1. Pipeline Materials:

15" - 60":	Corrugated high density polyethylene pipe (HDPE) with an integrally formed smooth interior (per AASHTO M-294) Reinforced concrete pipe (RCP), Class II minimum (per ASTM C76) Cast-in-place concrete pipe (CIPCP)
Drainage Inlets (as applicable):	Caltrans Type 'GO' per CSP D73E Caltrans Type 'G1' per CSP D73B Caltrans Type 'GOL-7' per CSP D73A
Drainage Inlet Grate and Frame:	Caltrans 24-12X Grate per CSP D77B Rectangular Frame per CSP D77A
Manhole Frame and Lid:	D&L Foundry Model A-1024 (Standard and Bolt-Down)

2. Pipe shall be installed in conformance with the manufacturer's recommendations and COSLCS 610.00.

3. Pipeline backfill shall conform to Page 610.10. Structure backfill shall conform to Page 610.20.

4. HDPE storm drain pipe joints shall have either a soil-tight compression joint gasket or a corrugated coupler to match the pipe corrugations. Concrete pipe shall have all joints mortared.

5. Soft, wet, or spongy (unsuitable) material encountered in the trench at pipe subgrade shall be removed and replaced as directed by the City Engineer.

6. All pipe shall be carefully lowered into the trench to prevent damage. Under no circumstances shall pipe be dropped, rolled, or dumped into trenches.

7. Pipe ends shall be throughly cleaned before the pipe is joined. Whenever work ceases for any reason, the end of the pipe shall be covered. The interior of the pipe shall be kept free from dirt and debris as the work progresses. All pipe field cuts shall be made in accordance with the manufacturer's recommendations. Field cut pipe ends shall be made at right angles to the axis of the pipe except where pipes terminate in manholes.

8. All joints shall be made in accordance with the manufacturer's recommendations. Pipe lubricant shall be applied to all pipe gaskets prior to joint assembly. Lubricant shall be of a type specifically for the type of pipe being joined as required to make all joint connections.

9. Trace wire and warning tape shall be installed on all storm drain pipelines and shall conform to Page 608.00. Trace wire branches shall terminate inside manholes and drainage inlets.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

STANDARD DRAWING

STORM DRAIN
MATERIALS and CONSTRUCTION CRITERIA

Approved:

09-30-2023

City Engineer Date

Date: 09/2023
Scale: None

Dwg No.:
200.01

General Design Criteria

Storm drainage design work shall include and/or address the following items:

1. All regulatory agency permits shall be obtained and/or consultation with regulatory agencies shall occur, as required, prior to submitting plans or drainage studies for approval.

2. Hydrology for drainage basins smaller than 10 acres may be calculated using either the Rational Method or the USDA Soil Conservation Service (SCS) Method. Hydrology for drainage basins larger than 10 acres shall be calculated using the USDA SCS Method. The following data sources shall be used:

   A. Soil types shall be determined by using the UC Davis / NRCS Soilweb: https://casoilresource.lawr.ucdavis.edu/gmap/

   B. Rainfall intensity data shall be obtained from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server: https://hdsc.nws.noaa.gov/hdsc/pfds/

3. The storm recurrence intervals used for all hydrology design work shall be the 10-, 25-, and 100-year events. Post-development peak flows shall not exceed existing pre-development peak flows for the 10-, 25-, and 100-year storm events at any point of discharge. If multiple floodplains are impacted by the project, this requirement applies to each floodplain, not the project as a whole.

4. Storm drainage systems shall be designed to handle the 10-year events without static head. During 25- and 100-year events, the storm drainage system may operate with static head; however, no damage due to ponding shall occur.

5. Each drainage basin shall be identified and correlated to calculations for that basin. Topographic mapping shall include contour intervals (maximum interval 5 feet) that are adequate to define the boundaries and slopes of each drainage basin. Run-on flow from basins located upstream of the project shall be included in all analysis work as appropriate.

6. Partial undetained release to a drainage feature is allowable, as long as the total release to the drainage feature does not exceed pre-development peak flow to that feature for all recurrence intervals. The acceptability of basin combinations shall require the approval of the City Engineer.

7. A total minimum clear width of 12' for collector streets, local streets, and cul-de-sacs and 24' for arterial streets and expressways shall be maintained for all storm recurrence intervals.

8. Individual lots shall be graded as best as possible towards the nearest street.

9. Placement of fills of any magnitude across an existing drainage course shall incorporate a means by which any 100-year events not handled by the drainage system can flow overland via essentially the same course as prior to placing the fill across the drainage course. Analysis of overland release routes shall demonstrate that adjacent structure floor elevations have at least 1' of elevation clearance above the expected adjacent 100-year water surface.

10. All storm drainage facilities located in non-roadway frontage locations shall have designated and improved maintenance access routes conforming to the following requirements:

    A. All access routes shall be located in designated easements. The minimum storm drainage easement width shall be 15'.

    B. Access routes shall be designed to the following:

       1. Width: 12' minimum

       2. Inside turning radius: 30' minimum

       3. Slope in the direction of travel: 8% maximum if unpaved, 12% maximum if paved

       4. Cross slope: 4% maximum

       5. Termination: Turning bulb with a minimum radius of 20' or a 60' hammerhead with a minimum width of 10'

       6. Loading: Access roads shall have a structural section sufficient to support heavy equipment

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department
STANDARD DRAWING
STORM DRAIN
GENERAL DESIGN CRITERIA

Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None
Dwg No.: 200.02

General Design Criteria (continued)

10. C. All access routes shall have an improved, gated entrance per COSLCS Page 630.00 with the following modifications:

    1. Type: Green belt (no public access)

    2. Width: 12' minimum between corner posts

    3. Signage: "EMERGENCY/MAINTENANCE ACCESS ONLY"

11. Detention shall be accomplished with purpose-built structures (earthen basins, engineered chamber systems, etc.). Using storm drain pipes that are a part of a storm drain system for detentionis not allowed under any circumstances.

				CITY OF SHASTA LAKE Public Works Department	Approved: 09-30-2023 City Engineer Date
				STANDARD DRAWING	
				STORM DRAIN GENERAL DESIGN CRITERIA	Date: 09/2023 Dwg No.: 200.03 Scale: None
REVISION	BY	APPROVED	DATE		

Pipeline Design Criteria

1. The minimum size of proposed culverts and pipelines shall be 15".

2. Storm drain pipelines shall be placed within the travelled way and not under sidewalks.

3. Storm drain pipelines shall be designed with a Manning's coefficient of:

   A. Concrete pipe: n=0.013-0.015

   B. Corrugated HDPE pipe with integrally formed smooth interior: n=0.012

4. Storm drain mains may be deflected at the factory pipe joint per the manufacturer's recommendations to 'curve' the pipe.

5. The minimum depth of cover over storm drain pipelines shall be 2' below street finished grade. The maximum depth of cover over storm drain pipelines shall be 15' below street finished grade.

6. Manhole spacing shall be 500 to 1,000 feet, or as approved by the City Engineer.

7. Storm drain pipeline outlets shall have treatments installed such that exit velocities shall be non-eroding. End treatments shall be as approved by the City Engineer.

Inlet Design Criteria

1. Inlets shall be spaced such that the 10-year storm event flows will be completely captured with no bypass. A portion of the 25-year and 100-year storm event flows may bypass to the next inlet. The designer shall demonstrate that the required clear area on streets is maintained during the 25-year and 100-year storm events at all times and in all locations with no damage due to ponding.

2. If an inlet submerges during the 25-year or 100-year event, the designer shall demonstrate that the curb height is not exceeded.

3. All newly constructed or modified storm drain inlets shall be labeled per COSLCS Page 202.00.

Detention Basin Design Criteria

1. Detention basins shall be designed to detain the 100-year storm event. A minimum 1' of freeboard shall be maintained at all times during the 100-year events.

2. The following elevations shall be shown and/or noted: Top, overflow outlet (manhole or area drain w/ trash grate), 100-year event maximum, bottom.

3. Orifice plates shall be sized to properly detain and release the 10-, 25-, and 100-year storm events.

4. Elevation, storage volume, and flow discharge calculations shall be submitted.

5. Detention basins shall be fenced, and shall have an access road to the detention pond overflow and outlet that shall meet the requirements for storm drain maintenance access routes.

6. Detention basin slopes shall be flat enough to allow vehicular access into the basin for maintenance equipment.

7. Detention basin pipeline outlets shall have treatments installed such that exit velocities shall be non-eroding. End treatments shall be as approved by the City Engineer.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department
STANDARD DRAWING
STORM DRAIN PIPELINE, INLET, AND DETENTION BASIN DESIGN CRITERIA

Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None
Dwg No.: 200.04

PIPELINE ACCEPTANCE TESTING

The Contractor shall furnish all labor, equipment, and materials needed to complete the following items:

1. Video Inspection: Prior to acceptance of pipelines by the City Engineer, the Contractor shall provide to the City video inspection of the new storm drain.

   All video inspection work shall be performed by a competent video service provider and shall be recorded in digital format. The video inspection shall be performed in color, shall pan in all directions so that all joints can be thoroughly examined, and shall be of sufficient resolution to allow the City Engineer to clearly see all pipe joints.

   The video inspection files will be reviewed by the City Engineer. If any irregularities are observed on the tapes (open or offset joints, grade problems, etc.), the City Engineer MAY elect to have the main in question re-inspected using City forces and equipment. If, in the opinion of the City Engineer, any of the following tolerances are found to be exceeded in any section of sewer main, that section shall be deemed to have failed the video inspection acceptance test.

   a. Joint Offset: ≥ 0.25” in any direction
   b. Design Grade: +/- 20% of the Design Grade

   When failure is observed, the Contractor shall be responsible for repairing or replacing the failed section of pipe at his own expense, including removal and replacement of all affected improvements and any and all other costs incurred in order to repair the pipe, as well as for all costs incurred by the City for the re-inspection of the storm drain.

   The City may also perform a video inspection at any time during the guaranty period. Where any of the above tolerances are found to be exceeded in any section of storm drain, that section shall be deemed to have failed the video inspection acceptance test, and the Contractor shall be responsible for repairing or replacing the failed section of pipe at his own expense, including removal and replacement of all affected improvements and any and all other costs incurred in order to repair the pipe, as well as for all costs incurred by the City for the re-inspection of the storm drain.

2. Barrel deflection testing: The Contractor shall conduct barrel deflection testing for all plastic pipelines to ensure that vertical deflections do not exceed the allowable deflection. Deflection testing shall be completed at least 30 days after pipeline installation, and deflection shall not exceed 5%. The mandrel used for deflection testing shall meet the following requirements:

   a. Fabricated from steel and fitted with pulling rings at each end.
   b. Be rigid and nonadjustable with an odd number of legs (9 legs minimum).
   c. Have an effective length not less than its nominal diameter.
   d. Be stamped or engraved with the pipe material specification, nominal size, and outside diameter

   If the mandrel is not able to travel unobstructed through the pipe and stops at any point, that section of pipeline will have failed the acceptance test. When failure is observed, the Contractor shall be responsible for repairing or replacing the failed section of pipe at his own expense, including removal and replacement of all affected improvements and any and all other costs incurred in order to repair the pipe. The use of a re-rounder will not be permitted at any time.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department
STANDARD DRAWING

STORM DRAIN
PIPELINE ACCEPTANCE TESTING

Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None
Dwg No.: 200.05

MANHOLE ACCEPTANCE TESTING

The Contractor shall furnish all labor, equipment, and materials needed to complete the following items:

1. Each manhole shall be vacuum tested in the presence of the City Engineer for acceptance after all backfilling and compaction is completed. The Contractor may pretest manholes immediately after assembly and prior to backfilling; pretesting is for the Contractor's convenience and need not be completed in the presence of City personnel.

2. All testing equipment and labor shall be provided by the Contractor.

3. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole during the test.

4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.

5. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter manholes, 75 seconds for 60" diameter manholes, and 90 seconds for 72" diameter manholes.

6. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout or epoxy. Retesting shall proceed until a satisfactory test is obtained. No grout shall be placed in the horizontal joints before testing.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

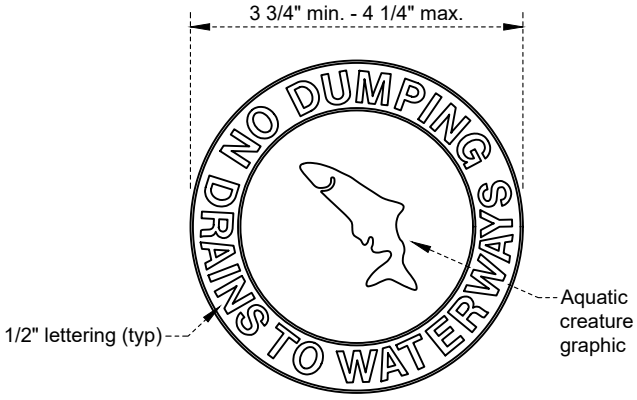
STANDARD DRAWING

STORM DRAIN
MANHOLE ACCEPTANCE TESTING

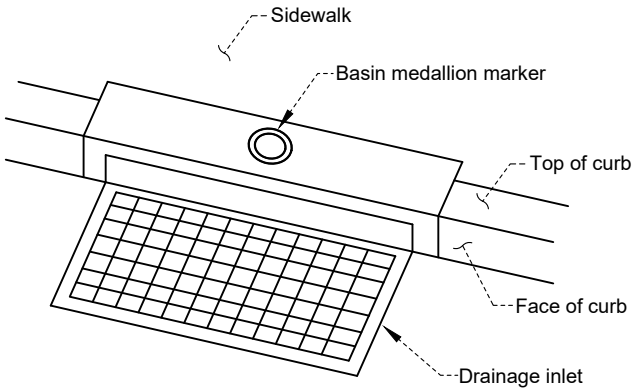
Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

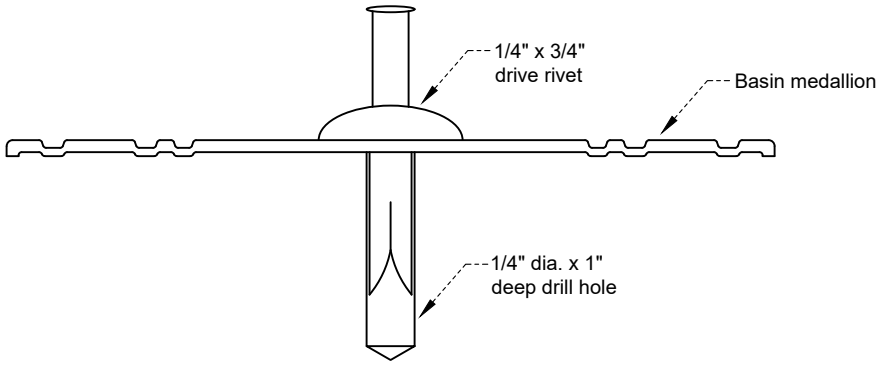
Dwg No.: 200.06



BASIN MEDALLION DETAIL



BASIN MEDALLION
INSTALLATION - PLAN

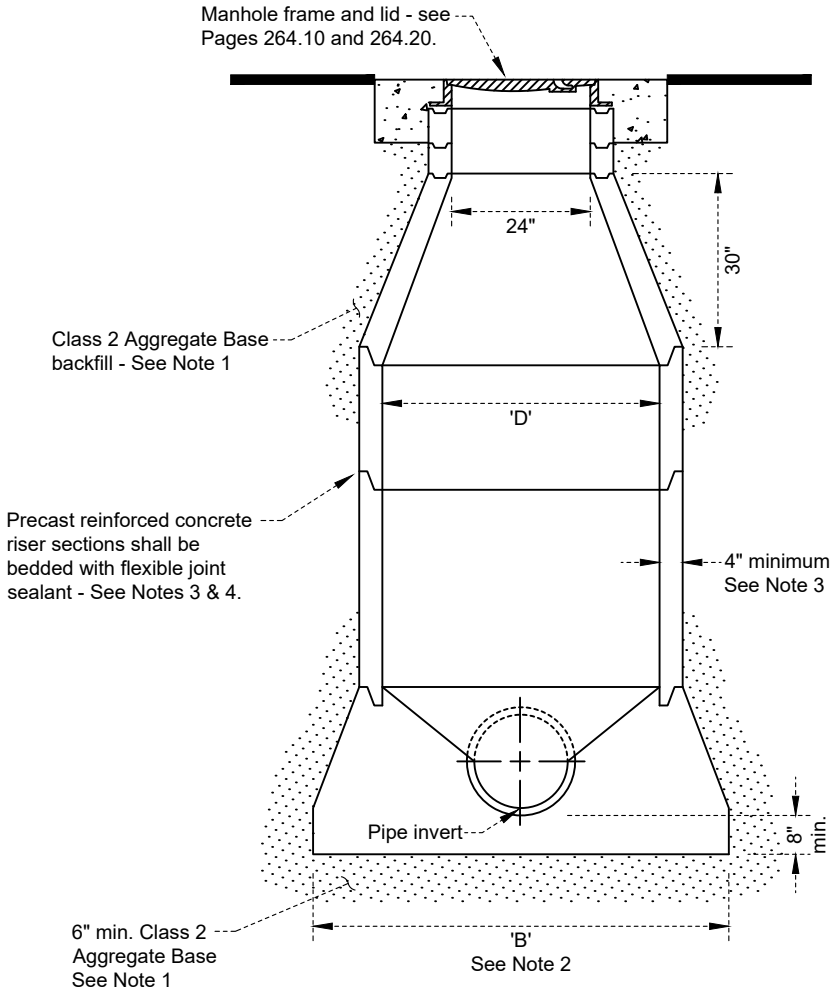


BASIN MEDALLION
INSTALLATION - SECTION

NOTES:

1. Basin markers shall be installed on all inlet structures, private or public.
2. Basin markers may be obtained from the City of Shasta Lake Public Works Department.
3. Markers shall be installed with the center being 4 inches from face of curb and, where applicable, shall be installed facing the roadway.

				CITY OF SHASTA LAKE Public Works Department	Approved: 09-30-2023 City Engineer Date
				STANDARD DRAWING	
				STORM DRAIN BASIN MEDALLION	Date: 09/2023 Dwg No.: 202.00 Scale: None
REVISION	BY	APPROVED	DATE		



Outlet Diameter	'D'	'B'
15" - 24"	4'	6'
27" - 42"	5'	7'
48" & Larger	6'	8'

NOTES:

1. Structure backfill shall conform to Page 610.20.
2. Precast concrete bases manufactured by Cook Concrete Products, Teichert Aggregate, or approved equal may be used in lieu of poured in-place bases. See Page 363.00 for base details.
3. Precast reinforced concrete manhole segments shall conform to ASTM C478-70 (4" min. wall thickness). All sections shall have tongue and groove joints.
4. All manhole segments shall be bedded in double beads of flexible joint sealant (Kent Seal or approved equal).
5. Where manholes are not located in streets or the traveled way, the top of the manhole shall be set 12" to 24" above existing ground per Page 365.00 unless otherwise approved by the City Engineer.
6. The minimum drop across manholes shall be the difference in diameters of the upstream and downstream pipes or 0.2', which ever is greater.
7. Trace wire shall be installed in conformance with Pages 608.00 and 612.20.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

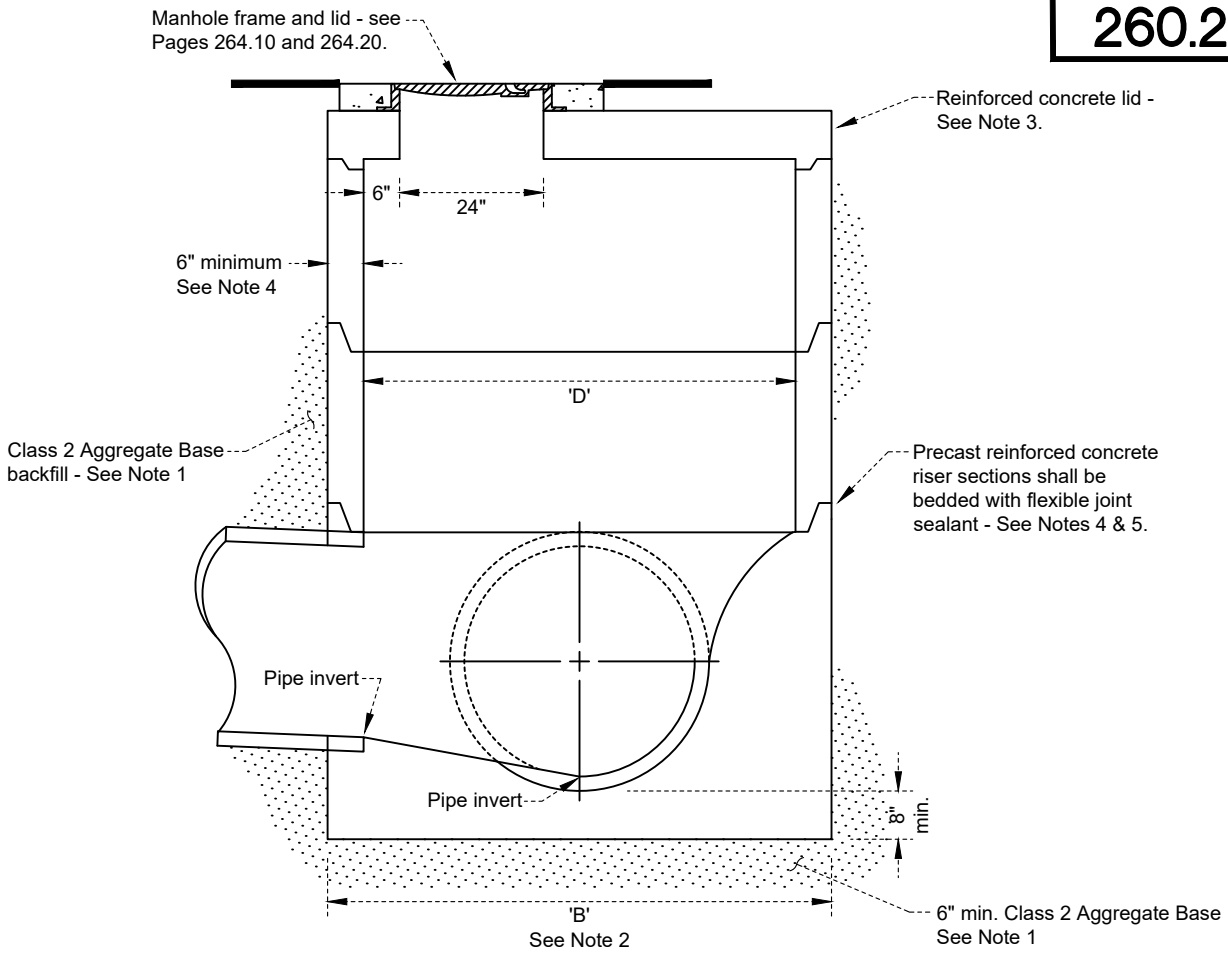
STANDARD DRAWING

TYPE 1
STORM DRAIN MANHOLE

Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

Dwg No.: 260.10



Outlet Diameter	'D'	'B'
15" - 24"	4'	6'
27" - 42"	5'	7'
48" & Larger	6'	8'

NOTES:

1. Structure backfill shall conform to Page 610.20.
2. Precast concrete bases manufactured by Cook Concrete Products, Teichert Aggregate, or approved equal may be used in lieu of poured in-place bases. See Page 363.00 for base details.
3. Flat reinforced concrete lid shall meet AASHTO HS20-44 requirements. Lid design shall be approved by the City Engineer prior to installation.
4. Precast reinforced concrete manhole segments shall conform to ASTM C478-70 (6" min. wall thickness). All sections shall have tongue and groove joints.
5. All manhole segments shall be bedded in double beads of flexible joint sealant (Kent Seal or approved equal).
6. Where manholes are not located in streets or the traveled way, the top of the manhole shall be set 12" to 24" above existing ground per Page 365.00 unless otherwise approved by the City Engineer.
7. The minimum drop across manholes shall be the difference in diameters of the upstream and downstream pipes or 0.2', which ever is greater.
8. Trace wire shall be installed in conformance with Pages 608.00 and 612.20.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

STANDARD DRAWING

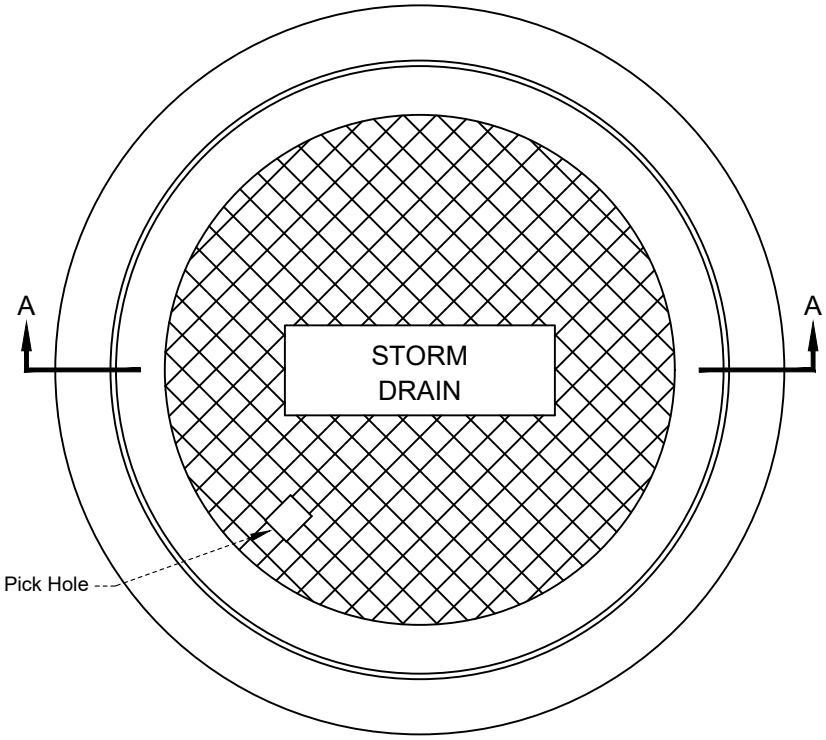
TYPE 2
STORM DRAIN MANHOLE

Approved:

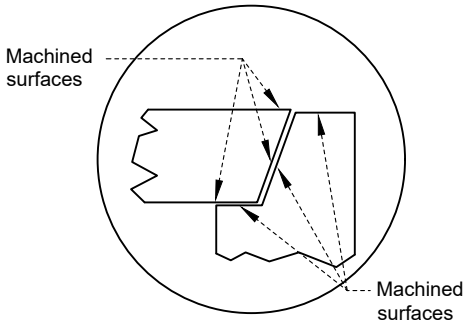
City Engineer — Date: 09-30-2023

Date: 09/2023
Scale: None

Dwg No.: 260.20



PLAN



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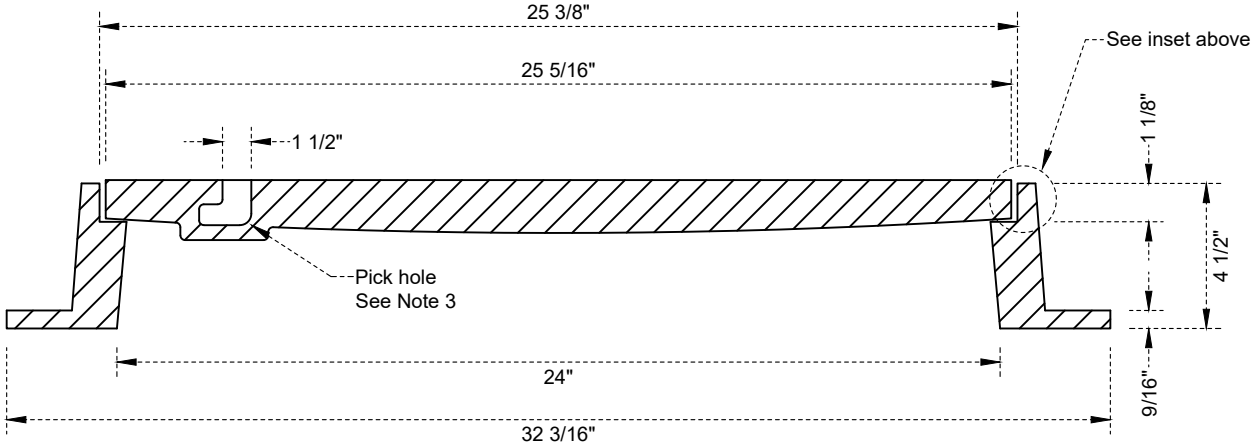


SECTION A-A

NOTES:

1. Frame and cover shall be fully machined on surfaces as shown to provide a no-rock, no-stick fit, and shall be HS-20 traffic-rated.
2. Cover markings shall be "STORM DRAIN", "STORM SEWER", or "SD".
3. Lid shall be furnished with closed pickholes.
4. All parts of acceptable assemblies shall be interchangeable.
5. See Page 612.20 for concrete collar and grade adjustment details.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

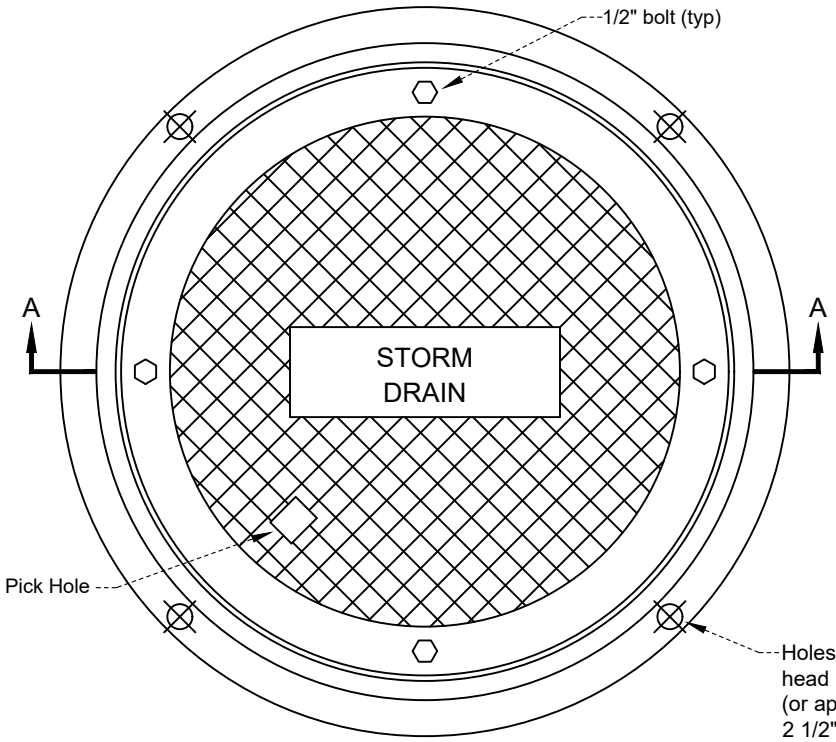
STANDARD DRAWING

24" STORM DRAIN
MANHOLE FRAME AND LID

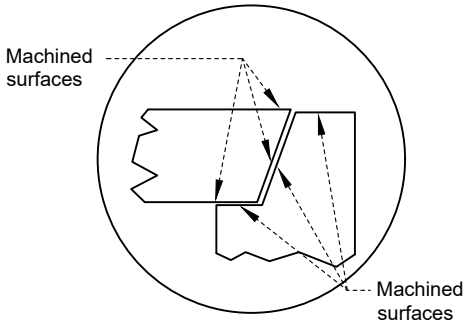
Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

Dwg No.: 264.10



PLAN



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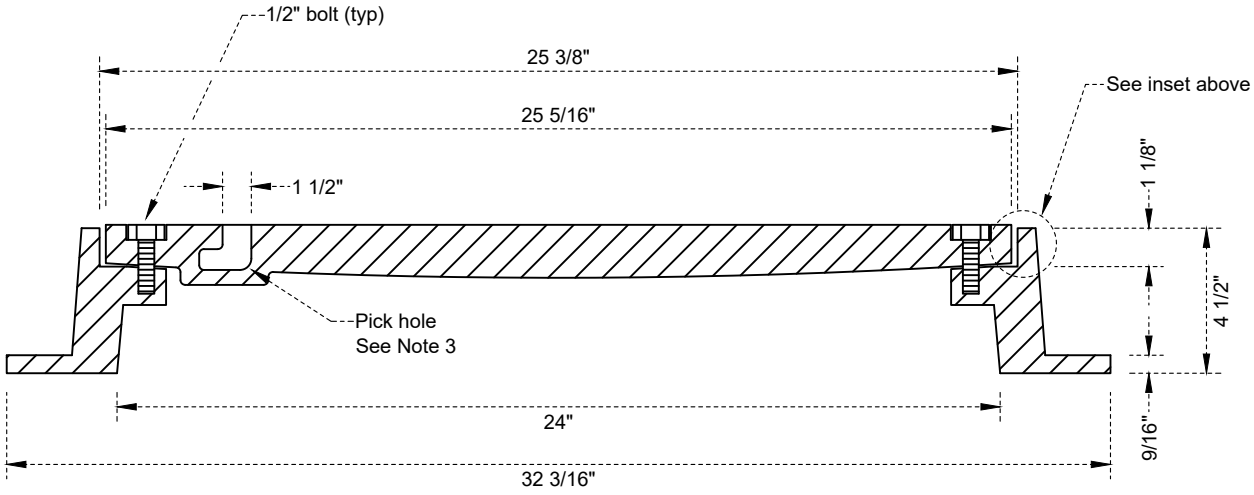


SECTION A-A

NOTES:

1. Frame and cover shall be fully machined on surfaces as shown to provide a no-rock, no-stick fit, and shall be HS-20 traffic-rated.
2. Cover markings shall be "STORM DRAIN", "STORM SEWER", or "SD".
3. Lid shall be furnished with closed pickholes.
4. All parts of acceptable assemblies shall be interchangeable.
5. See Page 612.20 for concrete collar and grade adjustment details.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

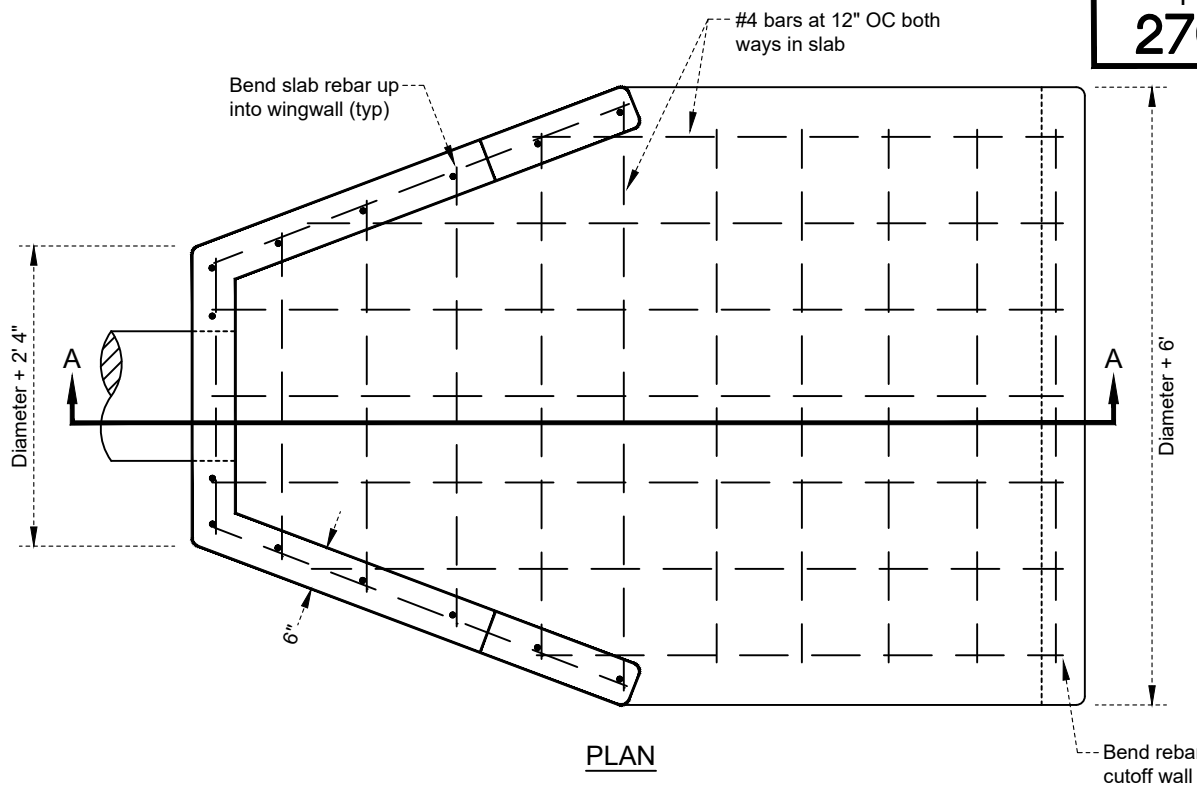
STANDARD DRAWING

24" STORM DRAIN
MANHOLE FRAME AND LID - BOLT DOWN

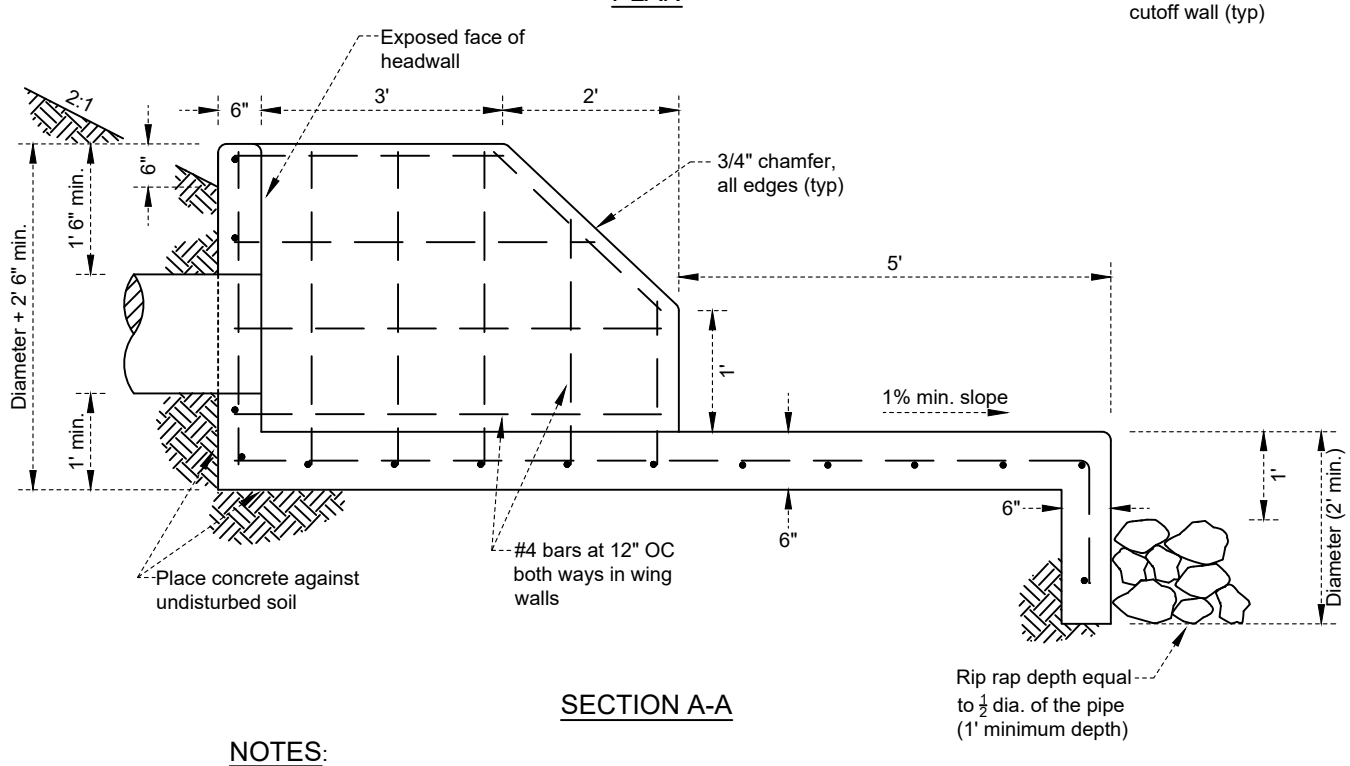
Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

Dwg No.: 264.20



PLAN



SECTION A-A

NOTES:

1. Concrete shall conform to Page 100.00. Structure backfill shall conform to Page 610.20.
2. Riprap placement downstream of the structure shall extend as required to reduce velocity and prevent erosion.
3. All headwalls for pipe larger than 42" diameter shall be engineered.
4. Provide guardrails/pedestrian barriers as needed per the California Building Code.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

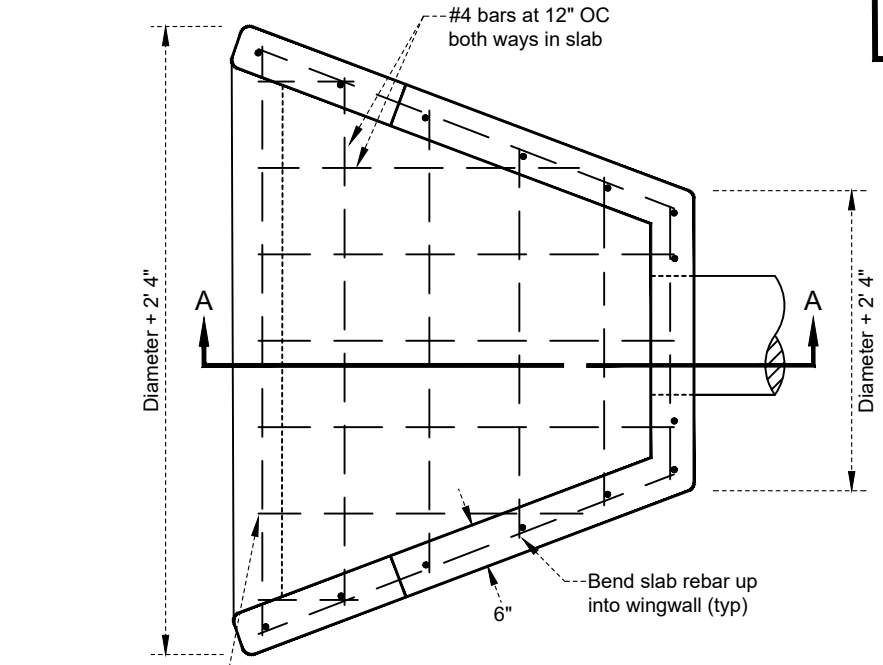
STANDARD DRAWING

OUTLET HEADWALL STRUCTURE

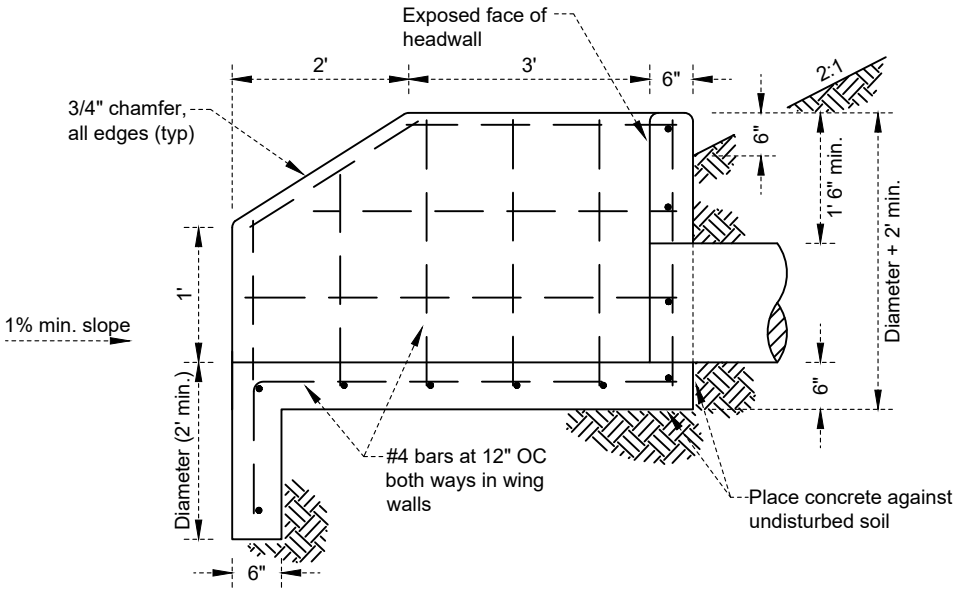
Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

Dwg No.: 270.00



PLAN VIEW



SECTION A-A

NOTES:
1. Concrete shall conform to Page 100.00. Structure backfill shall conform to Page 610.20.
2. All headwalls for pipe larger than 42" diameter shall be engineered.
3. Provide guardrails/pedestrian barriers as needed per the California Building Code.

REVISION	BY	APPROVED	DATE

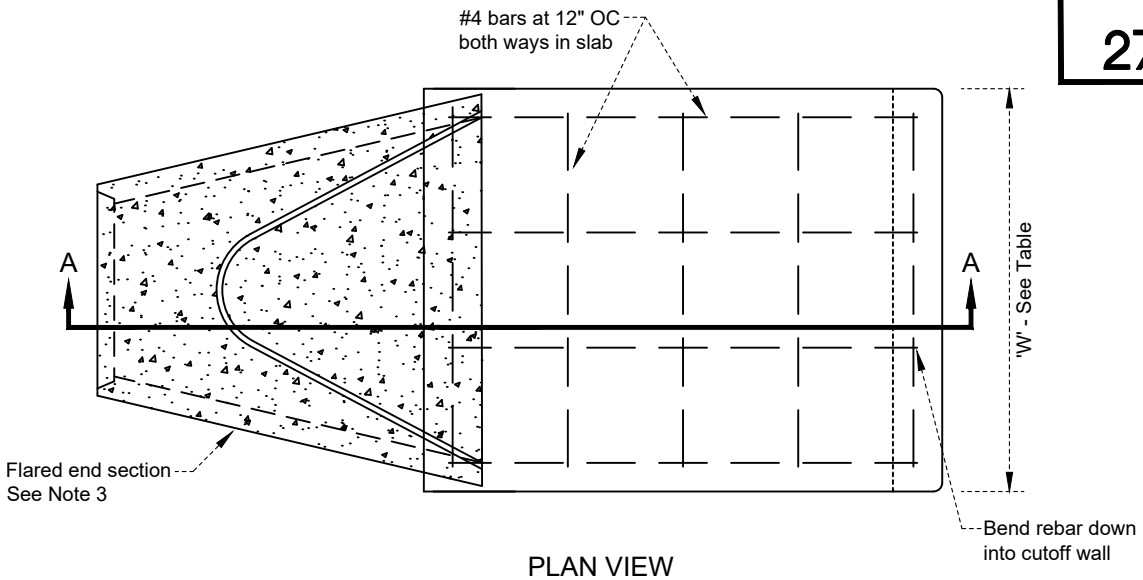
CITY OF SHASTA LAKE
Public Works Department

STANDARD DRAWING

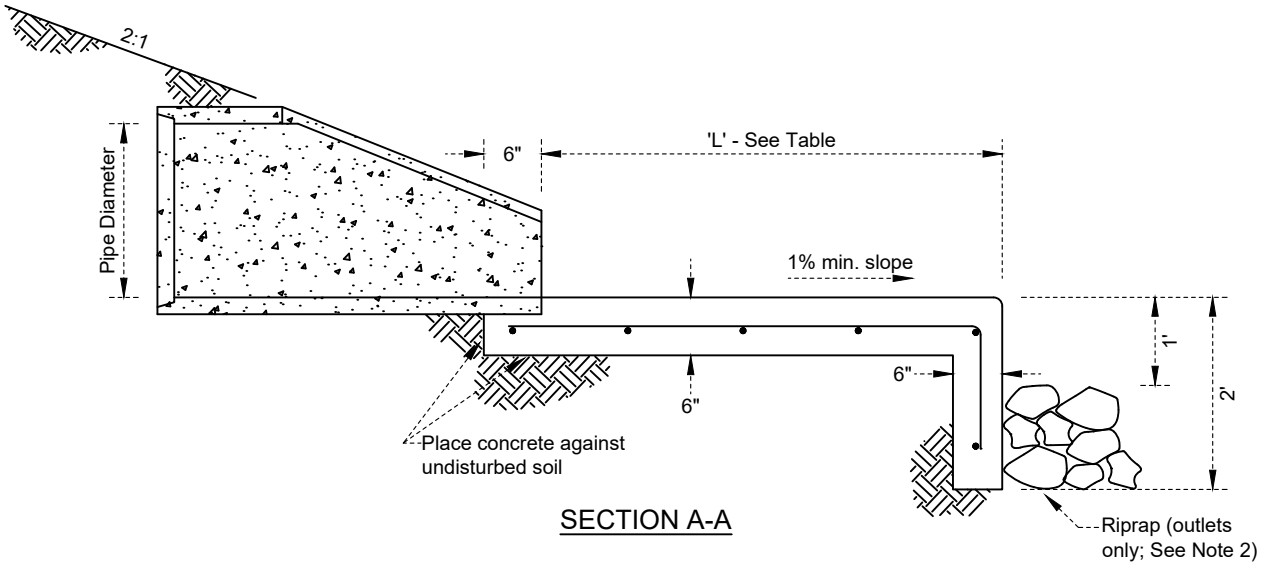
INLET HEADWALL STRUTURE

Approved:
City Engineer — Date: 09-30-2023

Date: 09/2023
Scale: None
Dwg No.: 271.00



PLAN VIEW



SECTION A-A

Pipe Diameter	'L'	'W'
15"	4'	3' 6"
18"	4'	3' 6"
24"	6'	4' 6"

NOTES:

1. Concrete shall conform to Page 100.00. Structure backfill shall conform to Page 610.20.
2. Riprap placement downstream of the structure shall extend as required to reduce velocity and prevent erosion.
3. Concrete flared end section shown (Oldcastle Precast or approved equal). Steel flared end sections (Contech or approved equal) may be used upon approval by the City Engineer. Where approved, steel flared end sections shall require additional end treatment behind flare.
4. Although depicted here as an outlet, flared end sections may be used as both inlet and outlet structures on storm drains not to exceed 24" pipe.

REVISION	BY	APPROVED	DATE

CITY OF SHASTA LAKE
Public Works Department

STANDARD DRAWING

FLARED END OUTLET - 15" to 24"

Approved: 09-30-2023
City Engineer Date

Date: 09/2023
Scale: None

Dwg No.: 272.00