


8' "AHEAD" w/1.5" Contrast

Design Number

8130106CONT

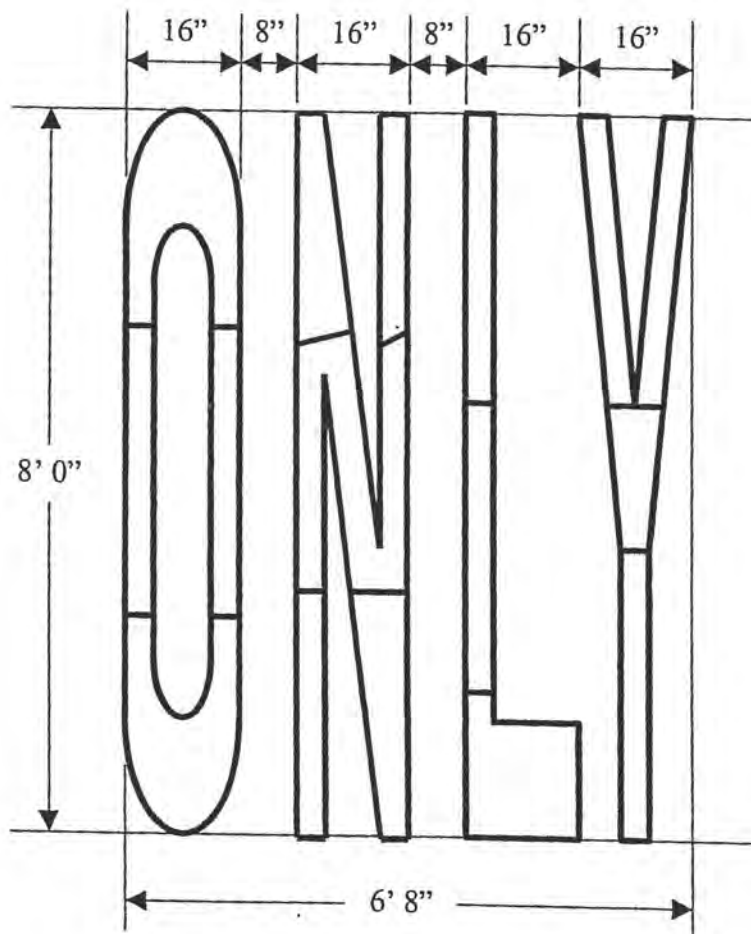
FLINT TRADING, INC.



8' "BUMP"

Premark Design Number 130145

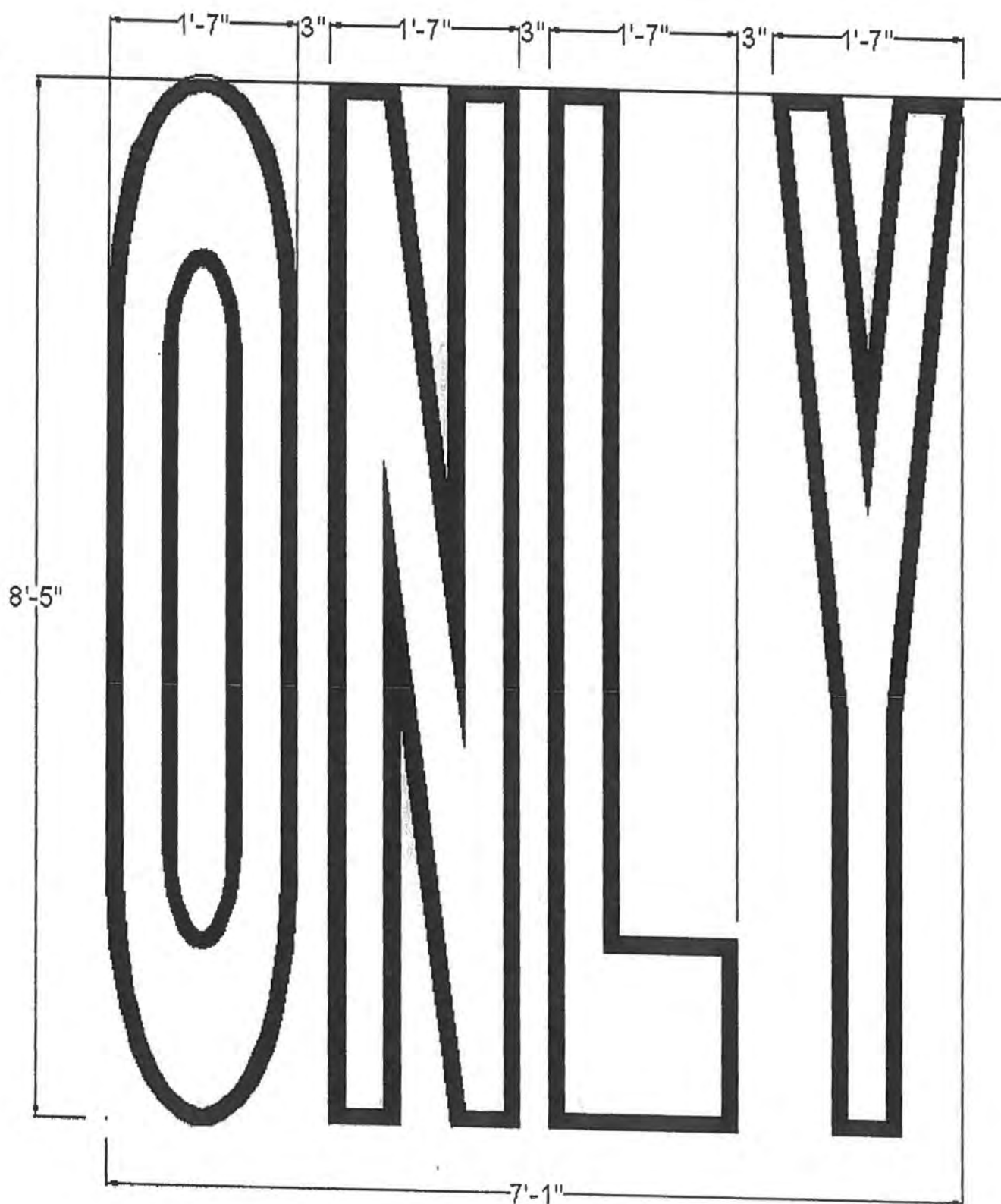
FLINT TRADING, INC.



8' "ONLY"

Premark Design Number

130102

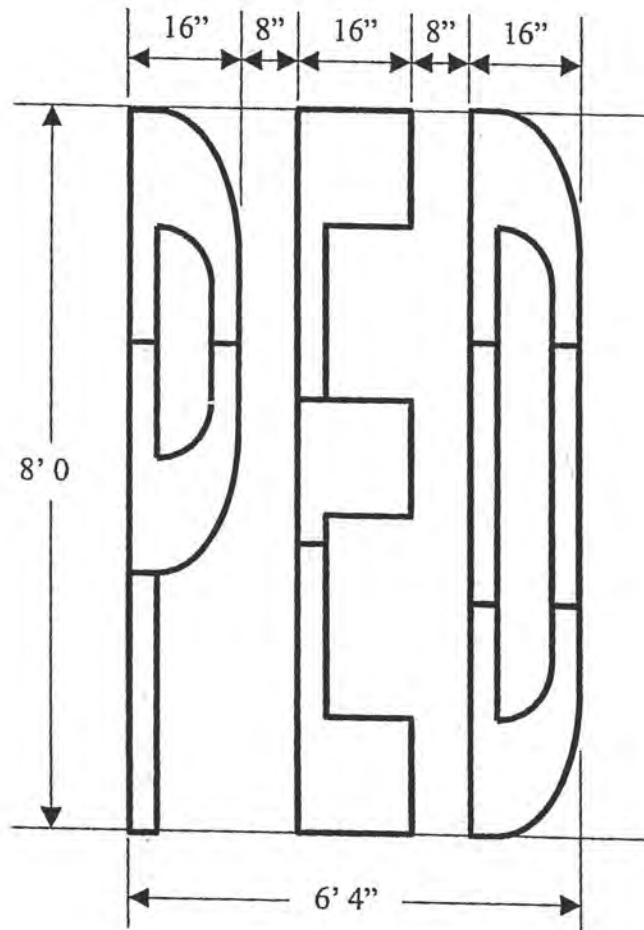


8' "ONLY" w/Contrast

Design Number

130102CONT

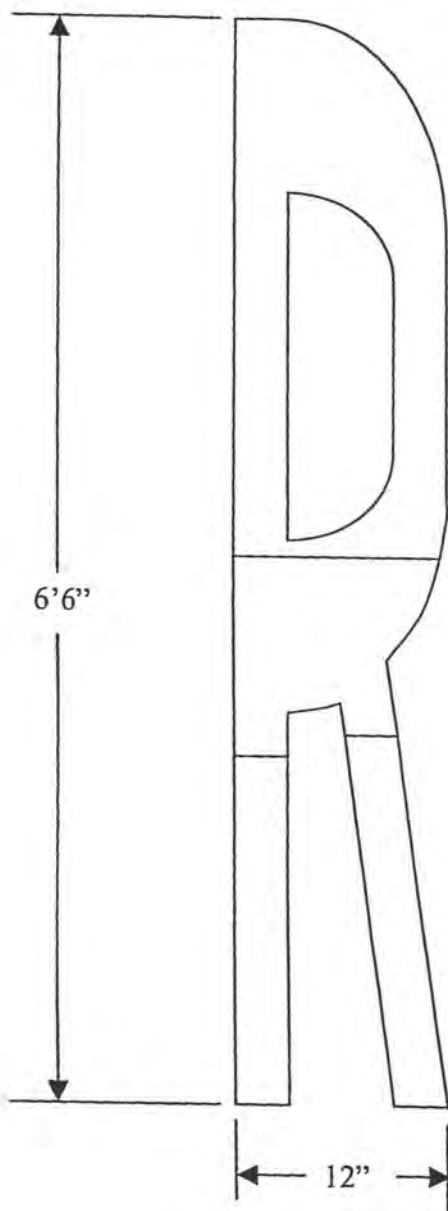
FLINT TRADING, INC.



8' "PED"

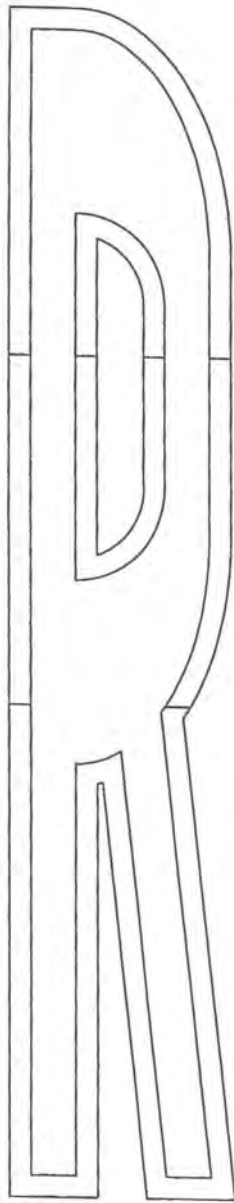
Premark Design Number 130114

FLINT TRADING, INC.



6'6" "R" FHWA

Premark Design Number 130203

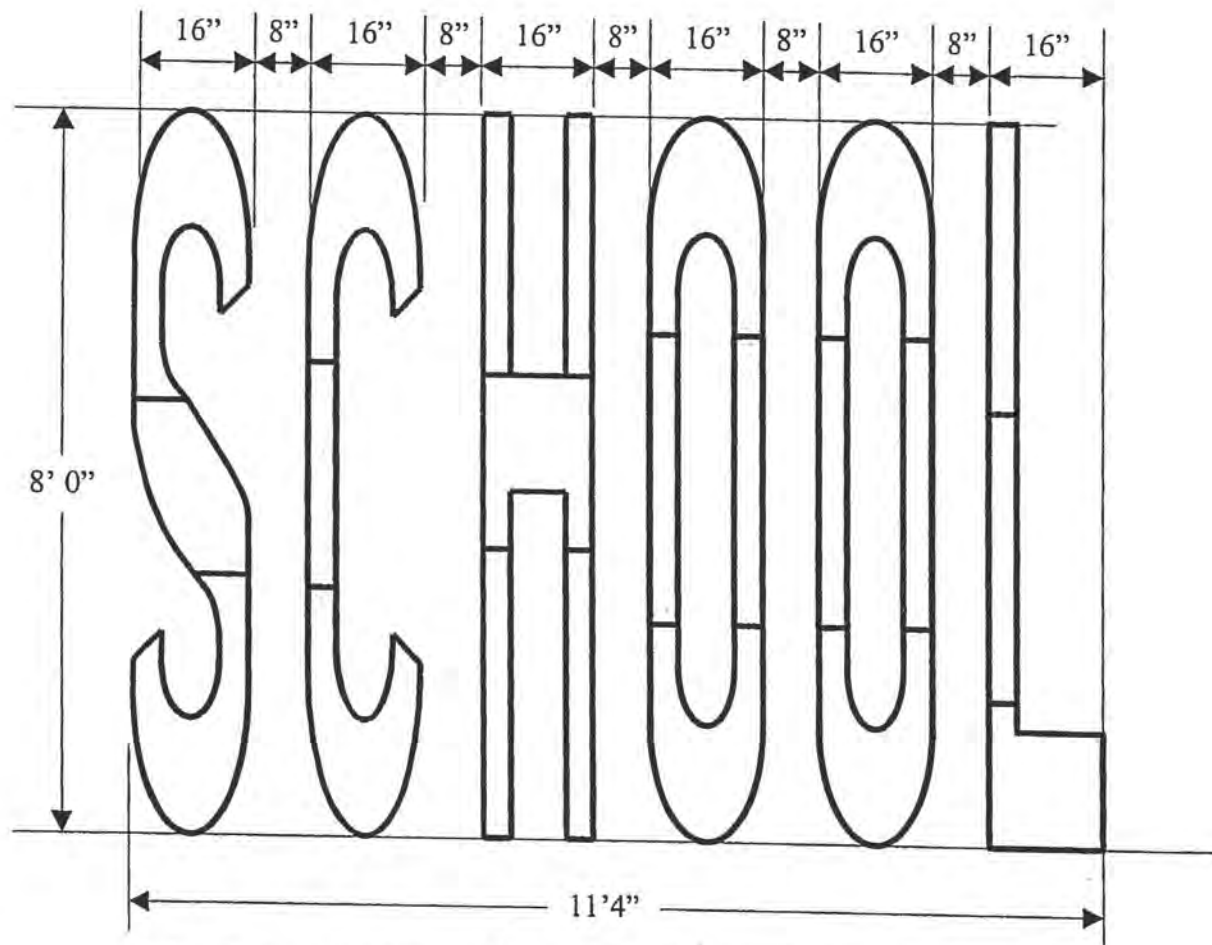


6' 6" "R" FHWA CONTRAST RETROFIT

Design Number

130203-CONT

FLINT TRADING, INC.



* Spacing Can Be Reduced From 8" To 4" If Required Due To Narrow Lane.

8' "SCHOOL"

Premark Design Number 110101

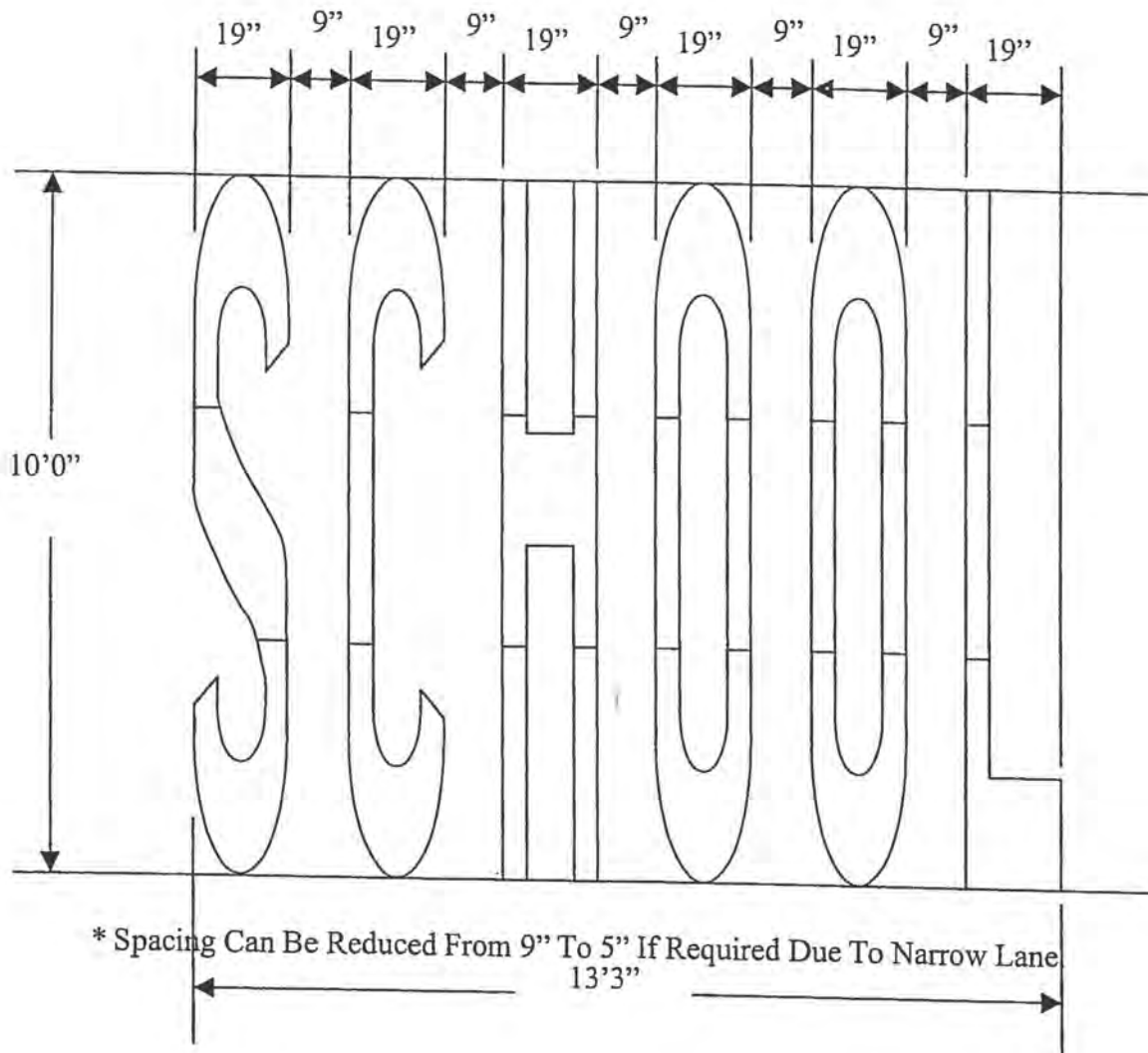


8' "SCHOOL" w/1.5" Contrast

Design Number

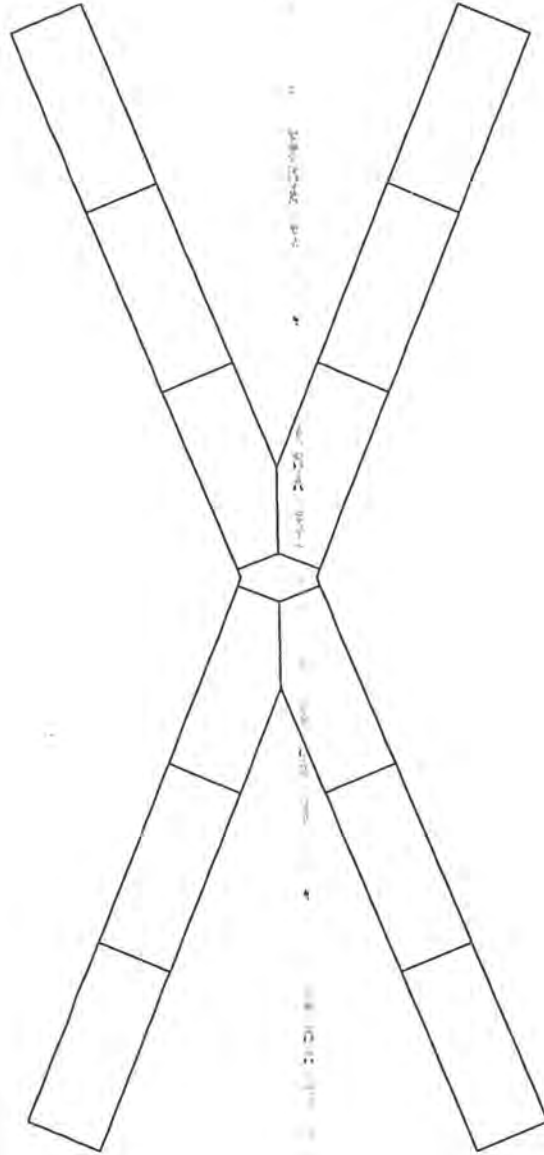
110101CONT

FLINT TRADING, INC.



10' SCHOOL

Premark Design Number 120100

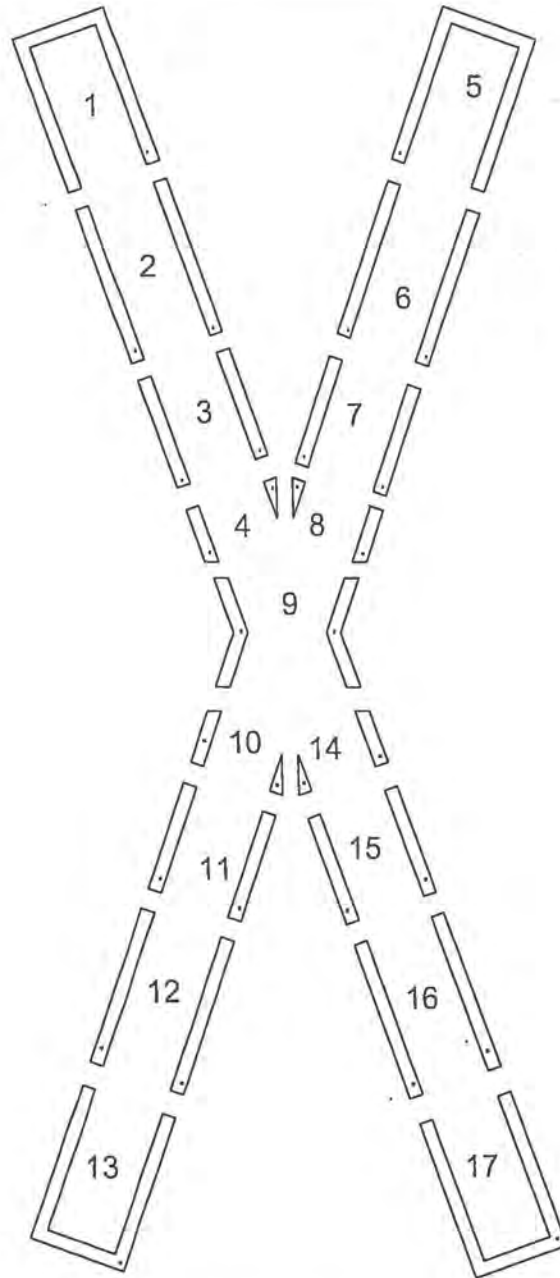


16 x 20' RR Kit Letter 'X'

PREMARK Design Number 130103

Mail Address: P.O. Box 160 * Thomasville, NC 27361 * Delivery Address: 115 Todd Court * Thomasville, NC 27360

Phone (336) 475-6600 * Fax (336) 475-7900 * E-Mail: flint@flintrtrading.com, Web: www.flintrtrading.com

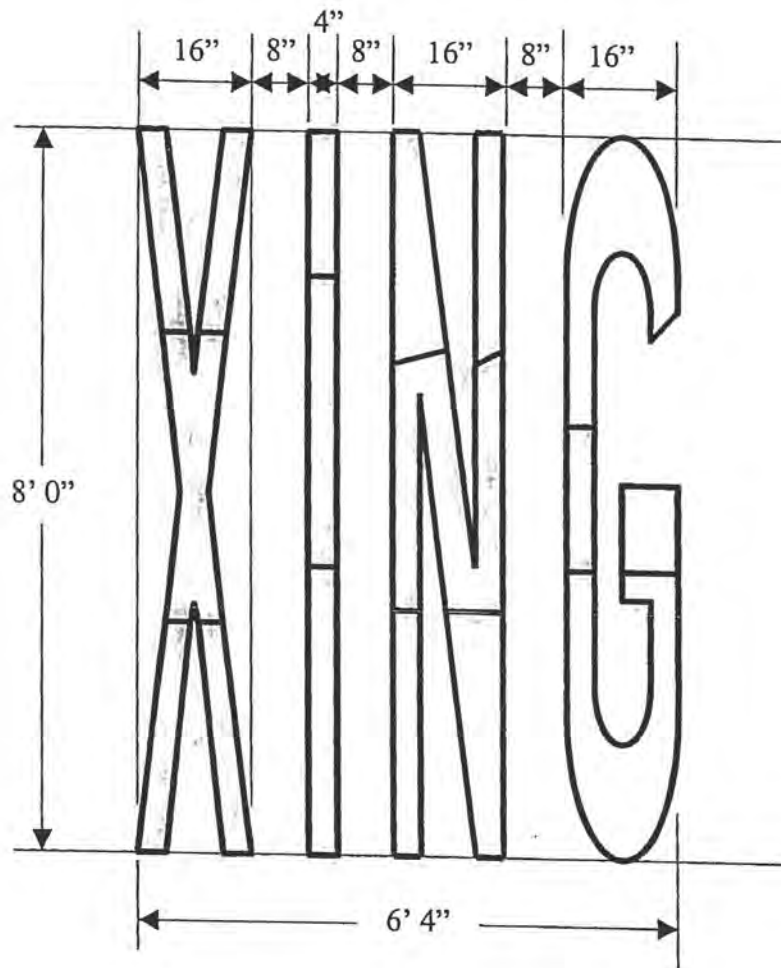


16 X 20 RXR 'X' CONTRAST

Design Number

130103-CONT

FLINT TRADING, INC.



8' "X-ING"

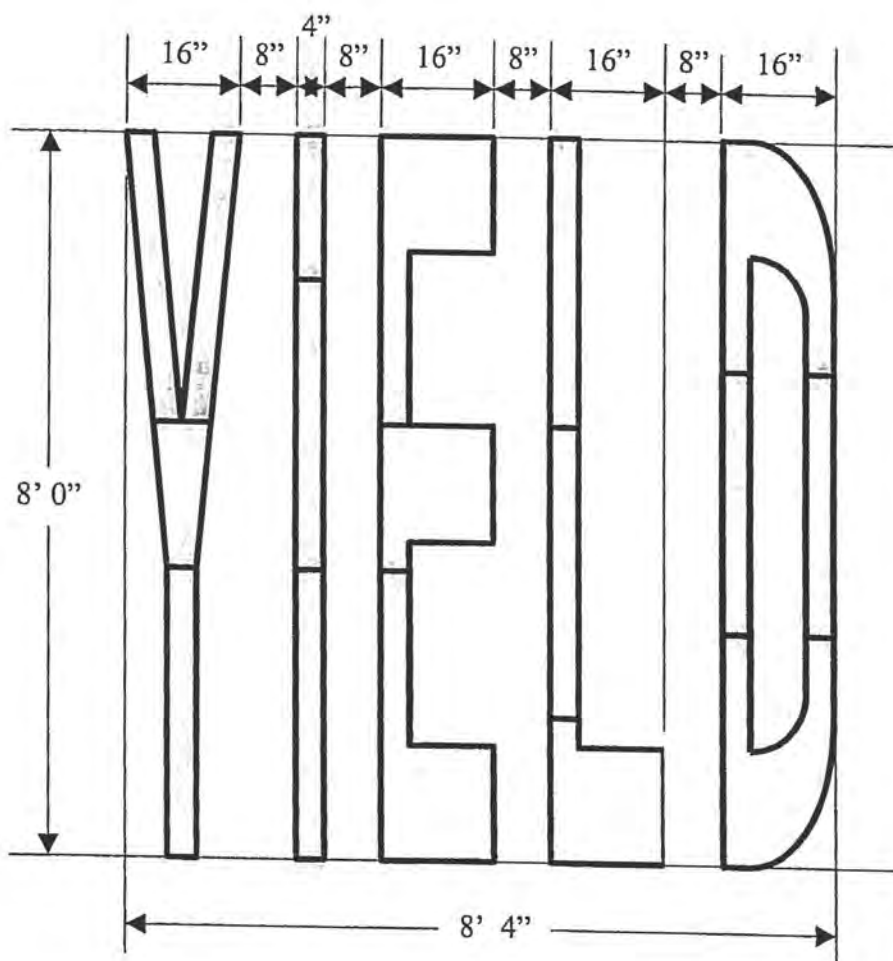
Premark Design Number

130107



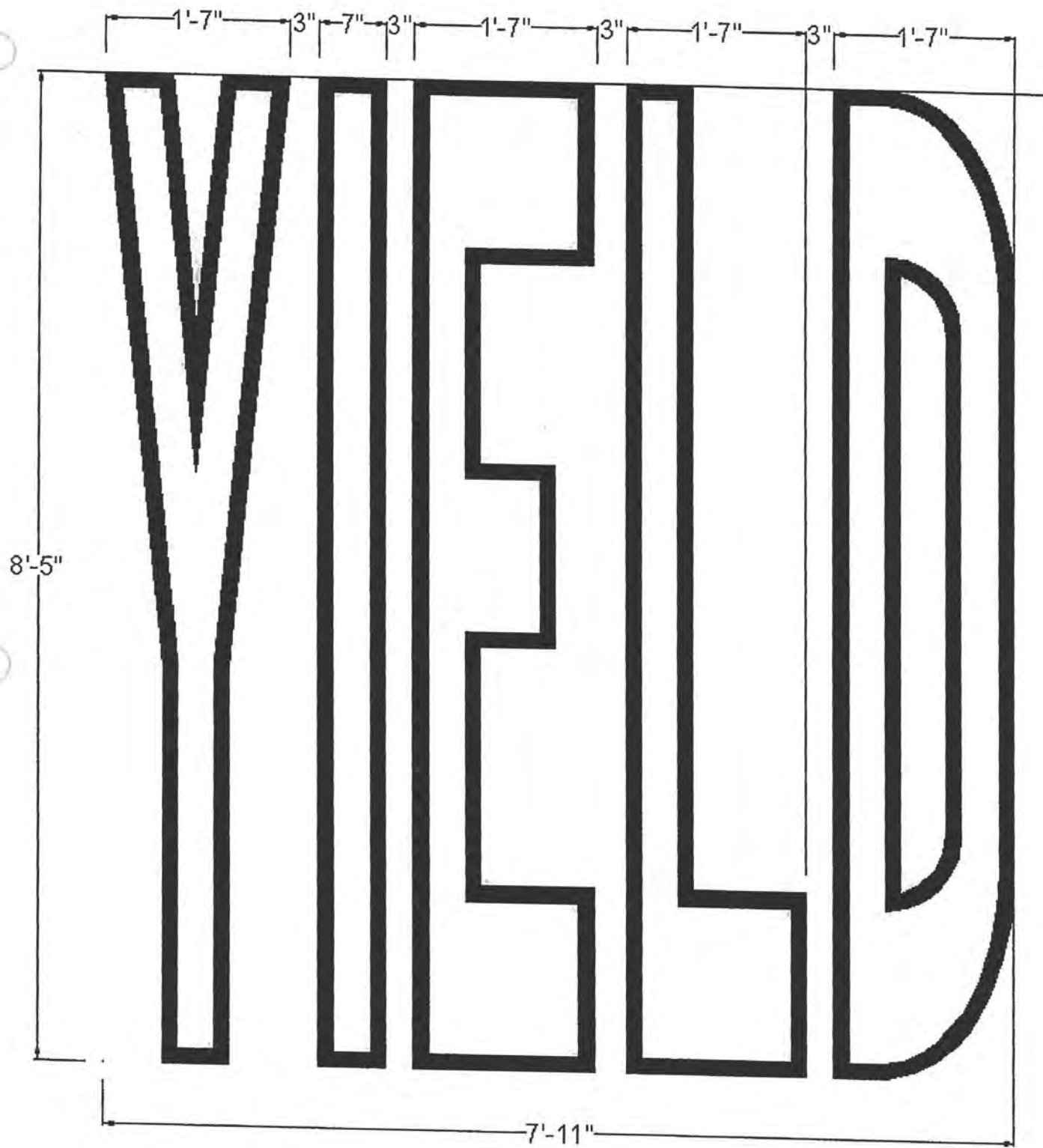
8' "XING" w/1.5" Contrast

FLINT TRADING, INC.



8' "YIELD"

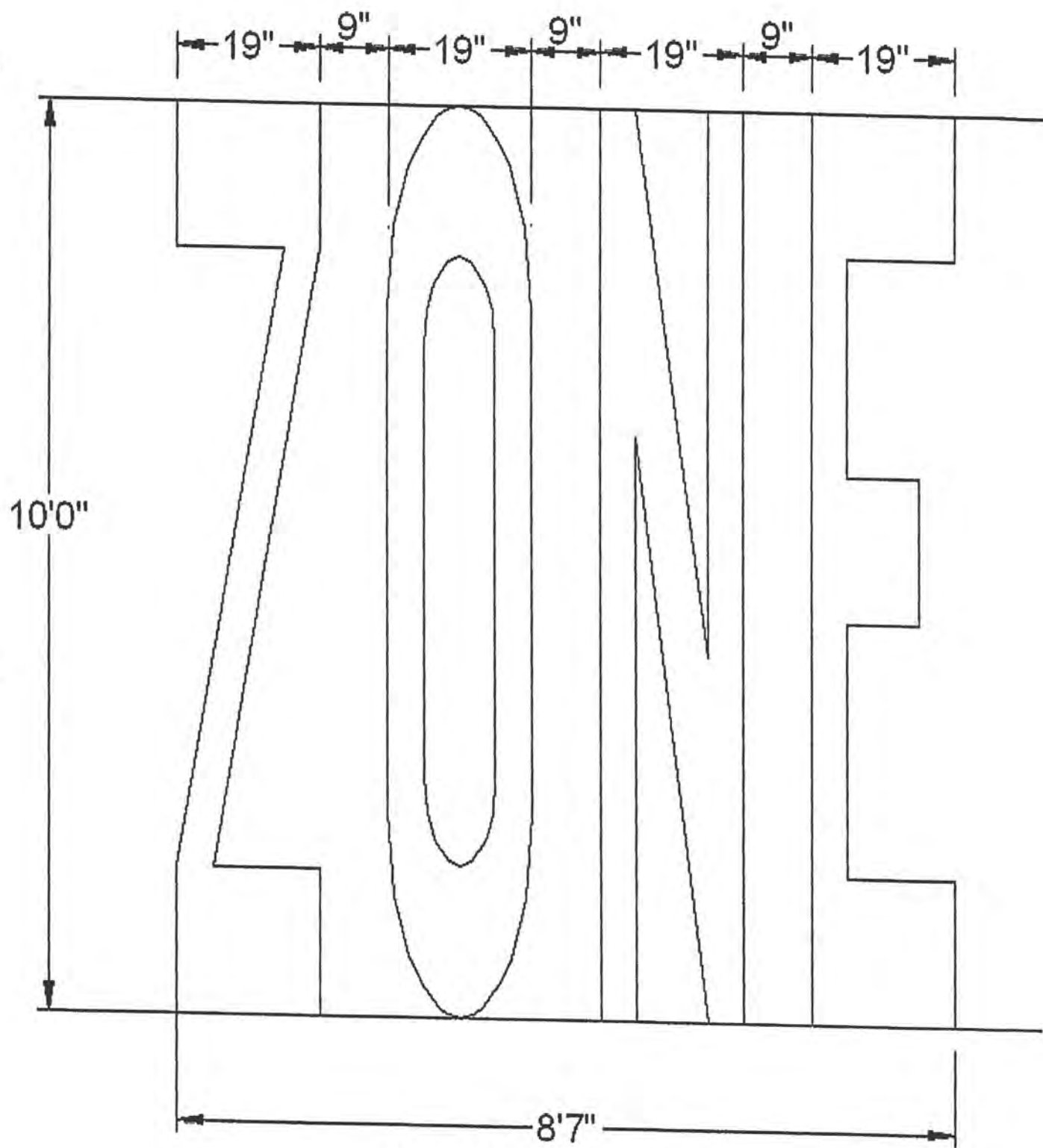
Premark Design Number 130127



8' "YIELD" W/ 1.5" Contrast

Design Number

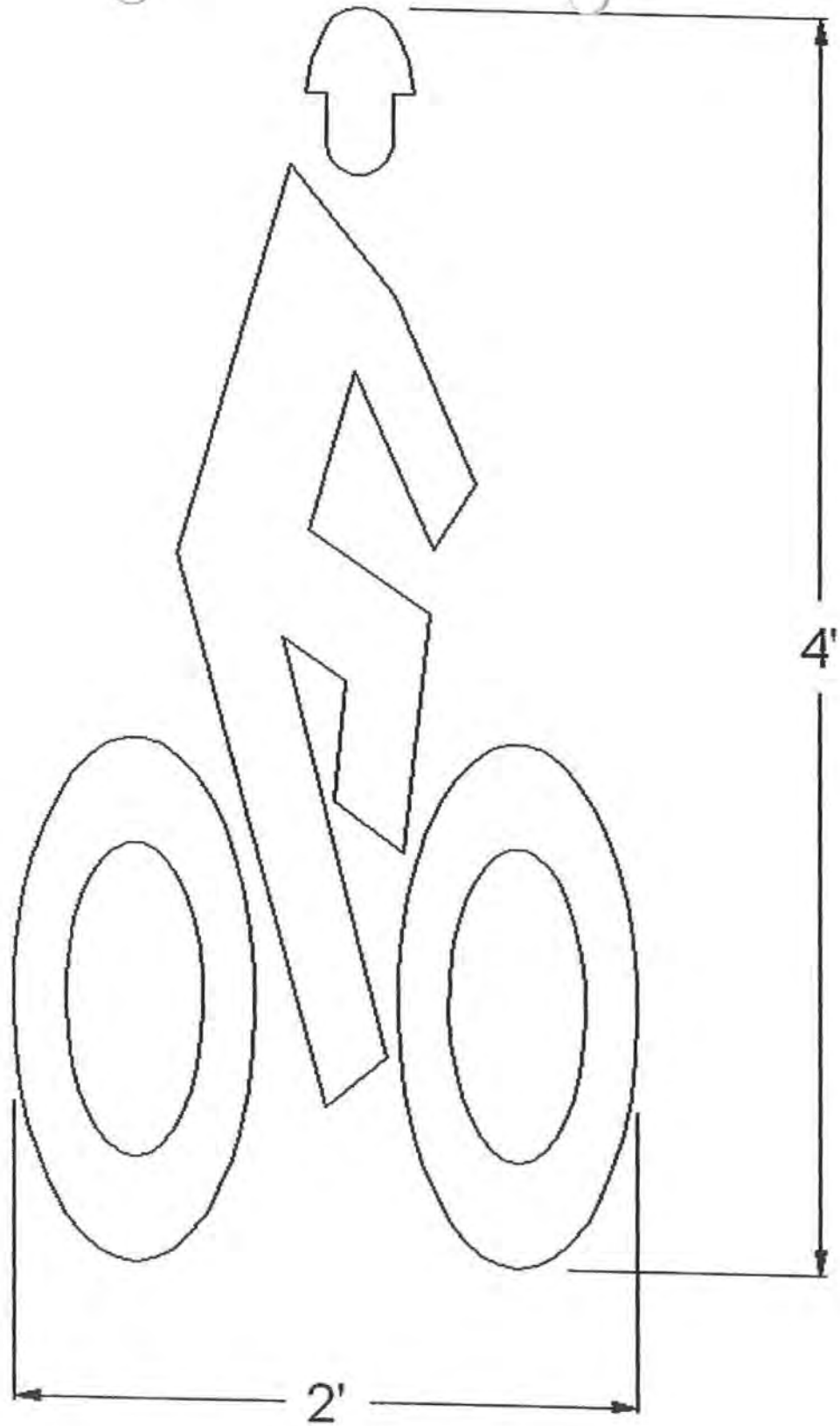
8130127-CONT



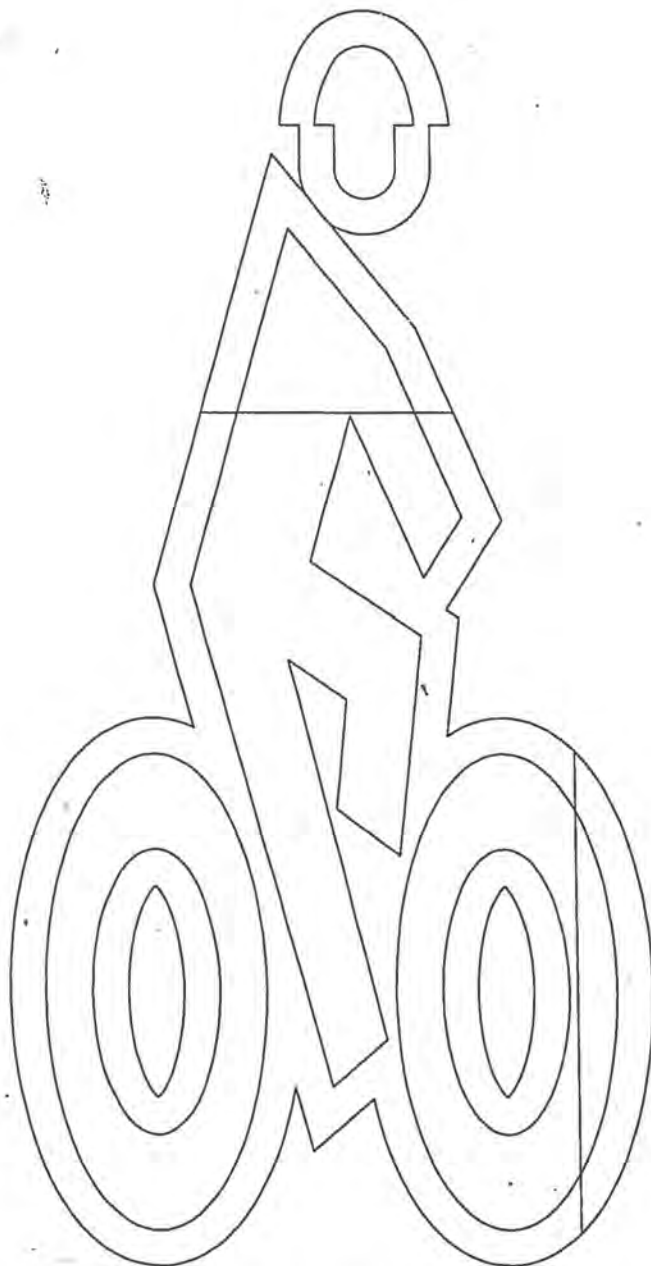
10' "ZONE"

PREMARK Design Number

120133



4' X 2' RIGHT BIKE LANE SYMBOL

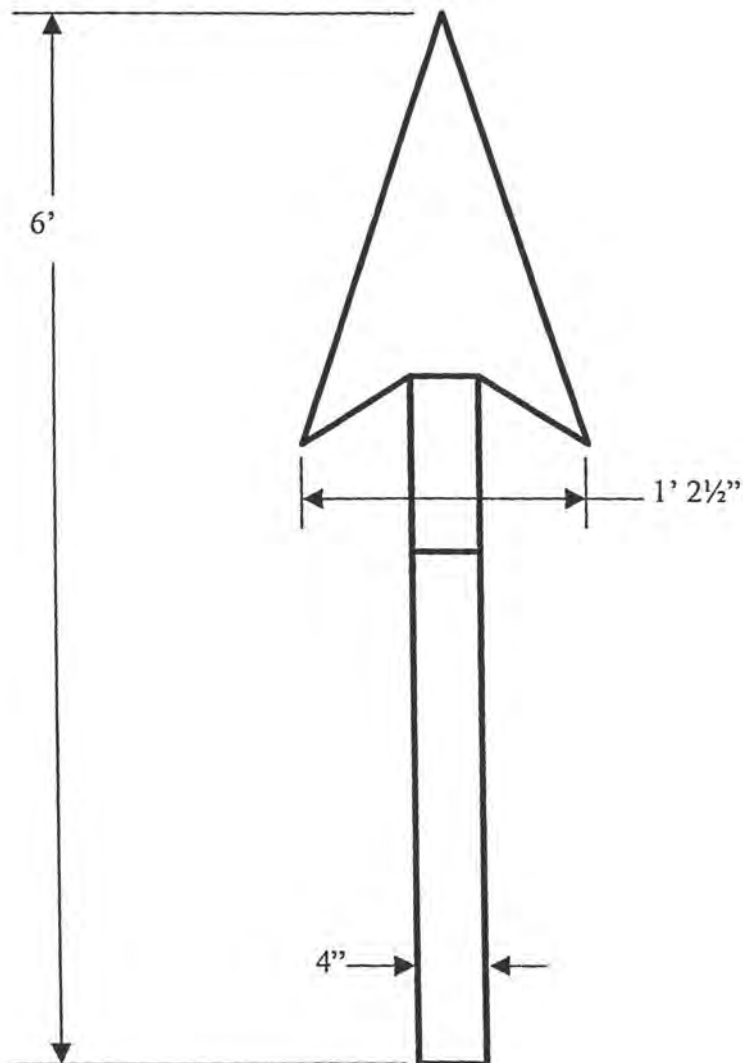


4' X 2' BIKE LANE SYMBOL W/1.5" CONTRAST

PREMARK Design Number

230525-CONT

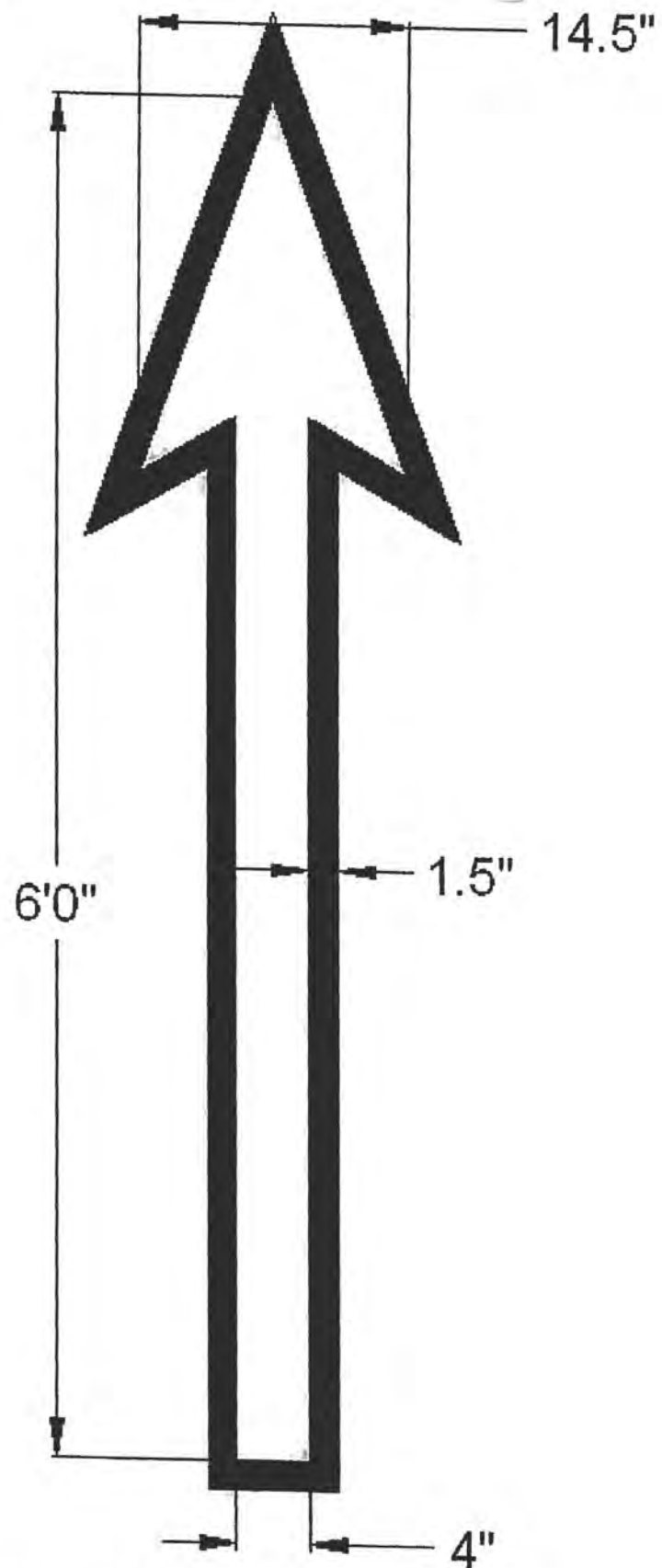
FLINT TRADING, INC.



6' MINI - STRAIGHT ARROW

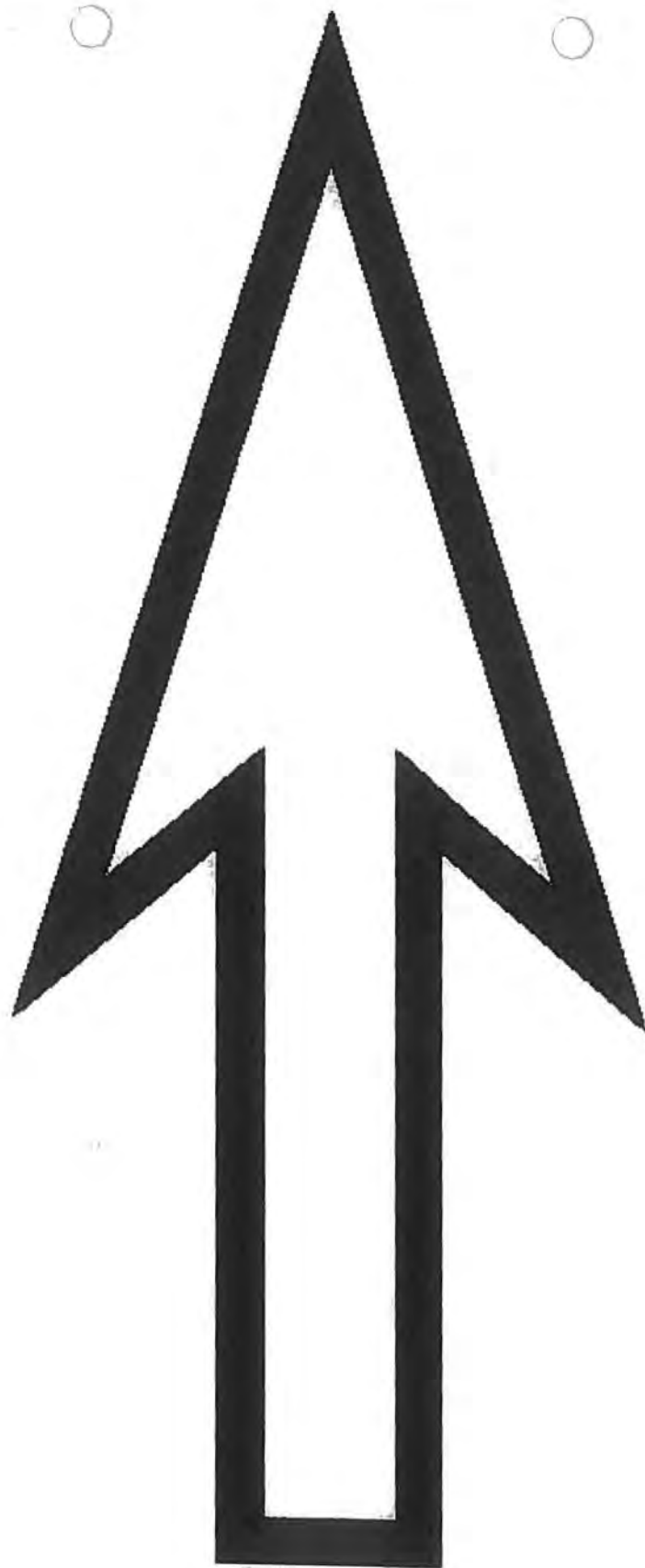
Premark Design Number

330558



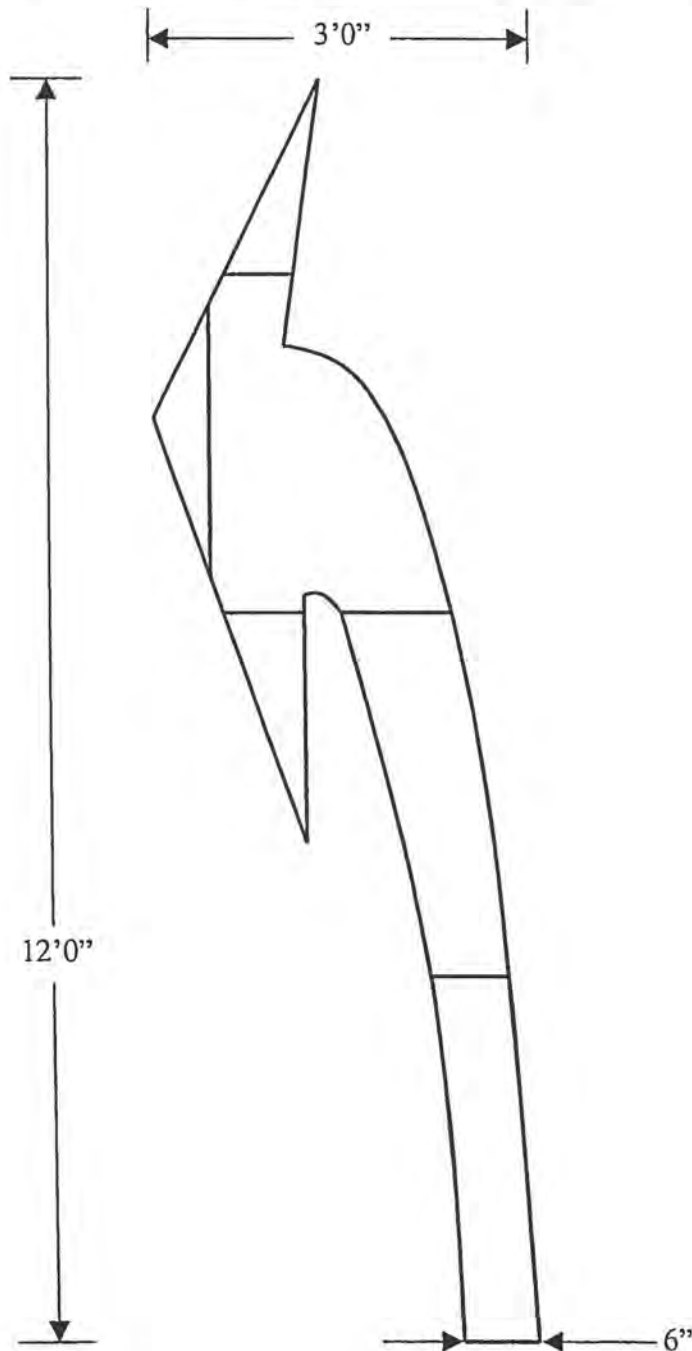
6' Mini Str Arrow W/Cont





9'10" STRAIGHT ARROW W/4" CONTRAST

FLINT TRADING, INC.

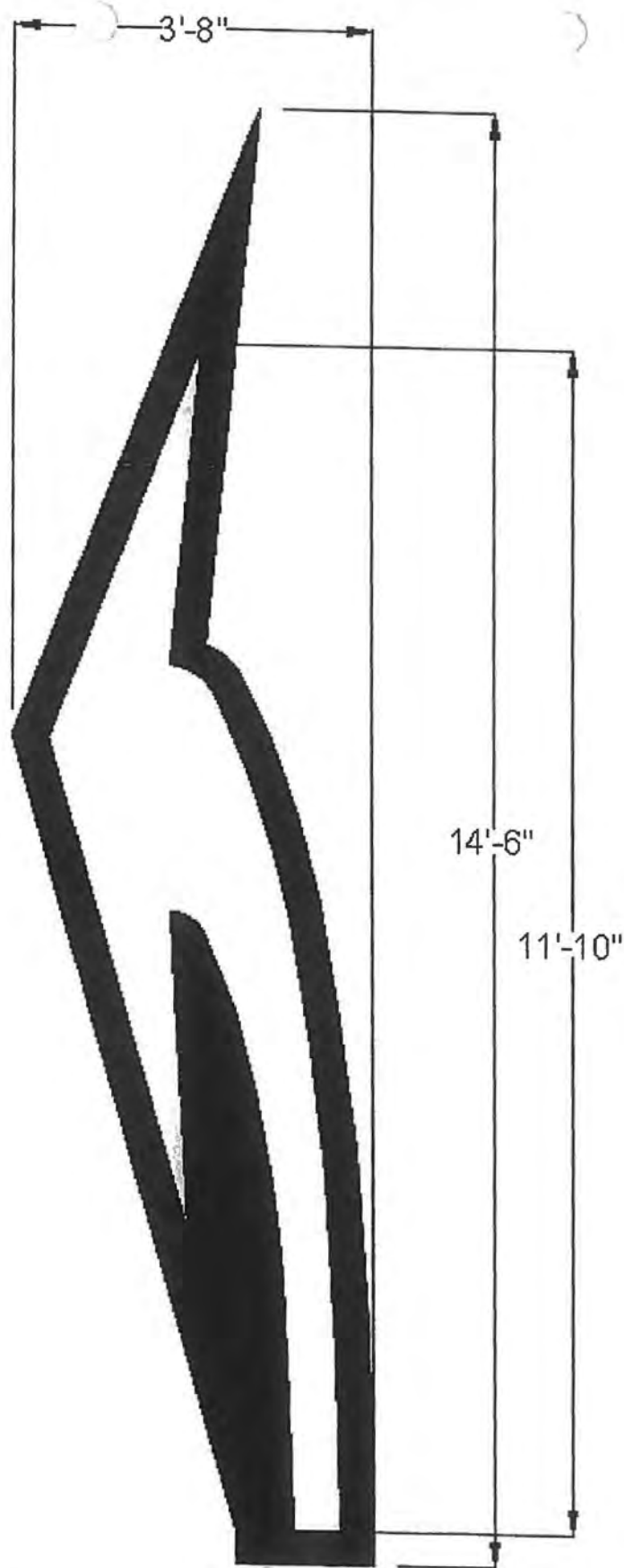


12' TURN ARROW NEW FHWA

Premark Design Number

330247

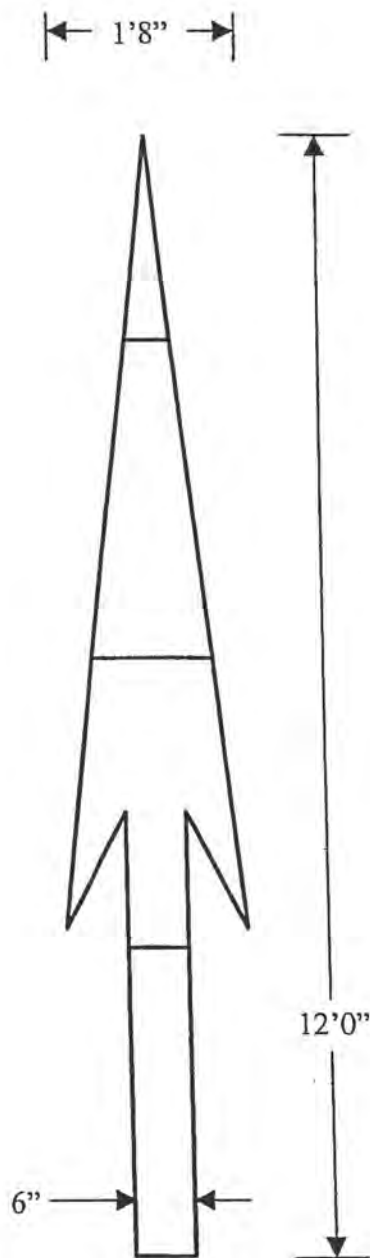
(Left Arrow Set Up As Shown, Right Arrow Reverse Image)



12' Left Turn Arrow w/4" contrast



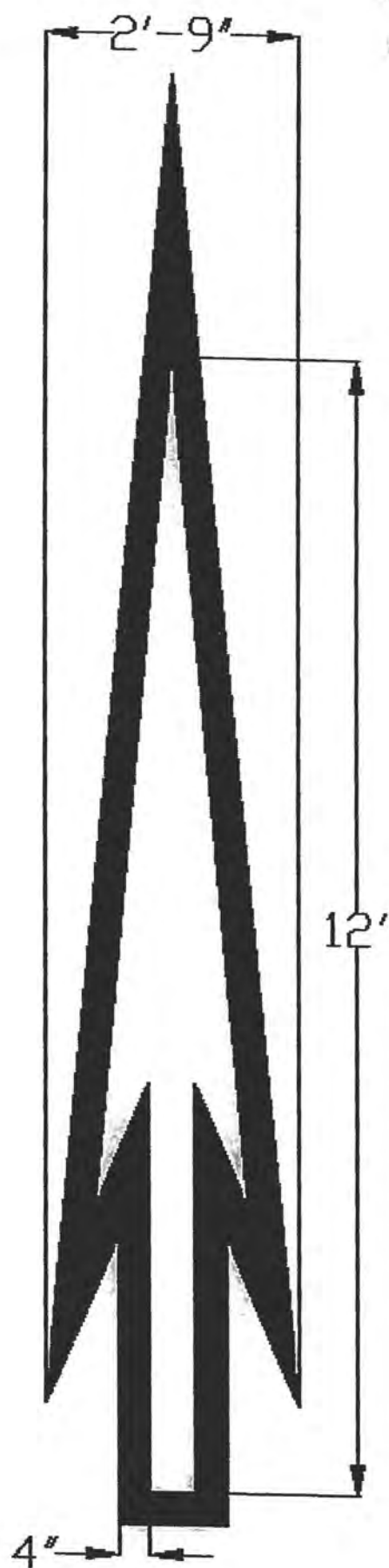
FLINT TRADING, INC.



12' STRAIGHT ARROW NEW FHWA

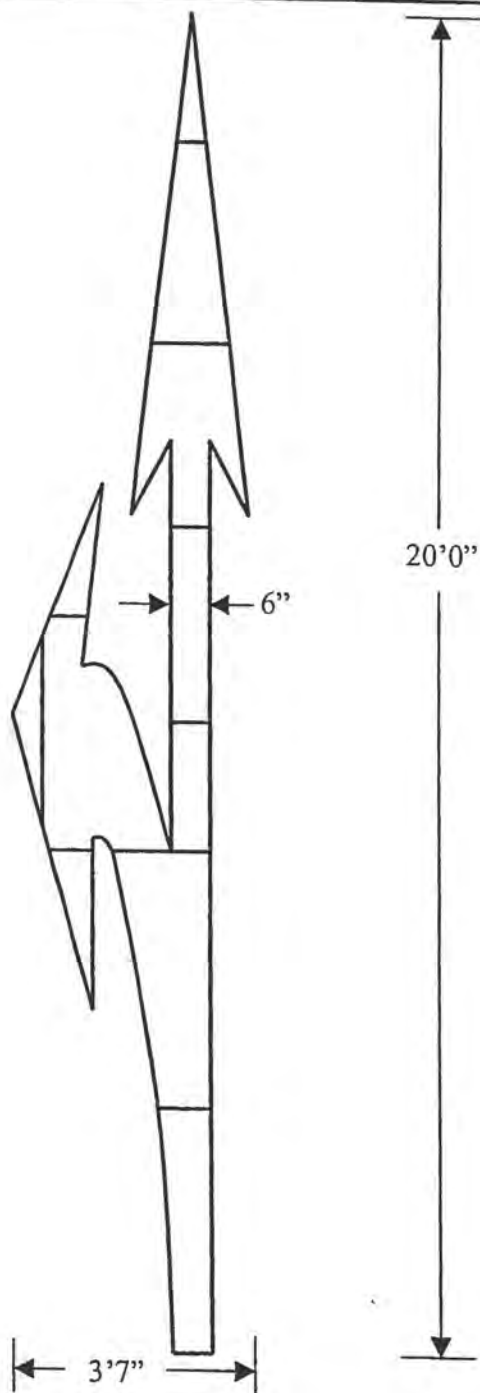
Premark Design Number

330248



12' STRAIGHT ARROW CONTRAST

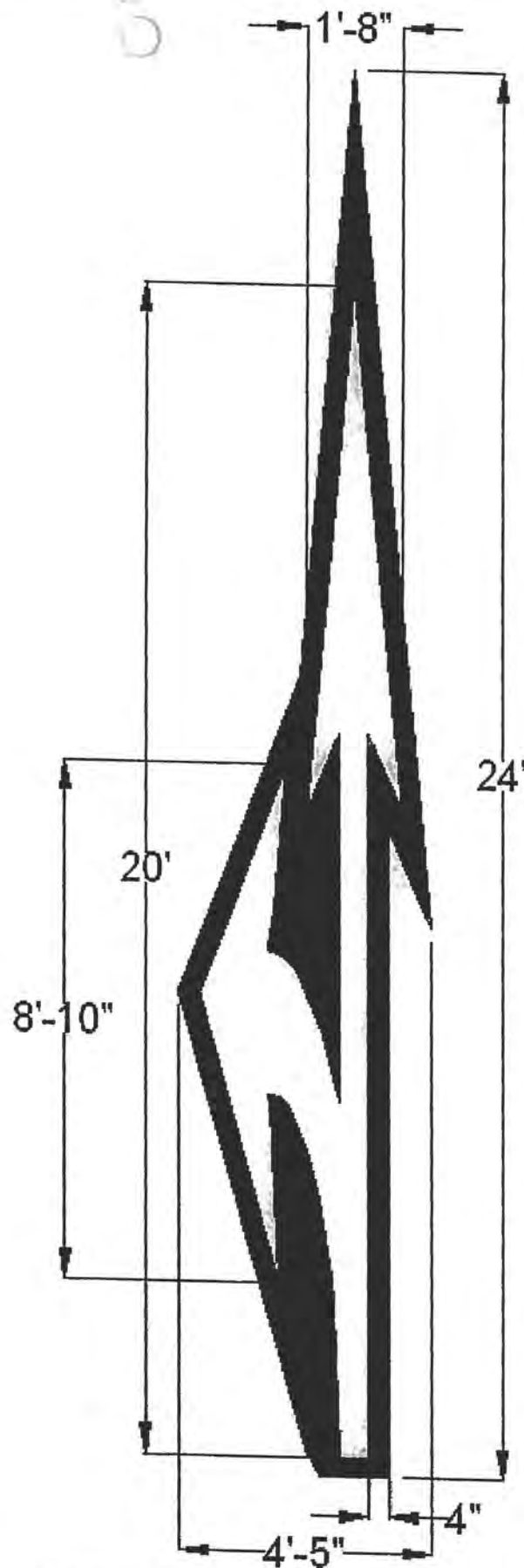
FLINT TRADING, INC.



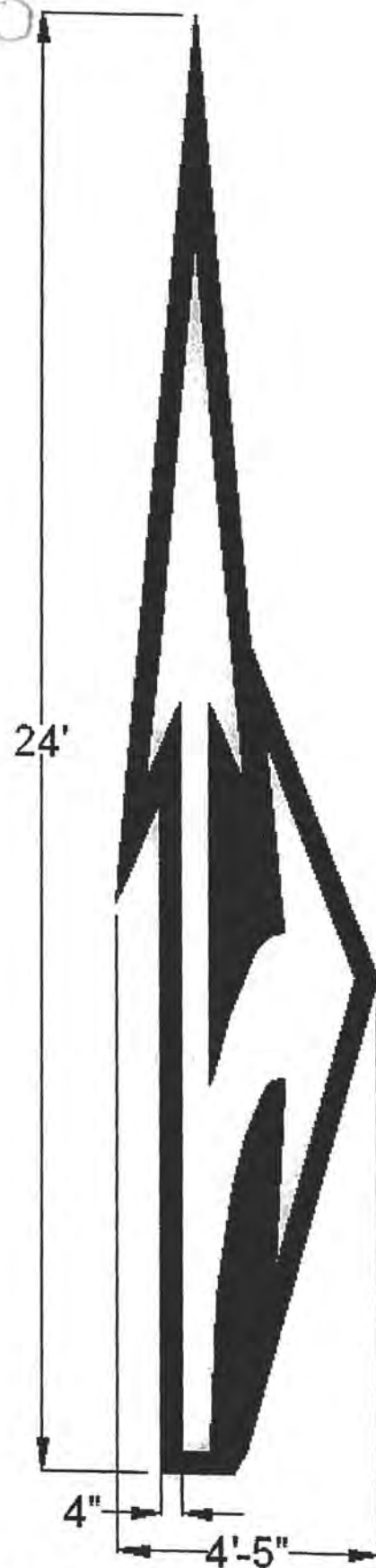
20' COMBI ARROW NEW FHWA

Premark Design Number 330149

(Left Arrow Set Up As Shown, Right Arrow Reverse Image)



20' COMBI ARROW LEFT - NEW FHWA



20' COMBI ARROW RIGHT W/CONTRAST

Appendix M

**NOTE: Appendix Information is for Reference Only.
Contact Local Entity Engineer for
Current Information.**

Appendix M shall be used as a reference for curb ramps within the City Limits of Loveland.

CURB RAMP GENERAL NOTES

- ①
- IN NEW DEVELOPMENT CONSTRUCTION, PROVIDE A SEPARATE CURB RAMP FOR EACH MARKED OR UNMARKED PEDESTRIAN STREET CROSSING. CURB RAMPS SHALL BE CONTAINED WHOLLY WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING OR CROSSWALK THEY SERVE, OR AS SHOWN ON THE APPROVED PLANS.
- ②
- A WALKABLE SURFACE IS DEFINED AS A PAVED SURFACE ADJACENT TO A CURB RAMP OR TURNING SPACE, WITHOUT RAISED OBSTACLES.
- ③
- ALTERATIONS ARE DEFINED AS CHANGES TO AN EXISTING ROADWAY THAT AFFECT PEDESTRIAN ACCESS, CIRCULATION, OR USE. ALTERATIONS INCLUDE, BUT ARE NOT LIMITED TO, RESURFACING, REHABILITATION, RECONSTRUCTION, CURB RAMP RETROFITS, HISTORIC RESTORATION, OR CHANGES OR REARRANGEMENT TO STRUCTURAL PARTS OR ELEMENTS OF A PEDESTRIAN FACILITY.
- ④
- IN ALTERATIONS, WHERE AN EXISTING PHYSICAL CONSTRAINT PREVENTS PROVIDING A SEPARATE CURB RAMP FOR EACH PEDESTRIAN STREET CROSSING, A SINGLE RAMP (ON THE APEX) SHALL BE PERMITTED TO SERVE BOTH PEDESTRIAN STREET CROSSINGS. THE USE OF A SINGLE RAMP SHALL BE APPROVED BY THE LOCAL ENTITY ENGINEER PRIOR TO CONSTRUCTION. SINGLE RAMPS ON THE APEX ARE NOT ACCEPTABLE IN NEW DEVELOPMENT CONSTRUCTION.
- ⑤
- DESIGN AND CONSTRUCT CURB RAMPS, TURNING SPACES, AND FLARE SLOPES WITH THE FLATTEST SLOPE POSSIBLE. THE SLOPES INDICATED IN THESE DETAILS SHOW THE MAXIMUM SLOPES ALLOWABLE. PREFERRED VALUES TO BE USED DURING DESIGN, LAYOUT, AND CONSTRUCTION ARE:

-

RAMP RUNNING SLOPE 7.5%

-

RAMP CROSS SLOPE 1.5%

-

TURNING SPACE RUNNING SLOPE 1.5%

-

TURNING SPACE CROSS SLOPE 1.5%

-

FLARE SLOPE 8.0% – 9.0%
- ⑥
- THE CONTRACTOR SHALL VERIFY REMOVAL LIMITS ARE SUFFICIENT TO PROVIDE POSITIVE DRAINAGE, MAINTAIN EXISTING DRAINAGE PATTERNS, AND AVOID PONDING IN THE FINAL CONFIGURATION.
- ⑦
- DETECTABLE WARNING SURFACES ARE INTENDED TO INDICATE THE BOUNDARY BETWEEN A PEDESTRIAN ROUTE AND VEHICULAR ROUTE WHERE THERE IS A FLUSH RATHER THAN CURBED CONNECTION. DETECTABLE WARNING SURFACES ARE NOT INTENDED TO PROVIDE WAYFINDING. DETECTABLE WARNING SURFACES SHALL BE PROVIDED AT THE FOLLOWING LOCATIONS:

1)

CURB RAMPS, BLENDED TRANSITIONS, AND DEPRESSED CORNERS AT PEDESTRIAN STREET CROSSINGS

2)

PEDESTRIAN REFUGE ISLANDS (6 FEET IN WIDTH OR GREATER)

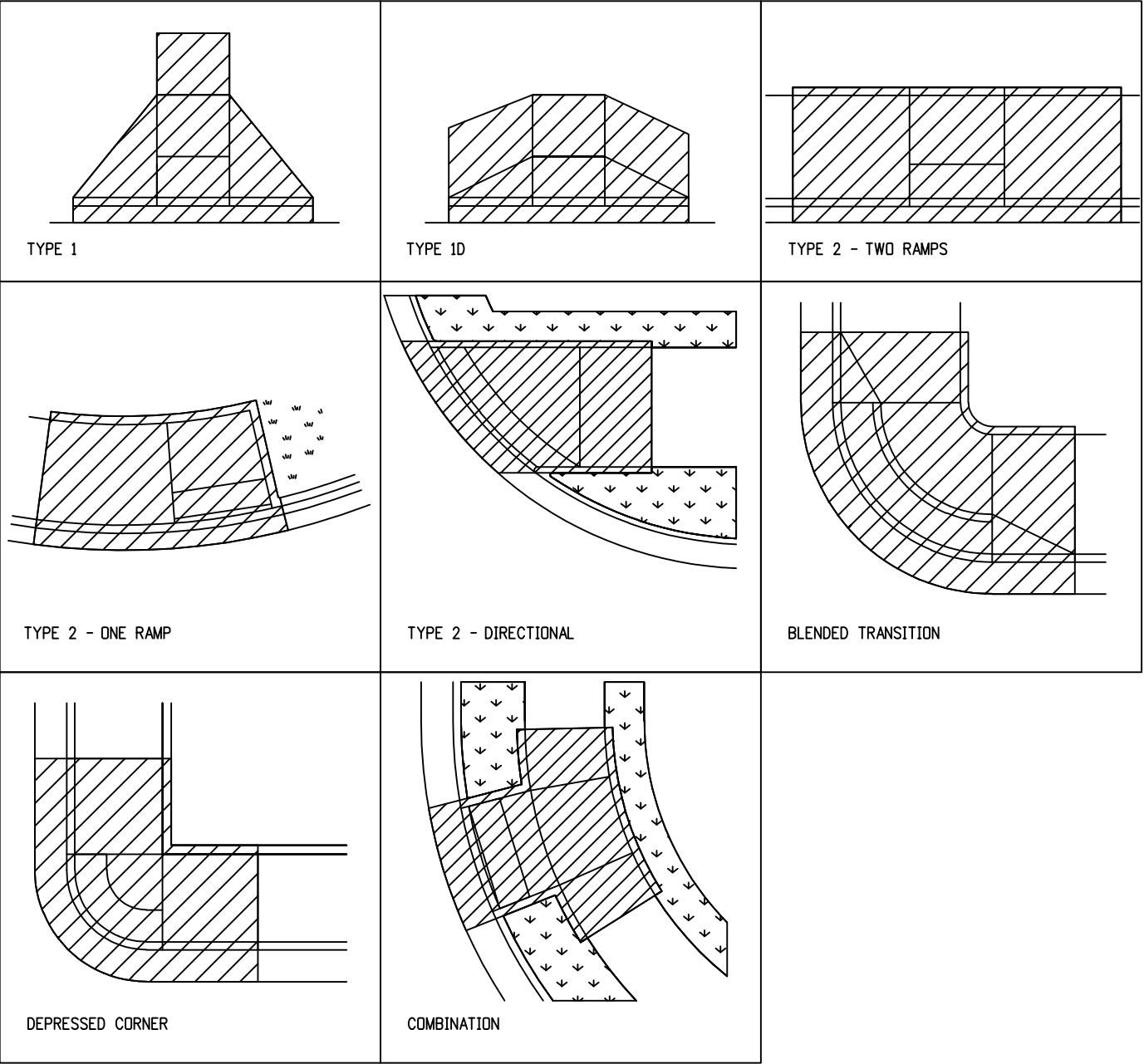
3)

BOARDING PLATFORMS AT TRANSIT STOPS WHERE THE EDGE OF THE PLATFORM IS NOT PROTECTED TO PEDESTRIAN CROSS TRAFFIC

4)

BOARDING AREAS AT SIDEWALK OR STREET LEVEL TRANSIT STOPS WHERE THE AREA IS NOT PROTECTED TO PEDESTRIAN CROSS TRAFFIC
- ⑧
- DETECTABLE WARNING SURFACES SHALL CONTRAST VISUALLY WITH THE ADJACENT GUTTER, ROADWAY, OR PEDESTRIAN ACCESS ROUTE SURFACE, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT.
- ⑨
- ALL SLOPES ARE MEASURED WITH RESPECT TO A LEVEL PLANE.
- ⑩
- FLARED SIDE SLOPES MAY EXCEED 10.0% ONLY WHERE THEY ABUT AN NON-WALKABLE SURFACE, OR WHERE THE ADJACENT RAMP SURFACE IS BLOCKED TO PEDESTRIAN TRAFFIC.
- ⑪
- IN ALTERATIONS, TO AVOID CHASING GRADE INDEFINITELY ON STEEP ROADWAYS, A CURB RAMPS LENGTH IS NOT REQUIRED TO EXCEED 15 FEET, REGARDLESS OF THE RESULTING RAMP RUNNING SLOPE.
- ⑫
- IN ALTERATIONS, WHERE A RAMP OR TURING SPACE MUST TIE INTO AN EXISTING GRADE THAT CANNOT BE ALTERED, THE RAMP OR TURNING SPACE MAY BE WARPED TO TRANSITION TO THE REQUIRED CROSS SLOPE. THE TRANSITION TO THE REQUIRED CROSS SLOPE SHALL BE SPREAD EVENLY OVER THE LENGTH OF THE RAMP OR TURNING SPACE TO MINIMIZE THE DEGREE OF WARPING. THE RATE OF CHANGE ON A RAMP OR TURNING SPACE SHALL NOT EXCEED 3% PER LINEAR FOOT.
- ⑬
- IN NEW DEVELOPMENT CONSTRUCTION, PULL BOXES, METER BOXES, MAINTENANCE HOLE COVERS, VAULT LIDS, OR SIMILAR, SHALL NOT BE CONSTRUCTED WITHIN ANY PART OF THE CURB RAMP OR TURNING SPACE. IN ALTERATIONS, WHERE THESE ITEMS CANNOT BE RELOCATED OUTSIDE OF THE CURB RAMP OR TURNING SPACE, THEY SHALL NOT CREATE A VERTICAL DISCONTINUITY GREATER THAN 1/2 INCH. ANY VERTICAL DISCONTINUITY BETWEEN 1/4 INCH AND 1/2 INCH SHALL BE BEVELED WITH A SLOPE NOT STEEPER THAN 1V:2H. THE BEVEL SHALL BE APPLIED ACROSS THE ENTIRE SURFACE DISCONTINUITY.
- ⑭
- DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, OR OTHER OBSTRUCTIONS SHALL NOT BE INSTALLED ON THE CURB RAMP OR TURNING SPACE AREAS.
- ⑮
- ALL CURB RAMP JOINTS AND GRADE BREAKS SHALL BE FLUSH (0" – 1/8"). THE JOINT BETWEEN THE ROADWAY SURFACE AND THE GUTTER PAN SHALL BE FLUSH.
- ⑯
- THE CHANGE IN GRADE AT THE BOTTOM OF THE CURB RAMP SHALL NOT EXCEED AN ALGEBRAIC DIFFERENCE OF 13.33%. THE COUNTER SLOPE OF THE GUTTER AT THE FOOT OF THE RAMP, TURNING SPACE, OR BLENDED TRANSITION SHALL NOT EXCEED 5.0%.
- ⑰
- GRADE BREAKS AT THE TOP AND BOTTOM OF RAMP RUNS SHALL BE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. GRADE BREAKS SHALL NOT BE PERMITTED ON THE SURFACE OF THE RAMP OR TURNING SPACE. SURFACE SLOPES THE MEET AT GRADE BREAKS SHALL BE FLUSH.
- ⑱
- A BROOM FINISH, WITH SWEEPS PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAFFIC, SHALL BE APPLIED TO ALL RAMP AND TURNING SPACE SURFACES.
- ⑲
- PROVIDE TIE BAR REINFORCING BETWEEN INDEPENDENTLY PLACED CONCRETE CURB RAMPS OR TURNING SPACES AND CURB AND GUTTER. DRILL AND GROUT NO. 4 12 INCH LONG REINFORCEMENT BARS (EPOXY COATED) AT 18 INCHES ON CENTER MINIMUM.
- ⑳
- THE USE OF CURB RAMPS TYPE 2, WHILE COMPLIANT WITH THE AMERICANS WITH DISABILITIES ACT (ADA), IS DISCOURAGED BY THE CITY OF LOVELAND DUE TO POTENTIAL ISSUES WITH PONDING WATER, DEBRIS COLLECTION AND ICE. TYPE 2 SERIES RAMPS WILL ONLY BE ALLOWED WHEN NO OTHER ADA COMPLIANT RAMP IS FEASIBLE.

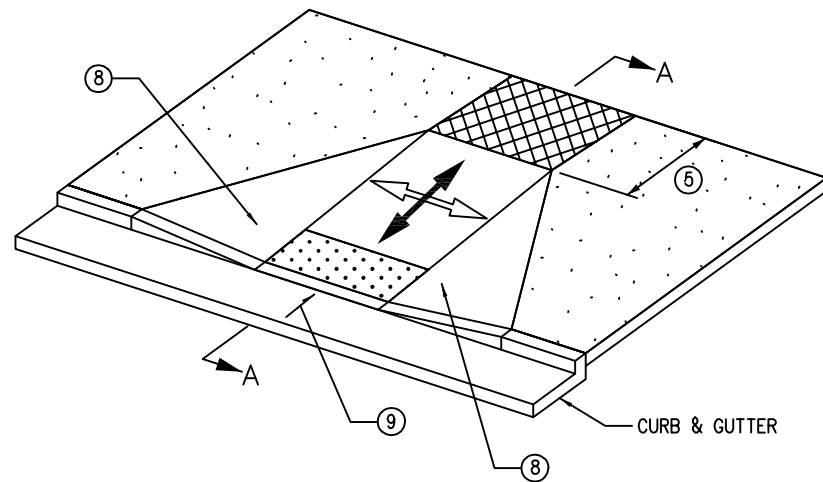
CURB RAMP PAY AREAS FOR CITY OF LOVELAND PROJECTS ONLY



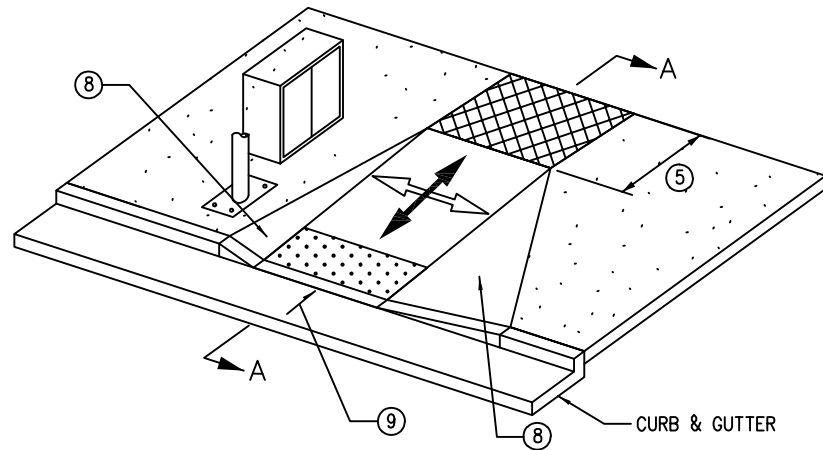
PERCENT SLOPE	1.0%	2.0%	5.0%	7.1%	8.3%	10.0%
EQUIVALENT RUN/RISE	100:1	50:1	20:1	14:1	12:1	10:1

SLOPE TABLE

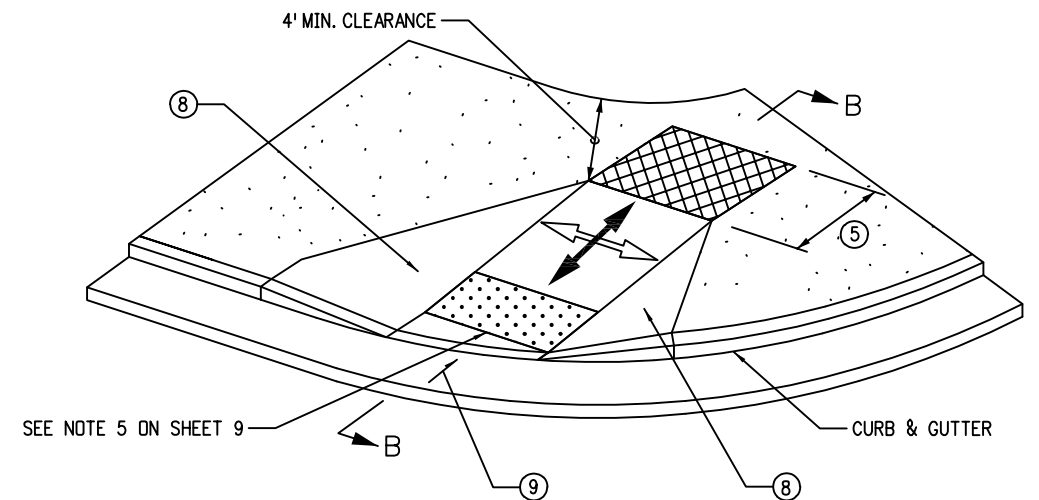
ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 1 OF 10 (LAST MODIFICATION DATE: 7/31/19 BY LTA) Modified by: B Reiter	DESCRIPTION	DATE:		CITY OF LOVELAND, CO DESIGN AND CONSTRUCTION STANDARDS	CURB RAMP GENERAL NOTES	NOT TO SCALE
	EFFECTIVE	08/01/2021				
						SHEET 1



CURB RAMP TYPE 1A



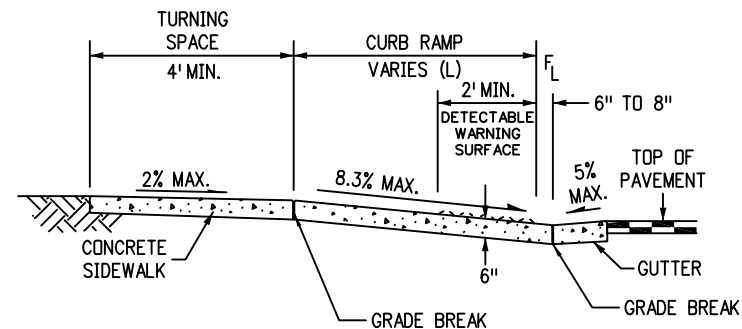
CURB RAMP TYPE 1B



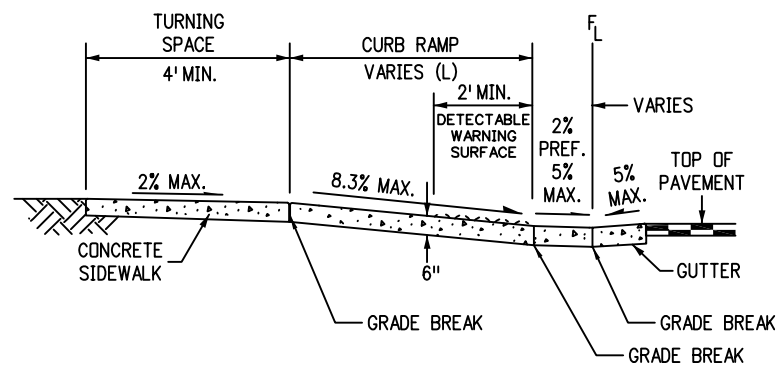
CURB RAMP TYPE 1C

NOTES

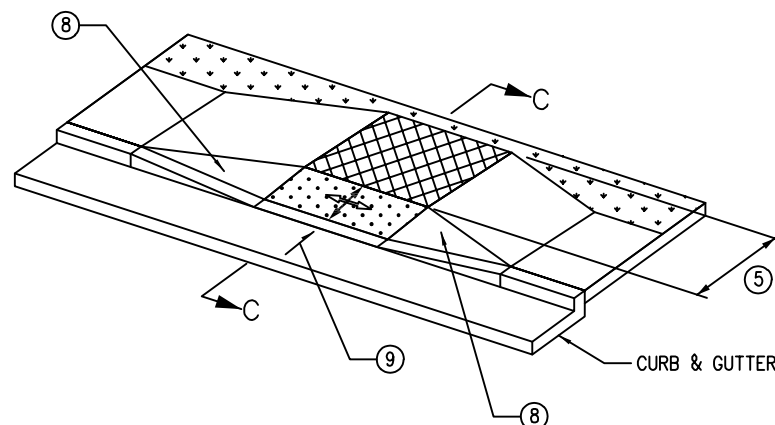
- ① RAMP WIDTH – PROVIDE 5 FT. OR GREATER WHERE POSSIBLE. IF SITE CONSTRAINTS DO NOT PERMIT, PROVIDE 4 FT. MINIMUM. RAMPS SERVICING SHARED USE PATHS SHALL MATCH THE WIDTH OF THE PATH.
- ② RAMP RUNNING SLOPE – 8.3% MAXIMUM
- ③ RAMP CROSS SLOPE – 2.0% MAXIMUM
- ④ TURNING SPACE CROSS AND RUNNING SLOPE – 2.0% MAXIMUM
- ⑤ TURNING SPACE DIMENSIONS – PROVIDE A SPACE AT THE TOP OF TYPE 1 RAMPS WITH A WIDTH EQUAL TO THE WIDTH OF THE CURB RAMP. TURNING SPACE LENGTH MUST BE 4 FT. MINIMUM, MEASURED IN THE DIRECTION OF THE RAMP RUN. WHEN A TURNING SPACE IS CONSTRAINED AT THE BACK OF SIDEWALK, INCREASE LENGTH TO 5 FT. MINIMUM IN THE DIRECTION OF THE RAMP RUN.
- ⑥ RAMP ALIGNMENT – RAMPS SHALL BE ALIGNED TO BE FULLY WITHIN THE CROSSWALK OR STREET CROSSING THEY SERVE. PROVIDE ONE RAMP FOR EACH STREET CROSSING DIRECTION. IN ALTERATIONS, WHERE EXISTING PHYSICAL CONSTRAINTS PREVENT PROVIDING ONE CURB RAMP FOR EACH CROSSING DIRECTION, A SINGLE RAMP (PLACED ON THE APEX OF A CORNER) SHALL BE PERMITTED TO SERVE BOTH STREET CROSSINGS. IF A SINGLE RAMP ON THE APEX IS USED, A CLEAR SPACE 4 FT. X 4 FT. MINIMUM MUST BE PROVIDED AT THE BASE OF THE RAMP. THE CLEAR SPACE MUST BE WITHIN BOTH CROSSINGS AND WHOLLY OUTSIDE OF ANY ADJACENT VEHICULAR TRAVEL LANES. A SINGLE RAMP ON THE APEX IS NOT ACCEPTABLE IN NEW DEVELOPMENT CONSTRUCTION.
- ⑦ RAMP LENGTH – TYPE 1 CURB RAMP LENGTH IS DEPENDENT UPON THE RAMP SLOPE, HEIGHT OF THE CURB, AND ADJACENT SIDEWALK CROSS-SLOPE. WHERE TERRAIN IS SLOPING, A RAMP IS NOT REQUIRED TO CHASE GRADE MORE THAN 15 FT., REGARDLESS OF THE RESULTING RAMP SLOPE.
- ⑧ RAMP FLARES – WHERE A RAMP EDGE ABUTS A WALKABLE SURFACE, A FLARED SIDE SHALL BE PROVIDED. RAMP FLARE SLOPES SHALL NOT EXCEED 10.0% EXCEPT WHERE THEY ABUT A NON-WALKABLE SURFACE, OR WHERE THE ADJACENT RAMP SURFACE IS BLOCKED TO PEDESTRIAN TRAFFIC.
- ⑨ GUTTER SLOPE – 5.0% MAXIMUM



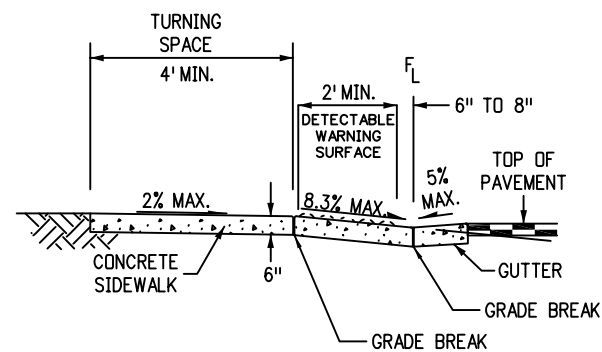
SECTION A-A



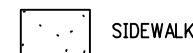
SECTION B-B



CURB RAMP TYPE 1D



SECTION C-C



SIDEWALK



TURNING SPACE ③ ④ ⑤



DETECTABLE WARNING SURFACE

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 2 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

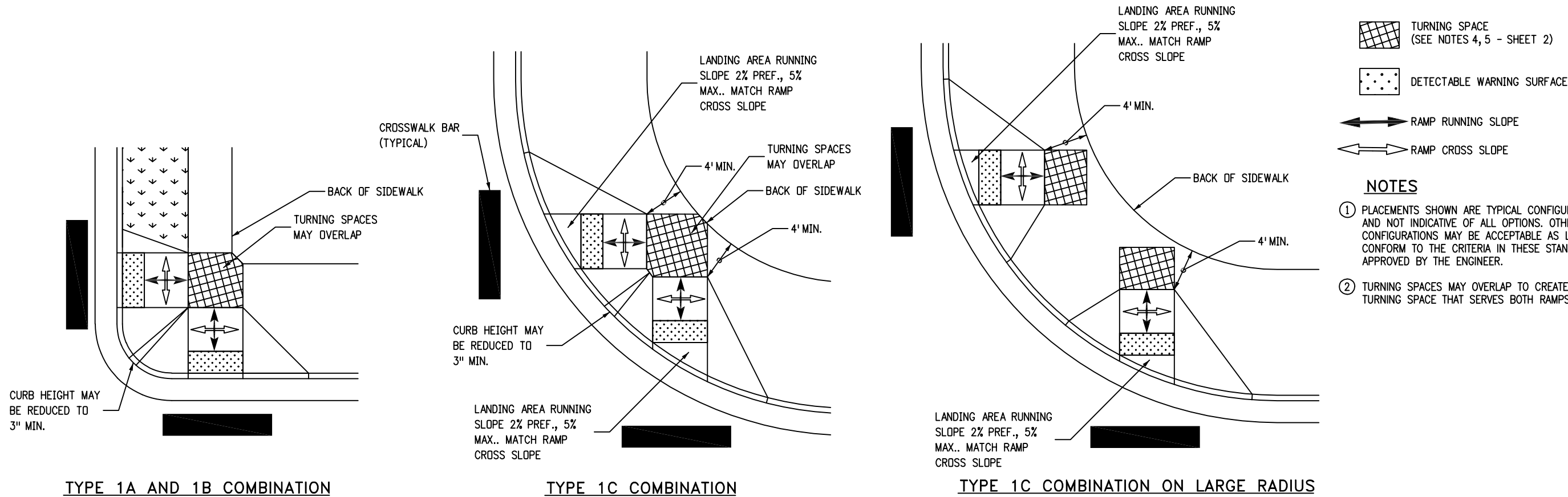


CITY OF LOVELAND, CO
CONSTRUCTION DRAWINGS

CURB RAMP
TYPE 1
DETAILS AND NOTES

NOT TO SCALE

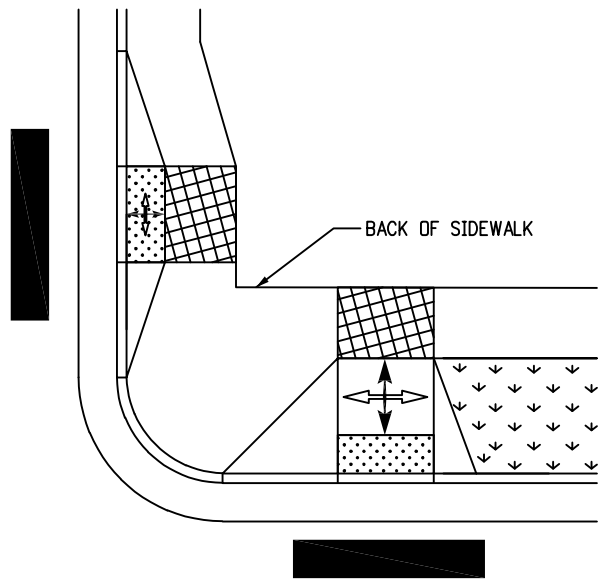
SHEET 2



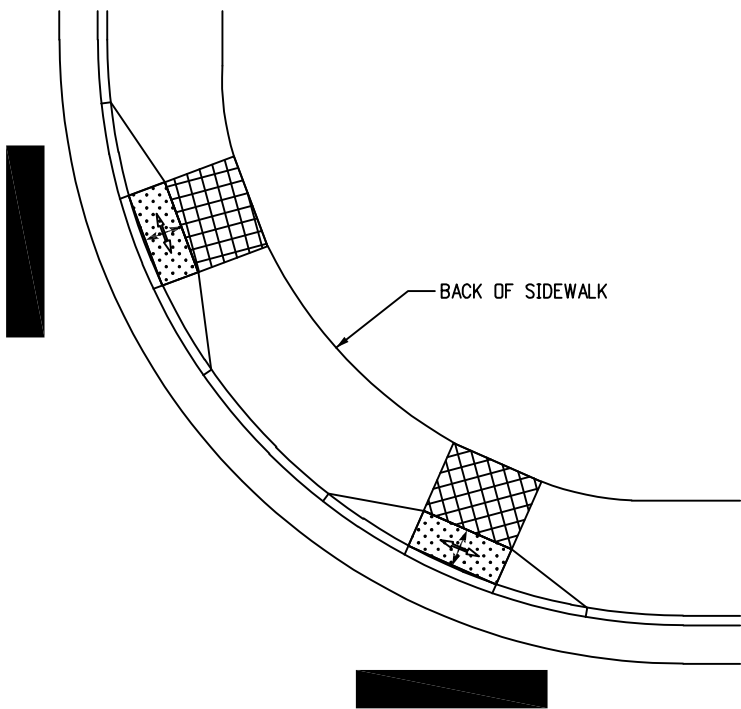
TYPE 1A AND 1B COMBINATION

TYPE 1C COMBINATION

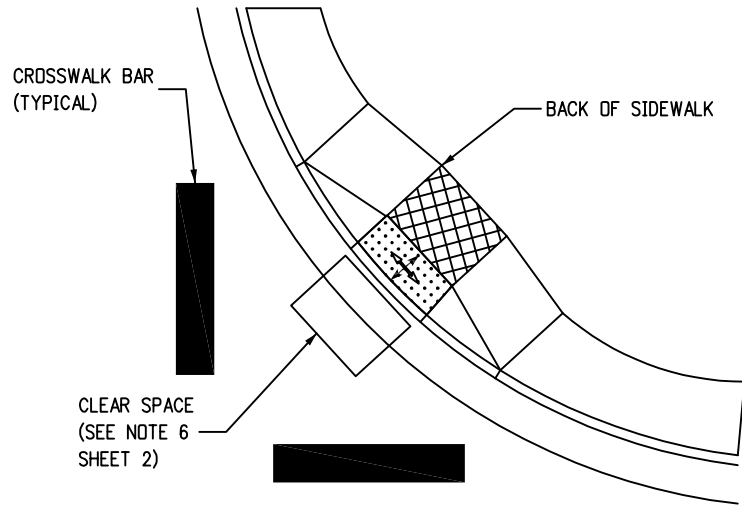
TYPE 1C COMBINATION ON LARGE RADIUS



TYPE 1B AND 1D COMBINATION

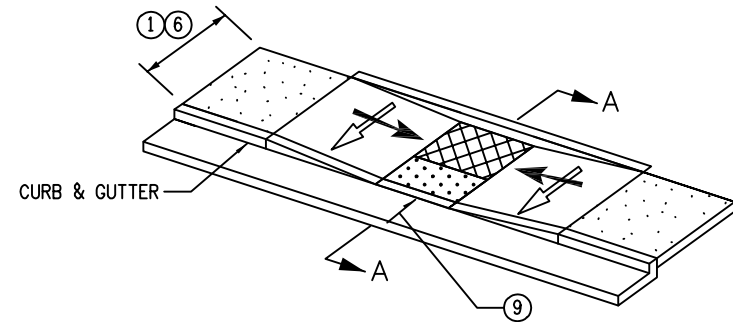


TYPE 1D COMBINATION

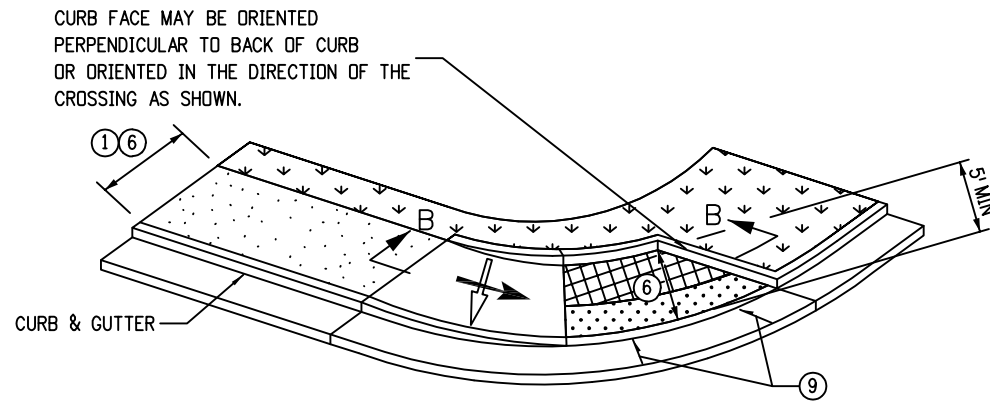


TYPE 1D ON THE APEX
SEE NOTE 6 ON SHEET 2

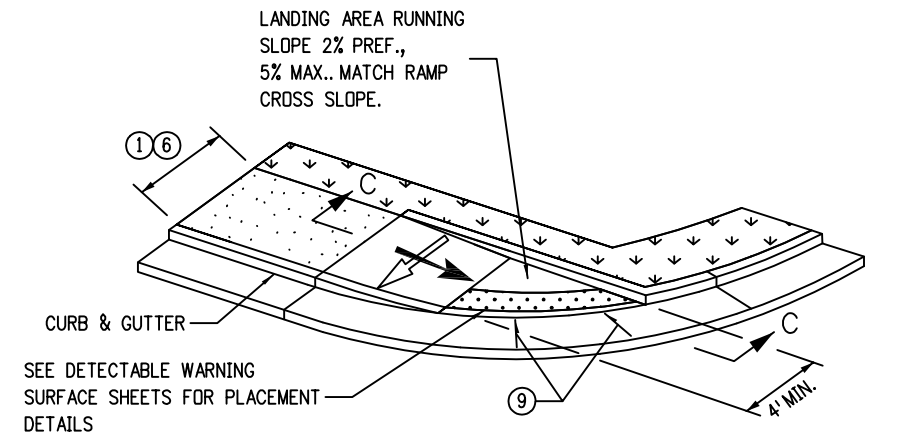
ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 3 OF 10 (LAST MODIFICATION DATE: 7/31/19 BY LTA) Modified by: B Reiter	DESCRIPTION	DATE:		CITY OF LOVELAND, CO DESIGN AND CONSTRUCTION STANDARDS	CURB RAMP TYPE 1 TYPICAL CONFIGURATIONS	NOT TO SCALE
	EFFECTIVE	08/01/2021				
						SHEET 3



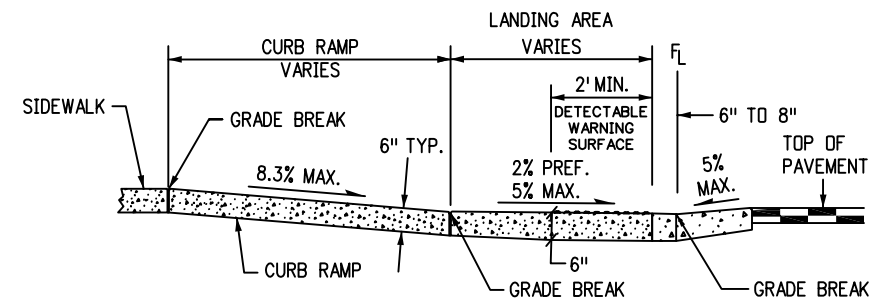
CURB RAMP TYPE 2A
(TYPICAL)



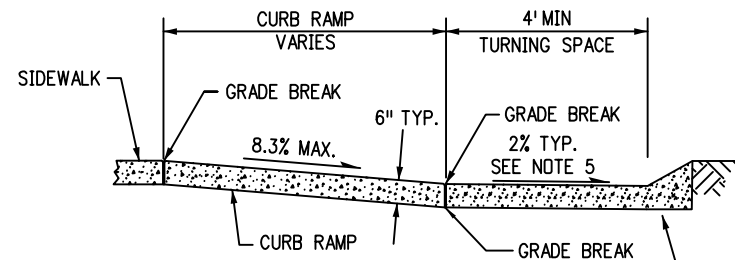
CURB RAMP TYPE 2B
(SIDEWALK ENDS)



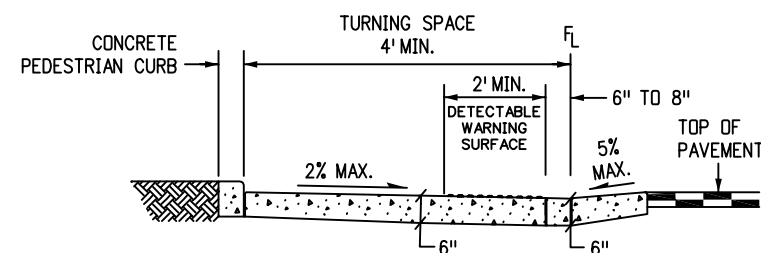
CURB RAMP TYPE 2C
(DIRECTIONAL - CROSSING IN ONE DIRECTION ONLY)



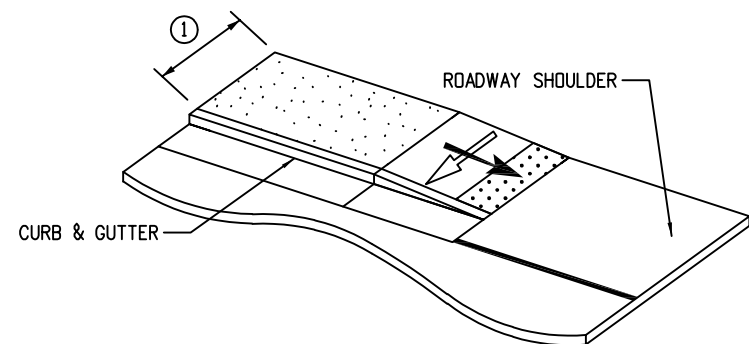
SECTION C-C



SECTION B-B



SECTION A-A



SIDEWALK TO SHOULDER TRANSITION

NOTES

- ① RAMP WIDTH - PROVIDE A RAMP WIDTH EQUAL TO THE ADJOINING SIDEWALK. PROVIDE 4 FT. MINIMUM. RAMP SERVING SHARED USE PATHS SHALL MATCH THE WIDTH OF THE PATH.
- ② RAMP RUNNING SLOPE - 8.3% MAXIMUM
- ③ RAMP CROSS SLOPE - 2.0% MAXIMUM
- ④ TURNING SPACE RUNNING SLOPE - 2.0% MAXIMUM. MEASURED PERPENDICULAR TO BACK OF CURB.
- ⑤ TURNING SPACE CROSS SLOPE - 2.0% MAXIMUM
- ⑥ TURNING SPACE DIMENSIONS - PROVIDE A TURNING SPACE AT THE BOTTOM OF TYPE 2 RAMP WITH A WIDTH EQUAL TO THE WIDTH OF THE CURB RAMP. TURNING SPACE LENGTH MUST BE 4 FT. MINIMUM, MEASURED IN THE DIRECTION OF THE RAMP RUN. WHEN A TURNING SPACE IS CONSTRAINED AT THE BACK OF SIDEWALK, INCREASE LENGTH TO 5 FT. MINIMUM IN THE DIRECTION OF THE STREET CROSSING. THE TURNING SPACE MAY CONTAIN THE DETECTABLE WARNING SURFACE.
- ⑦ RAMP ALIGNMENT - RAMP SHALL BE ALIGNED TO BE FULLY CONTAINED WITHIN THE CROSSWALK OR STREET CROSSING THEY SERVE. PROVIDE ONE RAMP FOR EACH STREET CROSSING DIRECTION. IN ALTERATIONS, WHERE EXISTING PHYSICAL CONSTRAINTS PREVENT PROVIDING ONE CURB RAMP FOR EACH CROSSING DIRECTION, A SINGLE RAMP (PLACED ON THE APEX OF A CORNER) SHALL BE PERMITTED TO SERVE BOTH STREET CROSSINGS. IF A SINGLE RAMP ON THE APEX IS USED, A CLEAR SPACE 4 FT. X 4 FT. MINIMUM MUST BE PROVIDED AT THE BASE OF THE RAMP. THE CLEAR SPACE MUST BE WITHIN BOTH CROSSINGS AND WHOLLY OUTSIDE OF ANY ADJACENT VEHICULAR TRAVEL LANES. A SINGLE RAMP ON THE APEX IS NOT ACCEPTABLE IN NEW CONSTRUCTION.
- ⑧ RAMP LENGTH - TYPE 2 CURB RAMP LENGTH IS DEPENDENT UPON THE RAMP SLOPE, HEIGHT OF THE CURB, AND ADJACENT SIDEWALK CROSS-SLOPE. WHERE TERRAIN IS SLOPING, A RAMP IS NOT REQUIRED TO CHASE GRADE MORE THAN 15 FT., REGARDLESS OF THE RESULTING RAMP SLOPE.
- ⑨ GUTTER SLOPE - 5.0% MAXIMUM
- ⑩ THE USE OF CURB RAMP TYPE 2B & 2C, WHILE COMPLIANT WITH THE AMERICANS WITH DISABILITIES ACT (ADA), IS DISCOURAGED BY THE CITY OF LOVELAND DUE TO POTENTIAL ISSUES WITH PONDING WATER, DEBRIS COLLECTION AND ICE. TYPE 2B & 2C SERIES RAMP WILL ONLY BE ALLOWED WHEN NO OTHER ADA COMPLIANT RAMP IS FEASIBLE. A CITY OF LOVELAND CURB RAMP VARIANCE FORM MUST BE SUBMITTED TO, AND APPROVED BY THE LOCAL ENTITY ENGINEER IN CHARGE OF THE RESPECTIVE PROJECT IN ORDER TO CONSTRUCT A TYPE 2B or 2C SERIES RAMP.

- ① SIDEWALK
- ② TURNING SPACE ④ ⑤ ⑥
- ③ DETECTABLE WARNING SURFACE

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 4 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

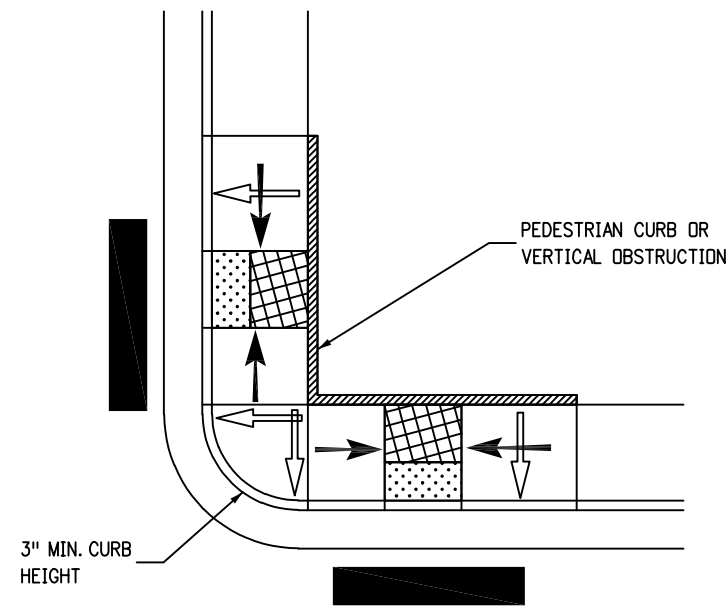


CITY OF LOVELAND, CO
DESIGN AND CONSTRUCTION
STANDARDS

CURB RAMP
TYPE 2
DETAILS AND NOTES

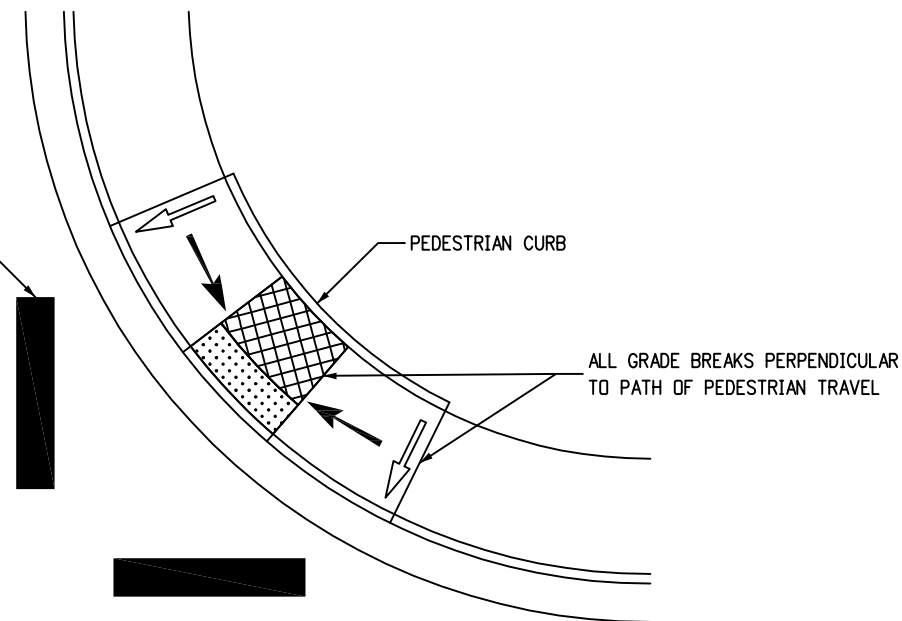
NOT TO SCALE

SHEET 4



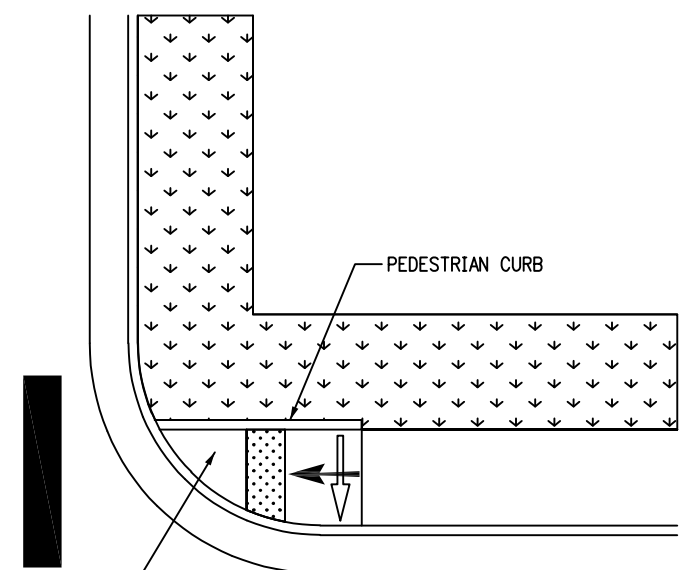
TYPE 2A COMBINATION
(3" REDUCED CURB)

CROSSWALK BAR
(TYPICAL)



TYPE 2A ON APEX OF RADIUS
NOT ALLOWABLE IN NEW CONSTRUCTION
SEE NOTE GENERAL NOTE 4

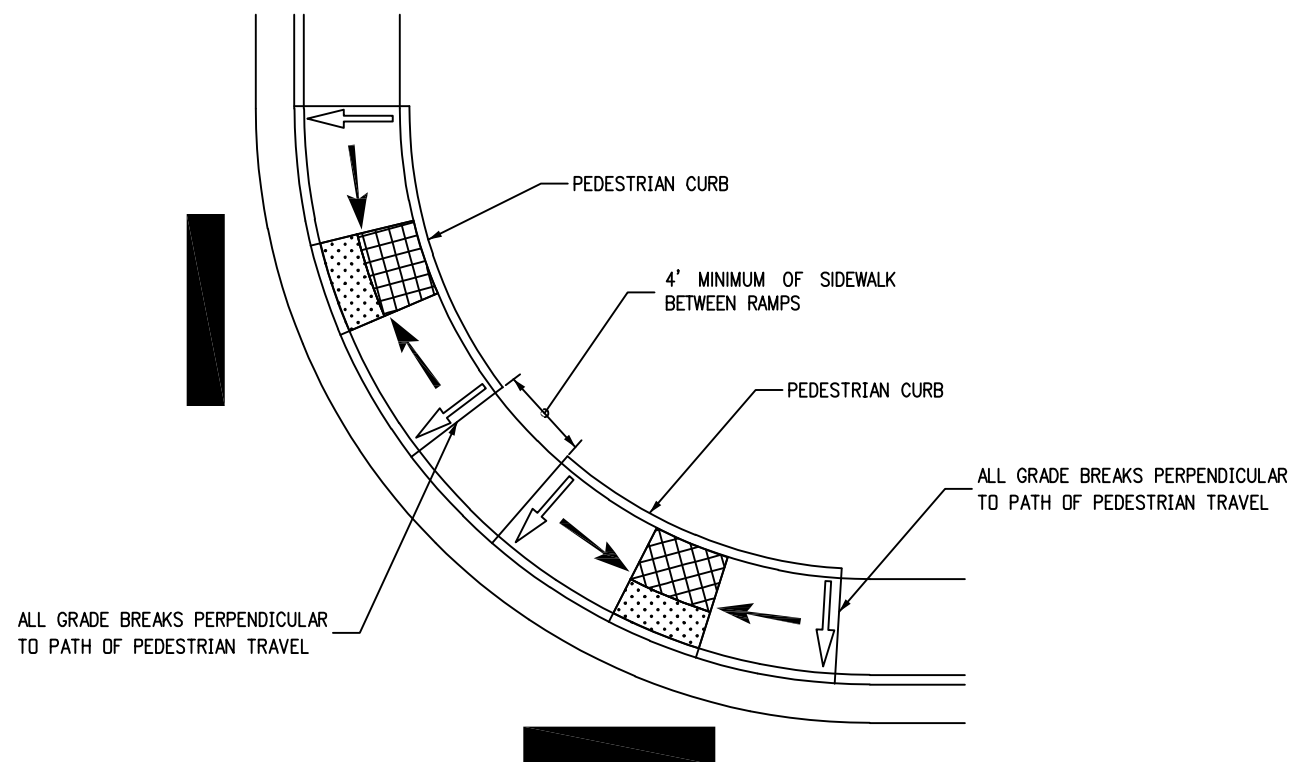
LANDING AREA RUNNING
SLOPE 2% PREF., 5% MAX..
MATCH RAMP CROSS SLOPE.



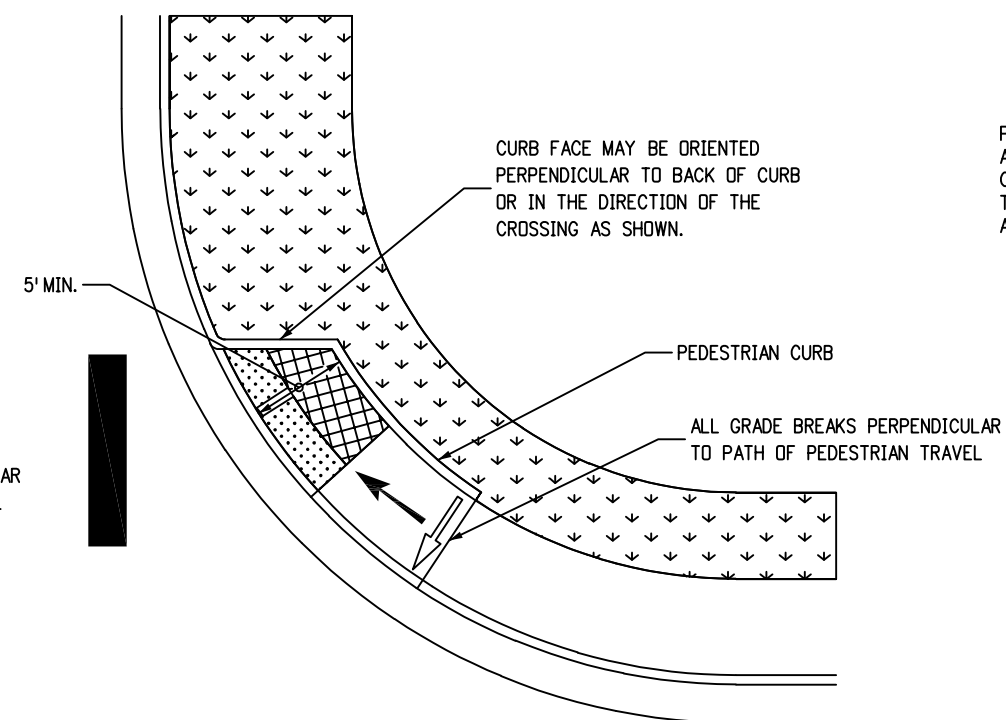
TYPE 2C
(CROSSING IN ONE DIRECTION)

NOTES

PLACEMENTS SHOWN ARE TYPICAL CONFIGURATIONS ONLY AND NOT INDICATIVE OF ALL OPTIONS. OTHER RAMP CONFIGURATIONS MAY BE ACCEPTABLE AS LONG AS THEY CONFORM TO THE CRITERIA IN THESE STANDARDS, AND ARE APPROVED BY THE ENGINEER.



TYPE 2A COMBINATION ON LARGE RADIUS



TYPE 2B ON LARGE RADIUS
(CROSSING IN ONE DIRECTION)

- TURNING SPACE
(SEE NOTE 4, 5, 6 - SHEET 4)
- DETECTABLE WARNING SURFACE
- RAMP RUNNING SLOPE
- RAMP CROSS SLOPE

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 5 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

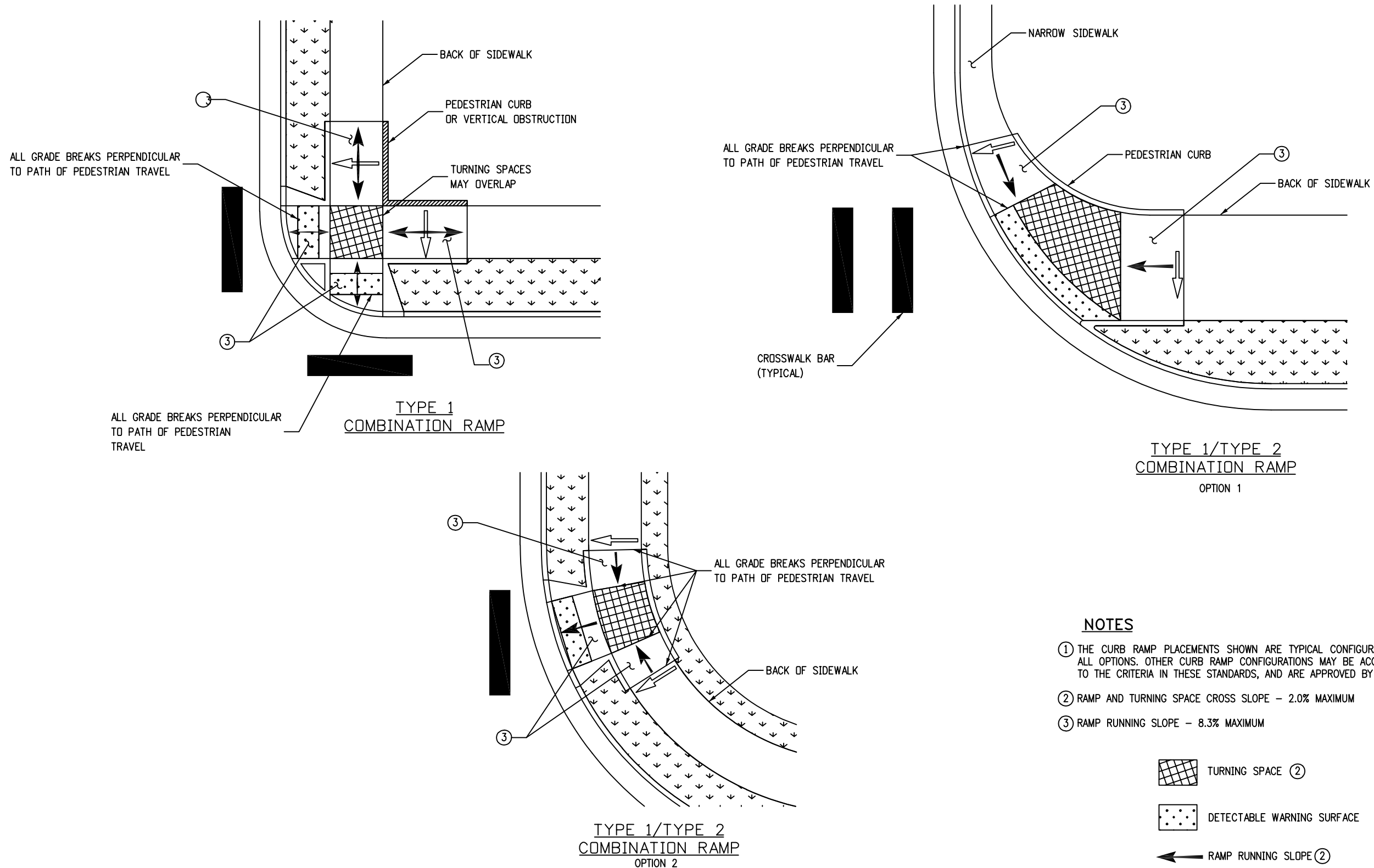


CITY OF LOVELAND, CO
DESIGN AND CONSTRUCTION
STANDARDS

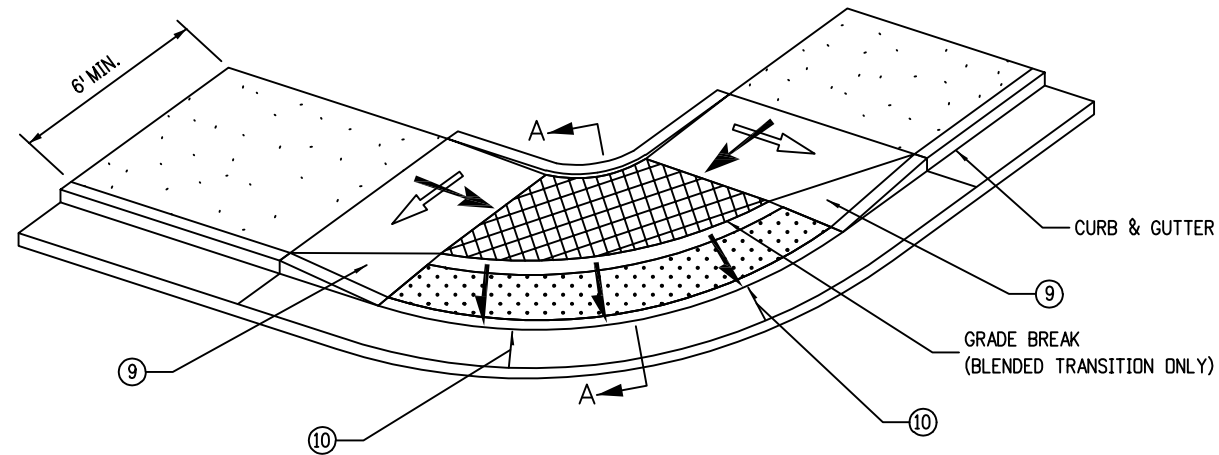
CURB RAMP
TYPE 2 TYPICAL
CONFIGURATIONS

NOT TO SCALE

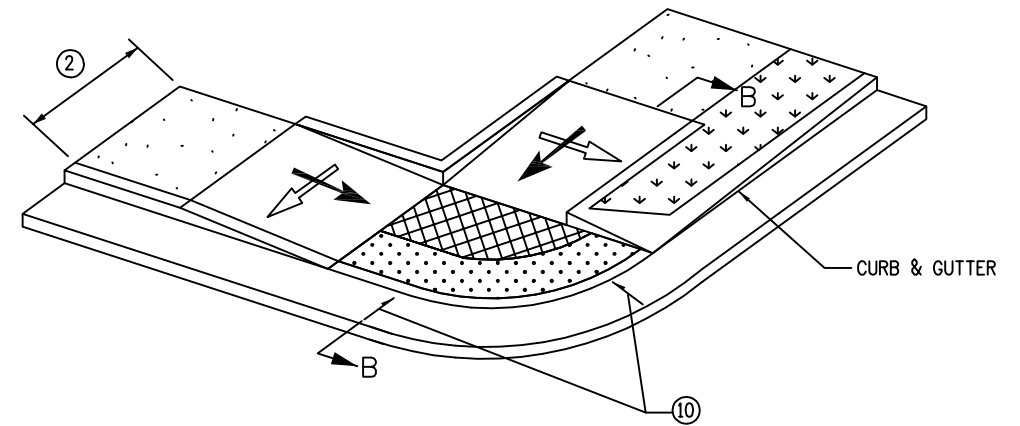
SHEET 5



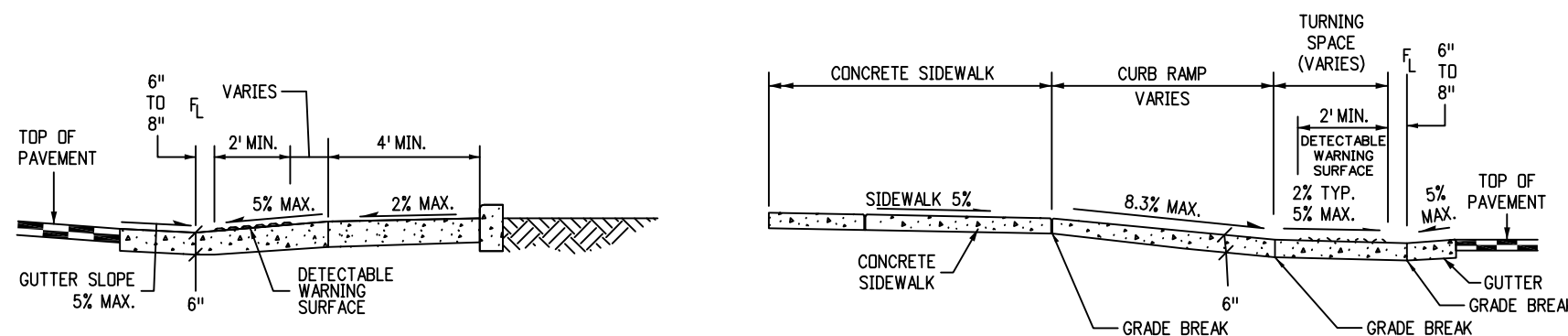
ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 6 OF 10 (LAST MODIFICATION DATE: 7/31/19 BY LTA) Modified by: B Reiter	DESCRIPTION	DATE:		CITY OF LOVELAND, CO DESIGN AND CONSTRUCTION STANDARDS	CURB RAMP TYPICAL COMBINATION CONFIGURATIONS	NOT TO SCALE
	EFFECTIVE	08/01/2021				
						SHEET 6



BLENDING TRANSITION

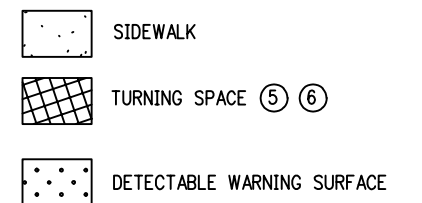


DEPRESSED CORNER



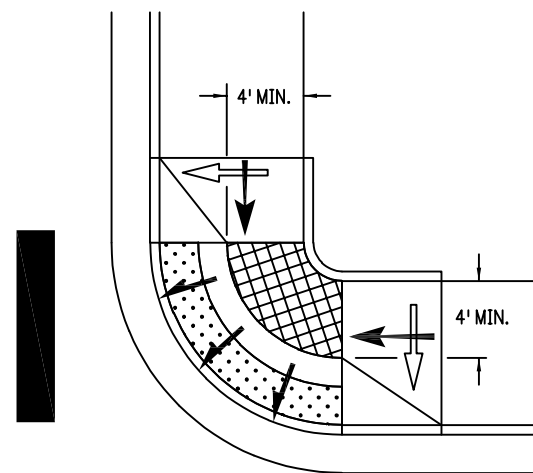
SECTION A-A

SECTION B-B

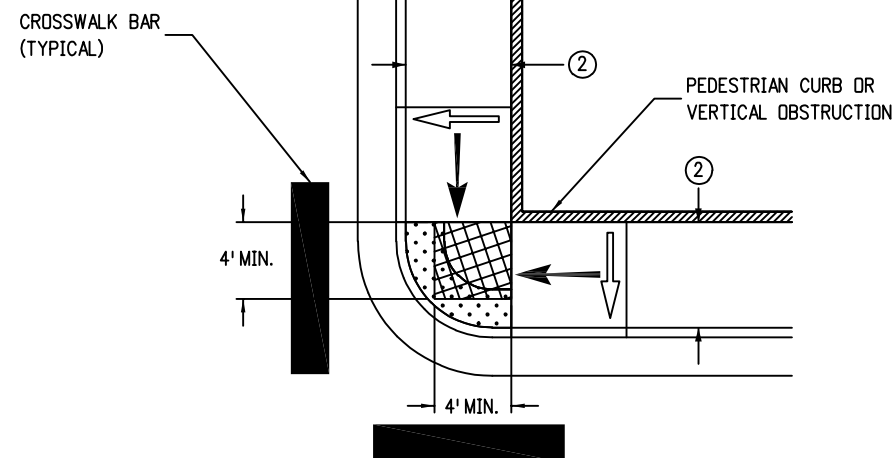


NOTES

- ① TYPE 1 AND TYPE 2 RAMP CONFIGURATIONS ARE PREFERRED. BLENDED TRANSITIONS AND DEPRESSED CORNERS SHOULD ONLY BE USED WHERE TYPE 1 AND TYPE 2 RAMPS CANNOT BE INSTALLED DUE TO PHYSICAL SITE CONSTRAINTS.
- ② RAMP WIDTH – PROVIDE 5 FT. OR GREATER WHERE POSSIBLE. IF SITE CONSTRAINTS DO NOT PERMIT, PROVIDE 4 FT. WIDTH MINIMUM. RAMPS SERVICING SHARED USE PATHS SHALL MATCH THE WIDTH OF THE PATH.
- ③ RAMP RUNNING SLOPE – 8.3% MAXIMUM
- ④ BLENDED TRANSITION RUNNING SLOPE – 5.0% MAXIMUM
- ⑤ RAMP AND TURNING SPACE CROSS SLOPE – 2.0% MAXIMUM
- ⑥ TURNING SPACE DIMENSIONS – PROVIDE A 4 FT. X 4 FT. MINIMUM TURNING SPACE AT THE BOTTOM OF THE RAMP RUNS. THE TURNING SPACE MAY CONTAIN THE DETECTABLE WARNING SURFACE.
- ⑦ RAMP ALIGNMENT – TURNING SPACE SHALL BE ALIGNED TO BE FULLY WITHIN THE CROSSWALK OR STREET CROSSINGS THEY SERVE.
- ⑧ RAMP LENGTH – TYPE 1 CURB RAMP LENGTH IS DEPENDENT UPON THE RAMP SLOPE, HEIGHT OF THE CURB, AND ADJACENT SIDEWALK CROSS-SLOPE. WHERE TERRAIN IS SLOPING, A RAMP IS NOT REQUIRED TO CHASE GRADE MORE THAN 15 FT., REGARDLESS OF THE RESULTING RAMP SLOPE.
- ⑨ RAMP FLARES – WHERE A RAMP EDGE ABUTS A WALKABLE SURFACE, A FLARED SIDE SHALL BE PROVIDED. RAMP FLARE SLOPES SHALL NOT EXCEED 10.0% EXCEPT WHERE THEY ABUT A NON-WALKABLE SURFACE, OR WHERE THE ADJACENT RAMP SURFACE IS BLOCKED TO PEDESTRIAN TRAFFIC.
- ⑩ GUTTER SLOPE – 5.0% MAXIMUM
- ⑪ DETECTABLE WARNING SURFACE PLACEMENT – DETECTABLE WARNING SURFACE SHALL BE PLACED AROUND THE RADIUS AND LOCATED AT THE BACK OF CURB ON BLENDED TRANSITION AND DEPRESSED CORNER RAMPS.



BLENDING TRANSITION



DEPRESSED CORNER

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 7 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

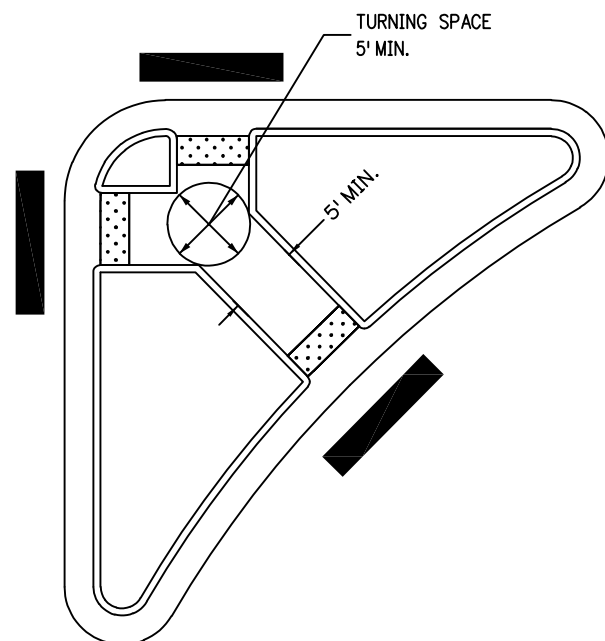
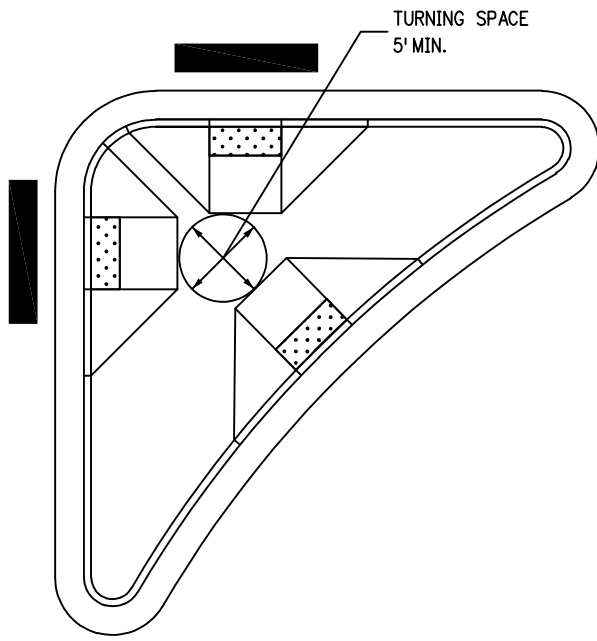


CITY OF LOVELAND, CO
DESIGN AND CONSTRUCTION
STANDARDS

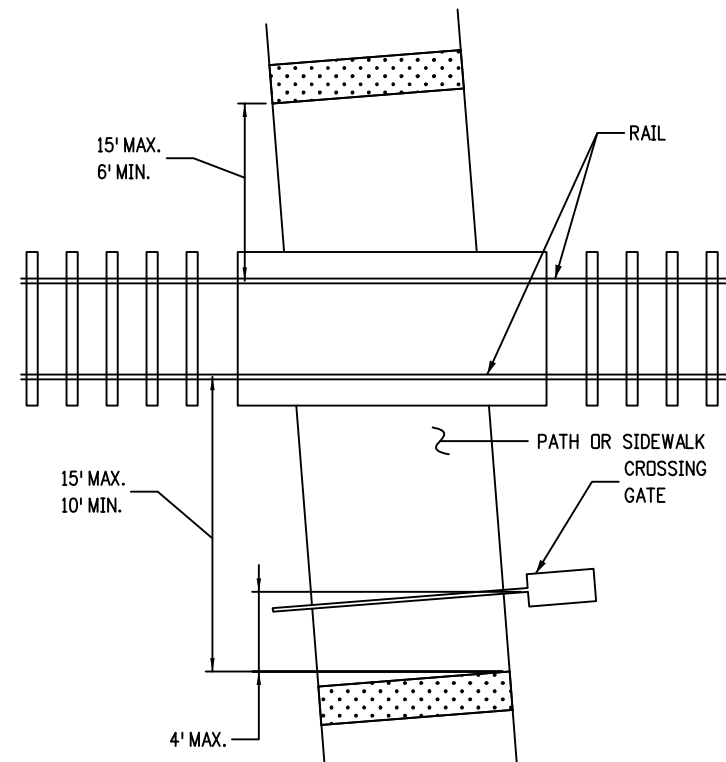
BLENDING TRANSITION
AND DEPRESSED CORNER
DETAILS AND NOTES

NOT TO SCALE

SHEET 7



INTERSECTION ISLANDS

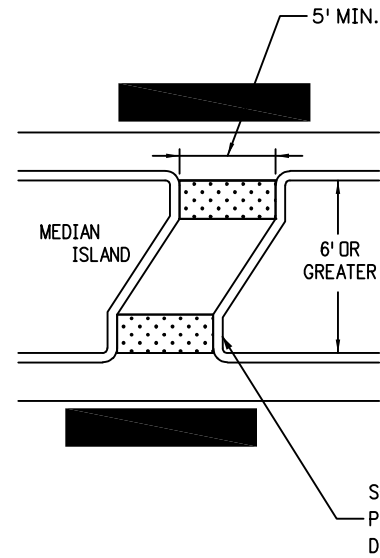
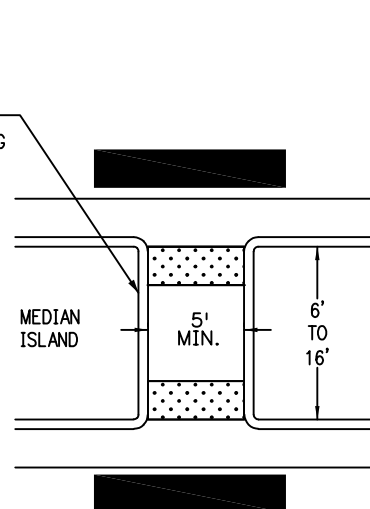


AT-GRADE RAIL CROSSING

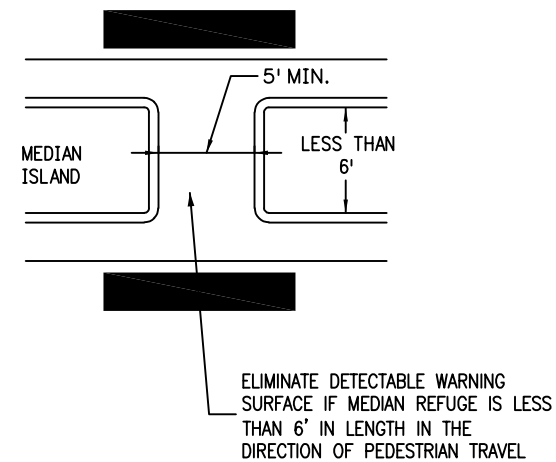
NOTES

- ① DETECTABLE WARNING SURFACES SHALL BE PLACED IN ALIGNMENT WITH THE BACK OF CURB.
- ② FLARED SIDES ARE PREFERRED ON RAISE INTERSECTION ISLANDS AND SHOULD BE PROVIDED ON ISLANDS WHICH SERVE SHARED USE PATHS, OR AT LOCATIONS WHERE BICYCLE USE IS EXPECTED.
- ③ FOR CUT-THROUGH MEDIAN ISLANDS, DETECTABLE WARNING SURFACES SHALL BE PLACED IN ALIGNMENT WITH THE BACK-OF-CURB IF THE DISTANCE BETWEEN BACK-OF-CURB TO BACK-OF-CURB IS 6 FEET OR GREATER. IF THE BACK-OF-CURB TO BACK-OF-CURB IS LESS THAN 6 FEET, THEN NO DETECTABLE WARNING SURFACE SHALL BE INSTALLED.
- ④ CURB RAMP AND CUT-THROUGH WIDTHS SHOULD BE THE SAME WIDTH AS ANY SIDEWALK OR SHARED USE PATH WHICH THEY SERVE.

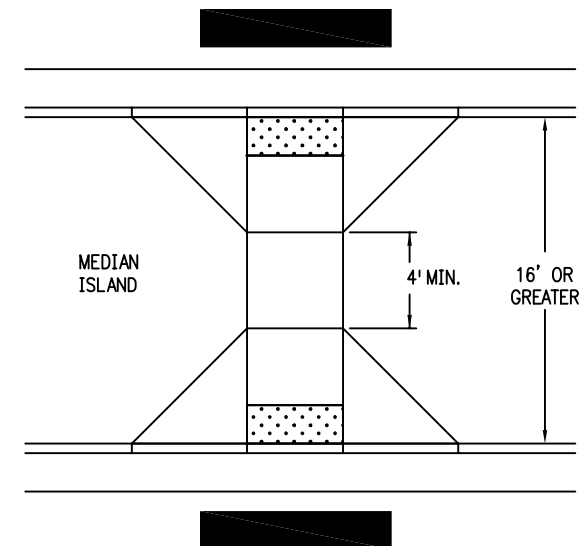
SQUARE CURB TO ORIENT PEDESTRIANS IN THE DIRECTION OF THE CROSSING



SQUARE CURB TO ORIENT PEDESTRIANS IN THE DIRECTION OF THE CROSSING



MEDIAN ISLANDS



DETECTABLE WARNING SURFACE

TURNING SPACE

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 8 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

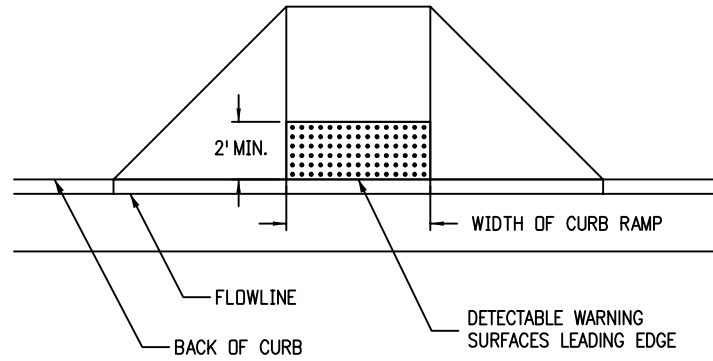


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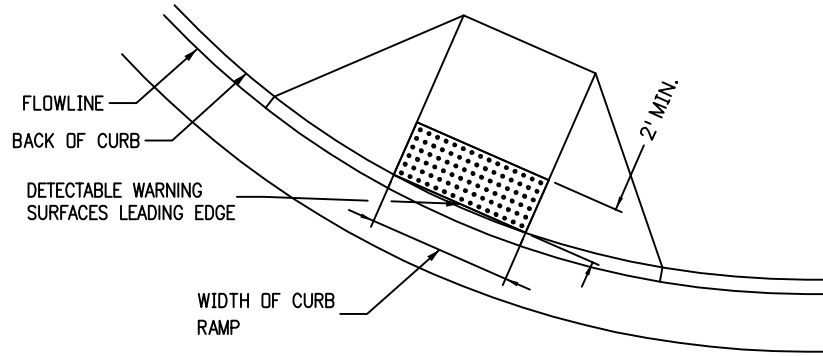
RAILROAD CROSSINGS,
MEDIANS AND ISLANDS
DETAILS AND NOTES

NOT TO SCALE

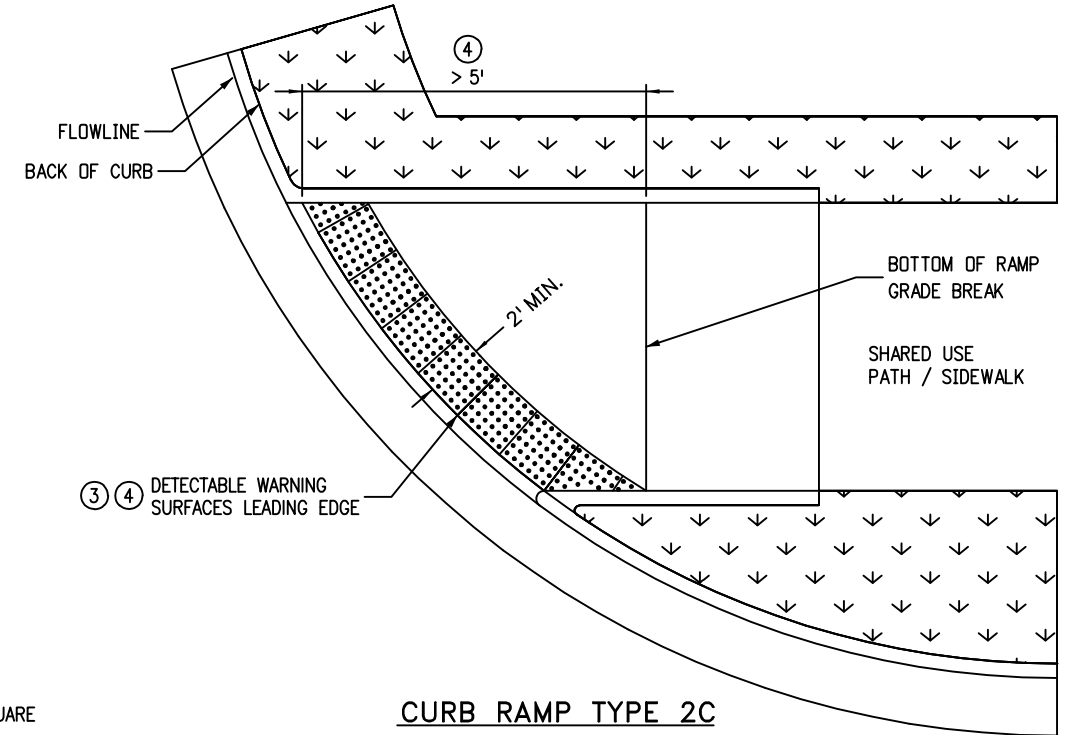
SHEET 8



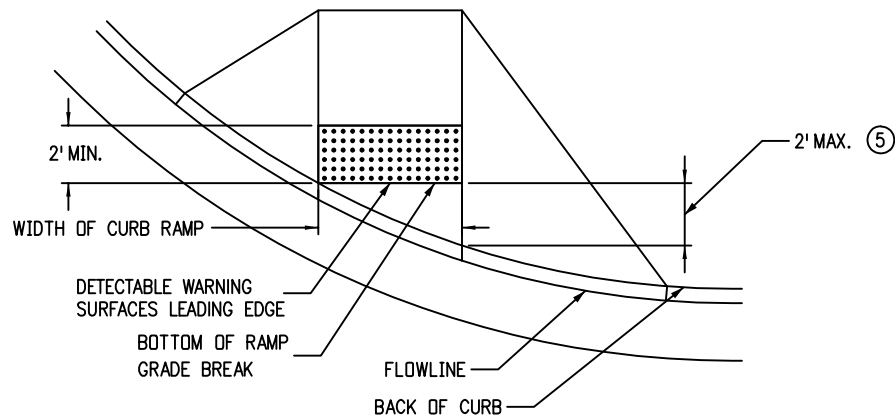
CURB RAMP TYPE 1
(PERPENDICULAR ON TANGENT)



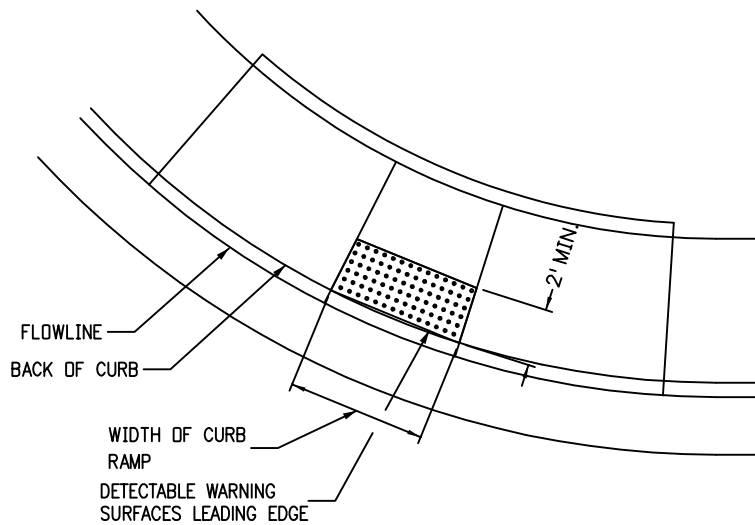
CURB RAMP TYPE 1
(PERPENDICULAR ON RADIUS)



CURB RAMP TYPE 2C
(SHARED USE PATH)

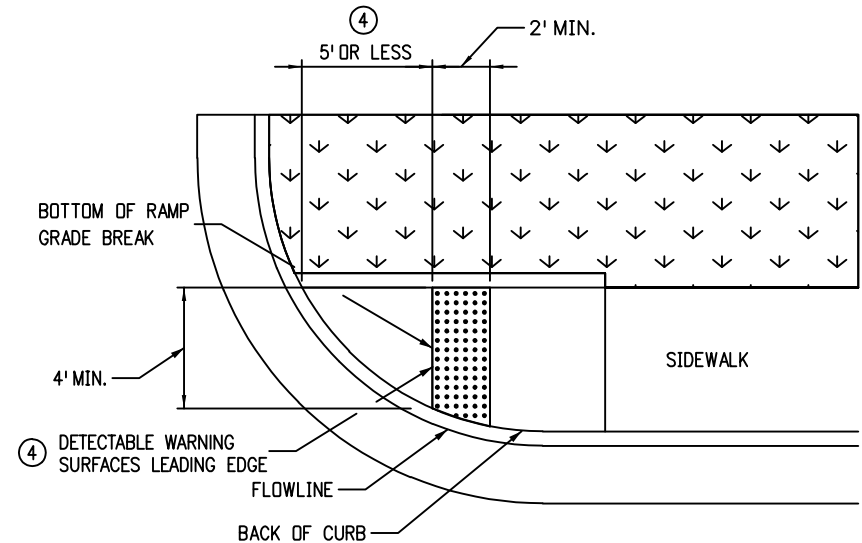


CURB RAMP TYPE 1C
(DIRECTIONAL ON RADIUS)



CURB RAMP TYPE 2A

- NOTES**
- DETECTABLE WARNING SURFACES SHALL CONSIST OF TRUNCATED DOMES IN A SQUARE GRID OR RADIAL PATTERN.
 - DETECTABLE WARNING SURFACES SHALL BE INSTALLED AT SIDEWALK, OR SHARED USE PATH, TO STREET CROSSING TRANSITIONS.
 - THE DETECTABLE WARNING SURFACE SHALL SPAN THE FULL WIDTH OF THE CURB RAMP, SHARED USE PATH, OR OTHER ROADWAY ENTRANCE AS APPLICABLE. A GAP OF 2 INCHES FROM THE EDGE OF THE DETECTABLE WARNING SURFACE TO THE EDGE OF THE CURB RAMP OR SHAVED USED PATH IS PERMITTED.
 - WHEN DETECTABLE WARNING SURFACES ARE PLACED ON A SLOPE GREATER THAN 5.0%, TRUNCATED DOMES PATTERN SHOULD BE ALIGNED IN THE DIRECTION OF THE RAMP RUN; OTHERWISE DOMES ARE NOT REQUIRED TO BE ALIGNED.
 - LOCATE ONE CORNER OF THE DETECTABLE WARNING SURFACE LEADING EDGE AT THE BACK OF CURB. NO POINT ON THE LEADING EDGE OF THE DETECTABLE WARNING SURFACE MAY BE MORE THEN 5 FT. FROM THE BACK OF CURB. WHEN ANY POINT OF THE LEADING EDGE OF THE DETECTABLE WARNING SURFACE WILL BE GREATER THAN 5 FT. FROM THE BACK OF CURB, PLACE THE DETECTABLE WARNING SURFACE RADially AT THE BACK OF CURB.
 - FOR CURB RAMP TYPE 1C, WHERE THE RAMP ABUTS A WALKABLE SURFACE, THE LEADING EDGE OF THE DETECTABLE WARNING SURFACE SHALL NOT BE PLACED FURTHER THAN 2 FEET FROM THE BACK OF CURB. IF THE RADIUS OF A CORNER MAKES THIS IMPOSSIBLE, ORIENT THE CURB RAMP PERPENDICULAR TO THE CURB AND GUTTER
 - DETECTABLE WARNING SURFACE PLATES SHALL BE EMBEDDED IN THE CONCRETE CURB RAMP WHILE THE CONCRETE IS STILL PLASTIC.
 - DETECTABLE WARNING SURFACES SHALL NOT BE PLACED OVER GRADE BREAKS.



CURB RAMP TYPE 2C
(DIRECTIONAL ON RADIUS)

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 9 OF 10 (LAST
MODIFICATION DATE: 7/31/19 BY LTA)

Modified by: B Reiter

DESCRIPTION	DATE:
EFFECTIVE	08/01/2021

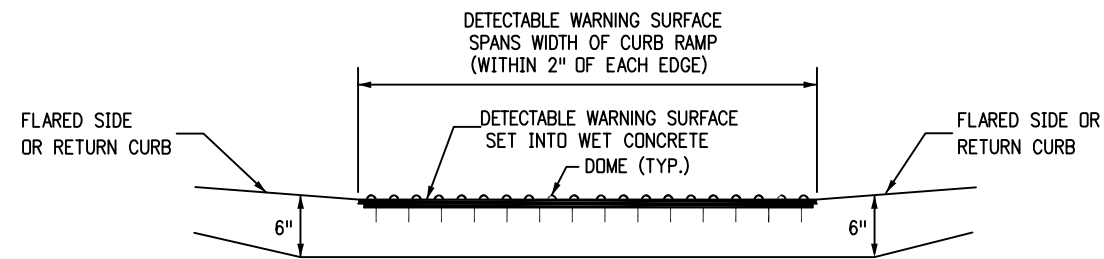


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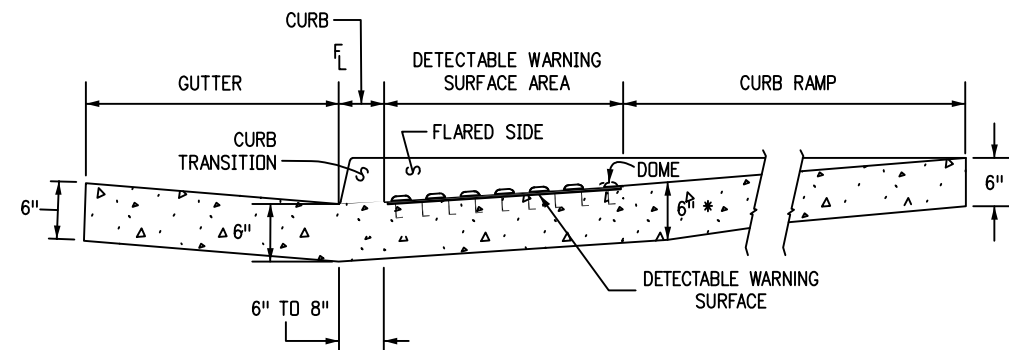
DETECTABLE
WARNING SURFACE
PLACEMENT

NOT TO SCALE

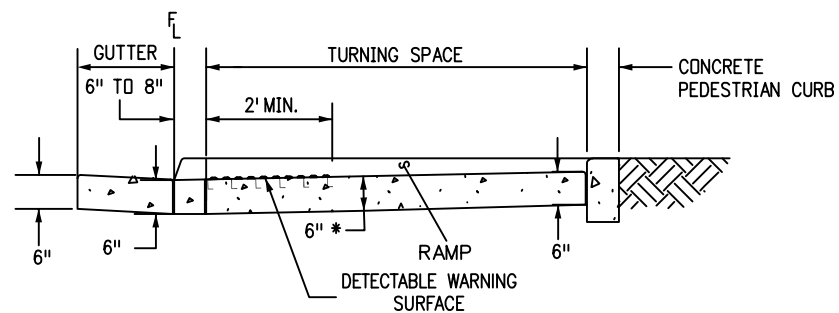
SHEET 9



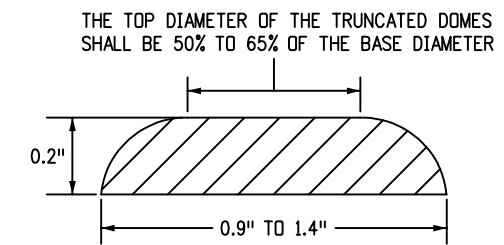
SECTION VIEW OF DETECTABLE
WARNING SURFACE
(LOOKING AT PERPENDICULAR RAMP
RUN FROM STREET)



SECTION VIEW FOR TYPE 1
CURB RAMPS
(LOOKING PERPENDICULAR TO RAMP RUN)



SECTION VIEW FOR TYPE 2
CURB RAMPS
(LOOKING PERPENDICULAR TO TURNING SPACE)



ELEVATION VIEW OF SINGLE
TRUNCATED DOME

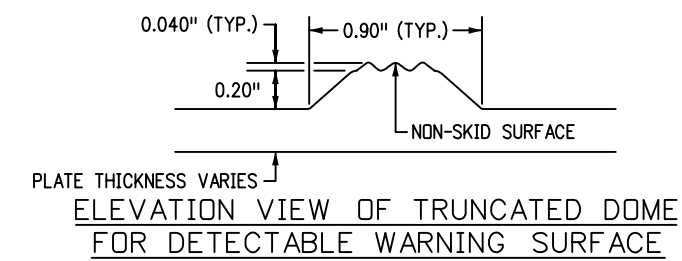
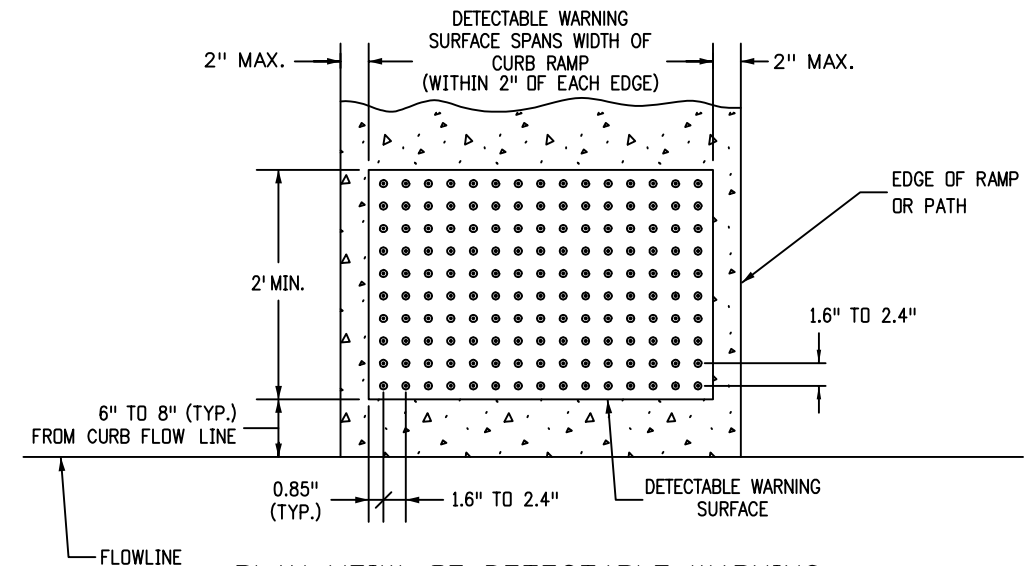


PLATE THICKNESS VARIES
ELEVATION VIEW OF TRUNCATED DOME
FOR DETECTABLE WARNING SURFACE



PLAN VEIW OF DETECTABLE WARNING
SURFACE

ADAPTED/MODIFIED FROM COLORADO DEPARTMENT OF TRANSPORTATION
STANDARD PLAN NUMBER M-608-1 SHEET NUMBER 10 OF 10 (LAST
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CITY OF LOVELAND, CO
DESIGN AND CONSTRUCTION
STANDARDS

DETECTABLE
WARNING SURFACE
DETAILS

NOT TO SCALE

SHEET 10