TOWNSEND ENGINEERING STANDARDS

prepared for:

CITY OF TOWNSEND, MONTANA

Submitted by:

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Helena, Kalispell, and Bozeman, Montana

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Chapter 1 – Engineering Standards

1.1 Design Standards

1.1.1 Lift Stations

A. Meet design requirements of Montana Department of Environmental Quality Circular 2.

1.1.2 Approaches onto Public Right-of-Way

A. Projects proposing an approach onto the public right-of-way shall submit to the City a report certified by a professional engineer addressing the following conditions, both present and future:
   I. truck turning movements;
   II. vehicular site vision;
   III. pedestrian conflicts; and
   IV. intersection level of service.

B. Approach permits must be obtained prior to beginning work within the public right-of-way. Permits are subject to fees and approval.
C. Approaches affecting state-designated roadways shall also be approved by the state department of transportation.
D. Approaches shall satisfy all applicable emergency service requirements.

1.2 Construction Standards

1.2.1 Lift Stations

A. Manufacturer
   I. Gorman Rupp;
   II. or Equal as approved by The City of Townsend PWD;
      a. Design Engineer shall provide all necessary information to justify the product as equal;
      b. Design Engineer shall submit a list of 3 lift stations of the type proposed which have been in operation at least 5 years;
      c. and The City of Townsend reserves the right to accept or reject the proposed lift station.

B. Pump Type:
   I. Self-Priming Centrifugal
      a. Model: Gorman Rupp Super T Series with Eradicator Solids Management System

C. Redundancy
    I. Duplex systems
        a. Minimum requirement for all systems.
    II. Triplex systems
        a. May be required by the City Engineer for large lift stations or lift stations requiring specialty items.
    III. Each motor shall include a VFD.

D. Influent Pipe
    I. Spigot end shall extend 6-inches beyond interior of wet well wall.

E. Access Road
    I. 12-foot minimum width paved for access by sewer maintenance vehicles.
    II. Access approach from street per Standards.

F. Bypass
    I. Shall have a dedicated valve.
    II. Shall connect downstream of the lift station check valves.
    III. Provide a cam-lock style connection with cap.

G. Electrical Wiring
    I. Shall be water resistant inside the lift station and enclosure.
    II. On-site generator required
        a. Make of generator shall be Generac.
        b. Generator shall be propane fueled.
        c. Noise emissions not to exceed 65 dbA at 20 feet from the power supply.
        d. Shall be installed inside building.
        e. Shall include an appropriately sized transfer switch, manufactured by the same manufacturer as the generator.
        f. Shall include an O&M manual Manufacturer shall perform training at startup.

    III. Alarms
        a. Pump shall be integrated into the existing SCADA system by the City's telemetry provider.
        b. Alarm Conditions:
            i. High water;
            ii. Low water;
            iii. Seal failure (if applicable);
            iv. Power interruption;
            v. High motor temp;
            vi. Running on back-up power; and
            vii. VFD fail (each pump);

IV. Controls
    a. Each pump shall have:
        i. Hour meter; and
        ii. Discharge pressure gauge tap and valve.
    b. Pump run alternator.
    c. Amperage meter on each leg of the electrical wiring.
    d. Lightning protection for the power supply.
    e. Level control
        i. Primary control – Pressure transducer.
        ii. Backup control –float switch system.
            A) Shall be installed and function if primary control is lost.
    f. Transfer switch and control panels shall be placed in building.

V. Lighting
    a. Exterior illumination shall be provided and connected to the power supply.
    b. Street lighting shall not be considered adequate to meet this requirement.

H. Enclosures
    I. Building
        a. Designed and constructed in accordance with Townsend Building codes.
        b. CMU Block (split face finish).
    II. Walls
        a. 8-foot floor to ceiling height (min).
        b. Interior walls and ceiling shall be finished with metal liner panels.
    II. Roof
        a. Gable style
        b. Trusses spaced at 24-inch maximum
        c. Designed to meet local snow load requirements
        d. 4:12 slope
        e. 5/8-inch OSB sheathing
        f. Metal roofing
    III. Other
        a. Steel door with deadbolt lock
        b. Heating and air circulation systems
        c. Ceiling mounted industrial lights
        d. All other necessary materials for a finished building.
        e. Wastewater process piping shall be painted gray.
    IV. Submittals by Design Engineer for City of Townsend approval include:
        a. Structural plans;
        b. Mechanical plans;
        c. Electrical plans; and
        d. Heating and air circulation.

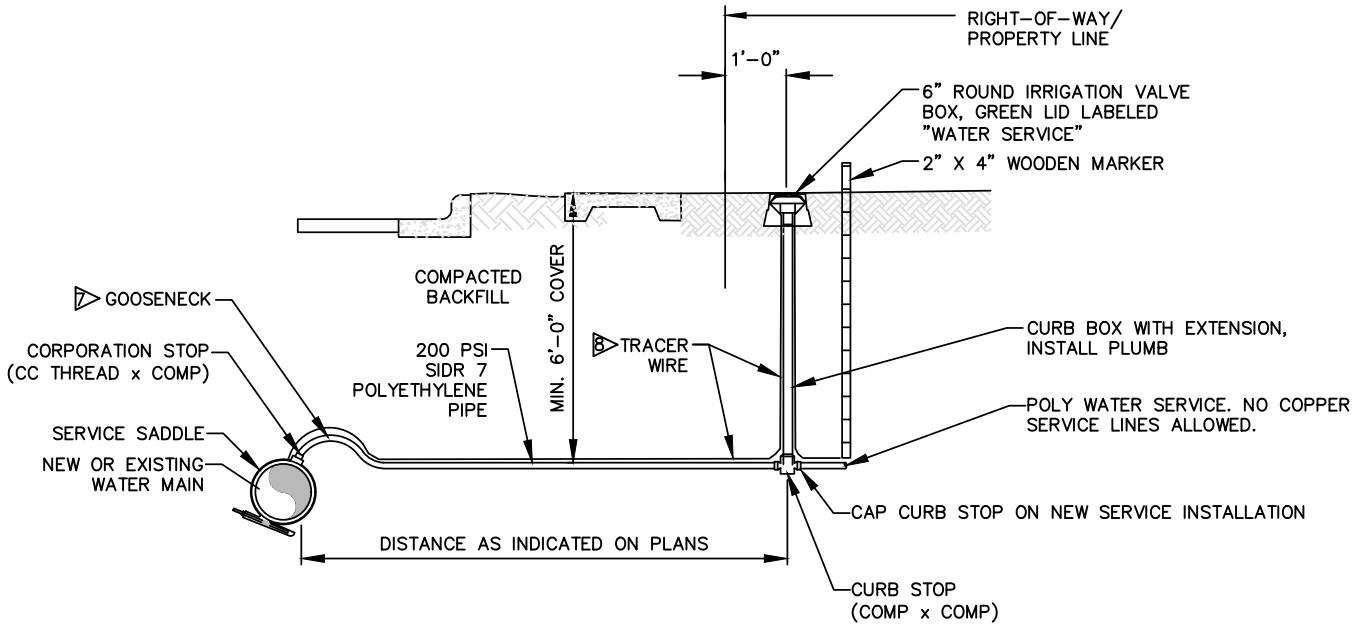
I. Fencing
    I. 6-foot chain link security.
    II. 3-foot wide personnel gate.
    III. 12-foot wide gate with two 6-foot leaves.
    IV. Shall provide adequate room for access and facility maintenance.
    V. 3-foot minimum offset from all structures and appurtenances.
    VI. Gate placement shall promote maintenance vehicle access for pump removal.
    VII. Gate installations shall include duckbill style gate holdbacks.

J. Landscaping
    I. 4-inches of clean 1-inch minus gravel or other landscaping rock as approved by the City of Townsend for areas outside of public right-of-way.
    II. Areas inside public right-of-way shall meet the requirements of the City of Townsend Municipal Code.

1.2.2 Sanitary Sewer Mains

A. Sanitary sewer mains to be flushed and TV inspected prior to City acceptance.

Chapter 2: Standard Details



NOTES:

1. CORPORATION STOPS SHALL BE AY MCDONALD OR MUELLER.
2. CURB STOPS SHALL BE AY MCDONALD OR MUELLER.
3. THIS DETAIL APPLIES TO SERVICES THAT ARE 2" IN DIAMETER OR SMALLER. SERVICE LINES OVER 2" ARE INSTALLED SIMILAR TO WATER MAINS.
4. WATER SERVICE LINES SHALL BE CONNECTED/INSTALLED WHERE SHOWN ON THE DRAWINGS OR AS SPECIFIED.
5. BEDDING MATERIAL WITHIN 6–INCHES OF THE SERVICE LINE SHALL BE TYPE 1 PIPE BEDDING.
6. THE CURB BOX SHALL BE INSTALLED 1'–0" FROM THE PROPERTY LINE.
7. THE GOOSENECK IN THE SERVICE LINE AT THE CONNECTION TO THE CORPORATION STOP SHALL BE MADE IN THE HORIZONTAL PLANE.
8. TRACER WIRE TO EXTEND FROM MAIN TO STRUCTURE WATER SERVICE ENTRANCE.
9. THE CORPORATION SHALL BE TAPPED AT 45° VERTICAL ANGLE ON THE PIPE (MEASURED FROM THE HORIZONTAL).
10. CONCRETE AND/OR PAVEMENT REMOVAL AND REPLACEMENT SHALL BE PROVIDED AS NECESSARY.
11. MINIMUM 6'–0" COVER SHALL BE MAINTAINED ALONG THE ENTIRE SERVICE LINE.
12. NO EXTENSION RODS ALLOWED IN CURB BOX.
13. SERVICE CONNECTIONS MUST BE INSPECTED BY CITY PERSONNEL AND ARE SUBJECT TO FEE(S) PER CITY ORDINANCE.

RPA

SCALE: NONE

SHEET TITLE

NEW WATER SERVICE

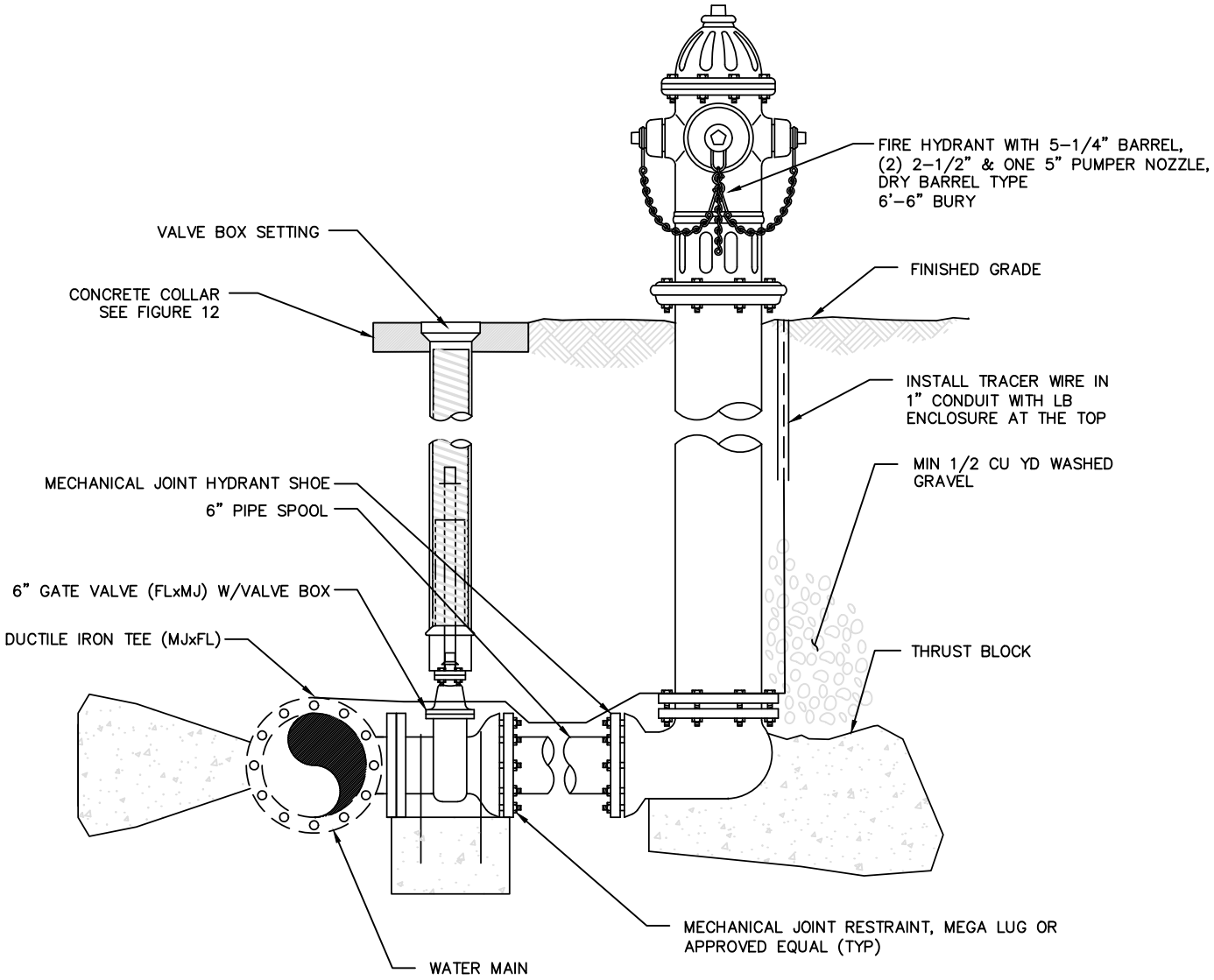
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

01



NOTES:

1. INSTALL HYDRANT W/PUMPER NOZZLE FACING THE PAVEMENT.
2. THRUST RESTRAINTS SHALL BE PROVIDED IN THE FORM OF CONVENTIONAL CONCRETE THRUST BLOCKS ON THE VALVE & HYDRANT.
3. HYDRANT SHALL BE INSTALLED A MIN OF 3'–6" BEHIND THE CURB AND AS DIRECTED BY THE CITY.
4. HYDRANTS SHALL CLOSE IN THE CLOCKWISE DIRECTION.
5. HYDRANTS AND GATE VALVES TO BE MANUFACTURED BY EAST JORDAN .
6. HYDRANT BODY SHALL BE PAINTED RED (SHERWIN WILLIAMS 6868).

RPA

SCALE: NONE

SHEET TITLE

FIRE HYDRANT INSTALLATION

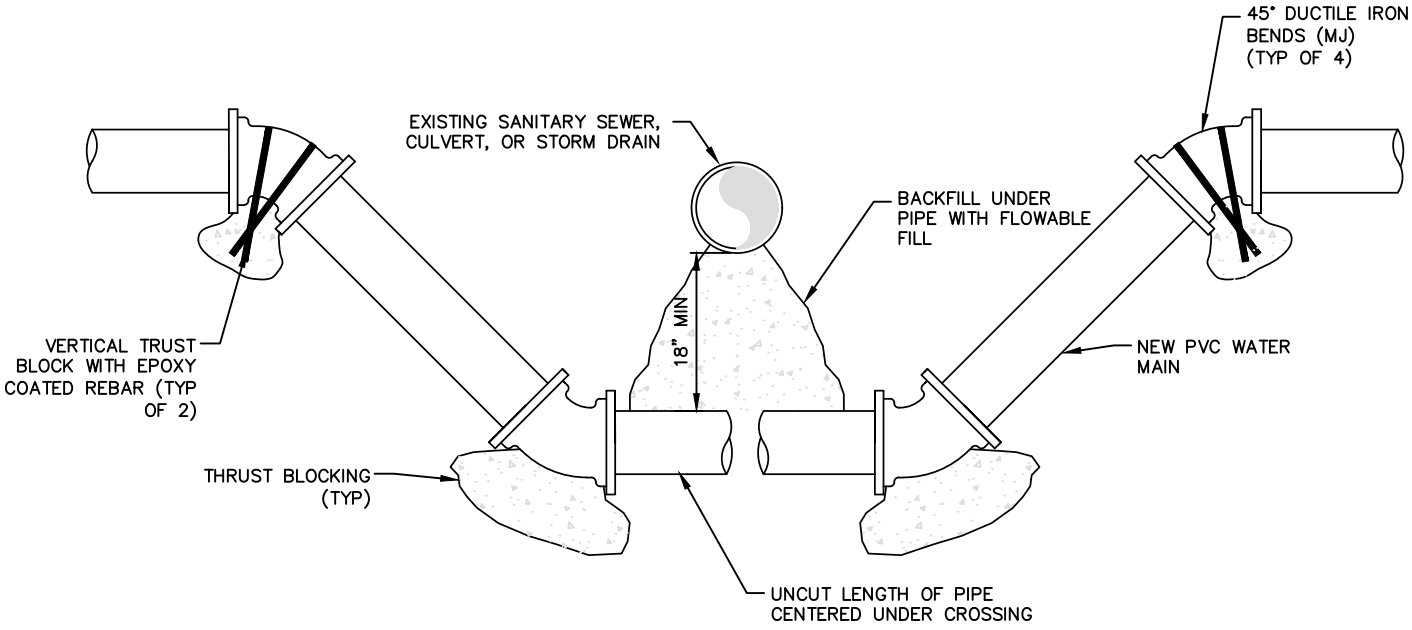
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

02



NOTES:

1. DURING CROSSINGS, STRUCTURAL SUPPORT OF THE SEWER OR STORM DRAIN SHALL BE PROVIDED TO PREVENT DAMAGE TO ANY EXISTING PIPES.

RPA

SCALE: NONE

SHEET TITLE

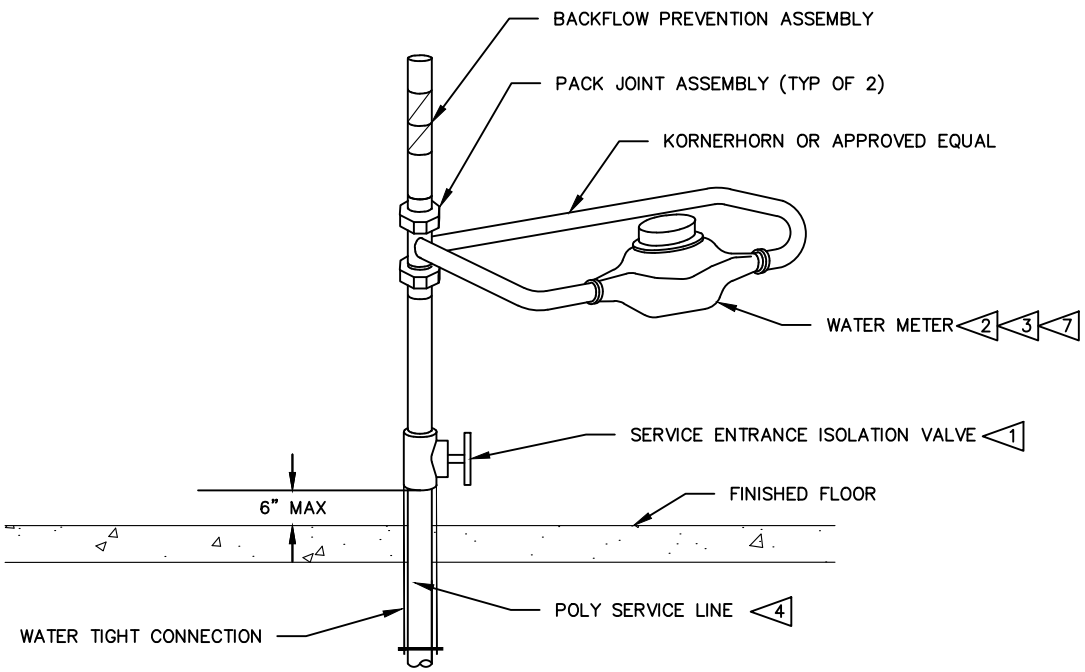
WATER MAIN VERTICAL ADJUSTMENT

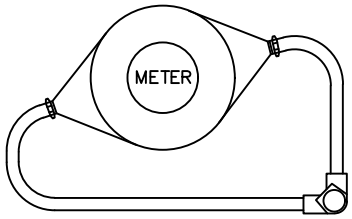
PROJECT TITLE

STANDARD DRAWINGS
Townsend, Montana

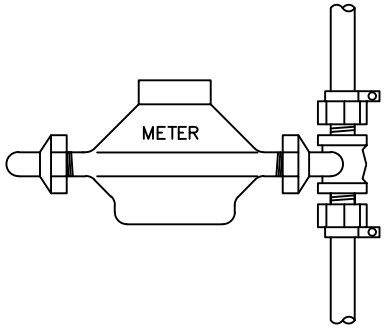
FIGURE

03





METER PLAN VIEW



METER ELEVATION VIEW

CONSTRUCTION NOTES:

1. THE FIRST FITTING INSIDE THE BUILDING SHALL BE A UL LISTED VALVE SIZED THE SAME AS THE SERVICE LINE.
2. METER SHALL BE SIZED THE SAME AS INCOMING SERVICE.
3. METER SHALL BE LOCATED WITHIN 4'–0" OF CRAWL SPACE OPENING.
4. THE INCOMING SERVICE LINE SHALL BE A MINIMUM OF 6' BELOW FINISHED GRADE.
5. ALL SERVICE LINE APPURTENANCES SHALL HAVE A MINIMUM WORKING PRESSURE OF 175 PSI.
6. WATER SERVICE LINES AND FIRE SERVICE LINES SHALL BE TWO SEPARATE SERVICES.
7. METER TYPE AND BRAND SHALL BE APPROVED BY THE CITY OF TOWNSEND PWD.

RPA

SCALE: NONE

SHEET TITLE

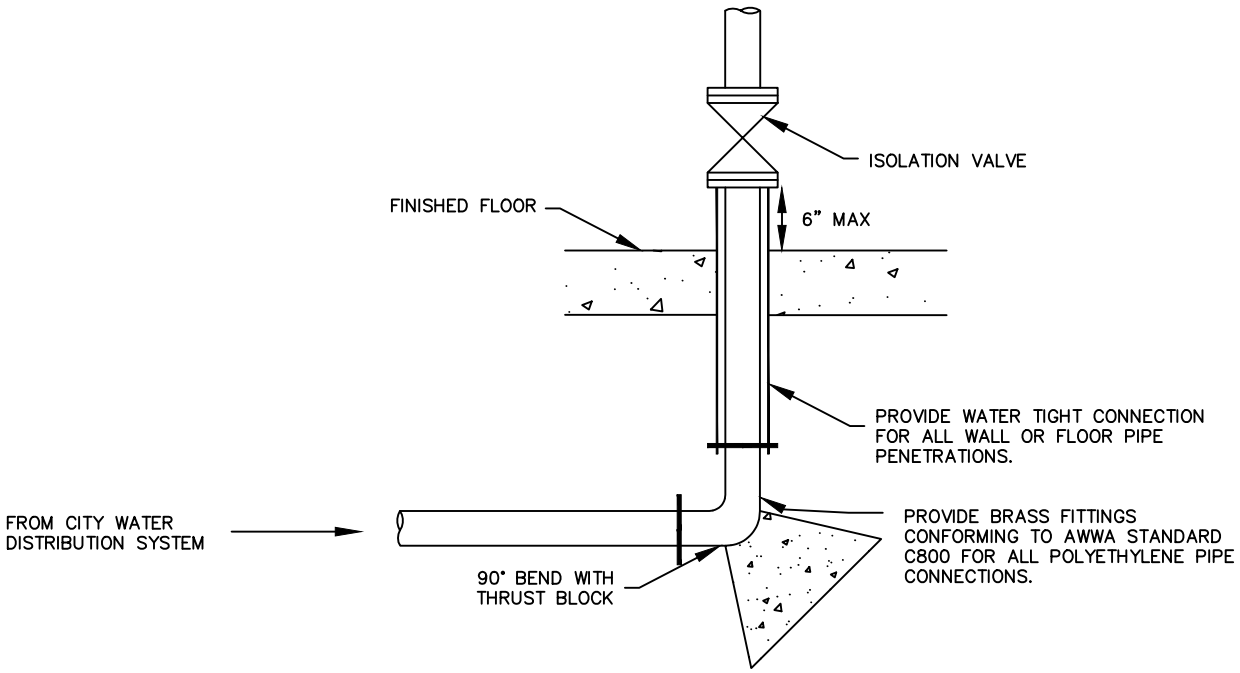
WATER SERVICE ENTRANCE

PROJECT TITLE

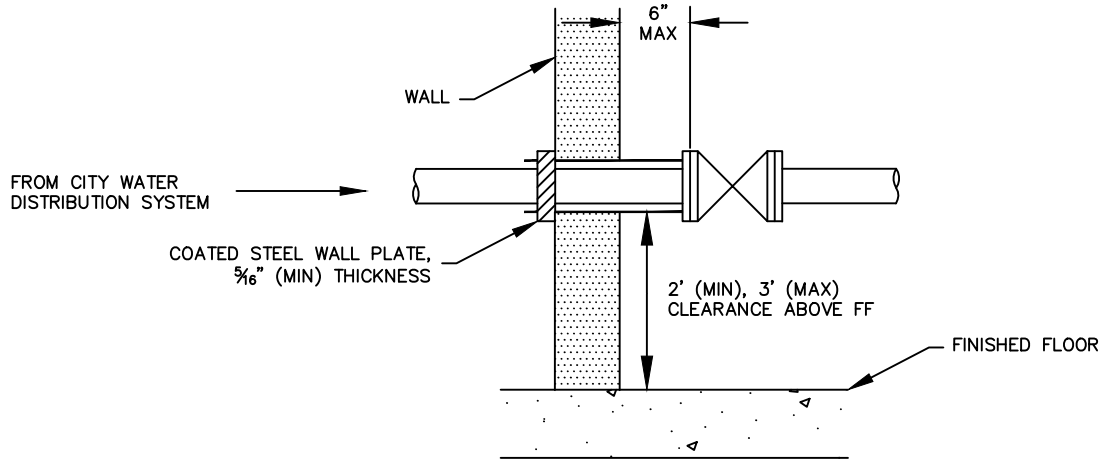
STANDARD DRAWINGS
Townsend, Montana

FIGURE

04



FLOOR PENETRATION



WALL PENETRATION

RPA

SCALE: NONE

SHEET TITLE

WATER SERVICE ENTRANCE CONFIGURATIONS

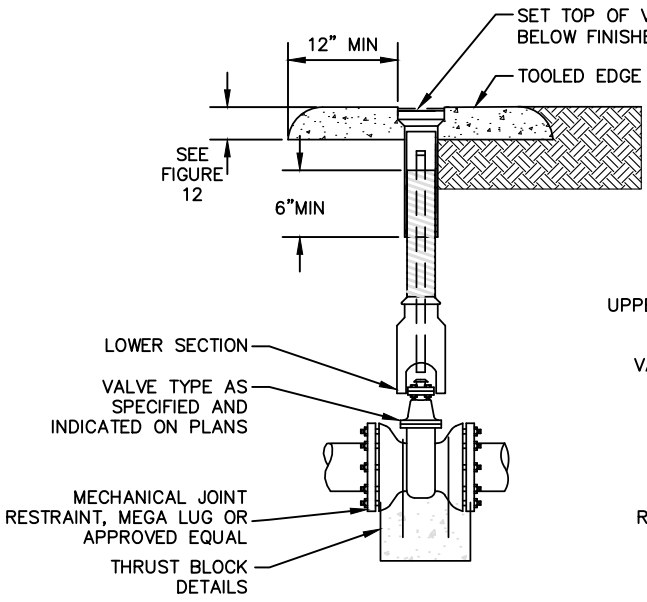
PROJECT TITLE

STANDARD DRAWINGS

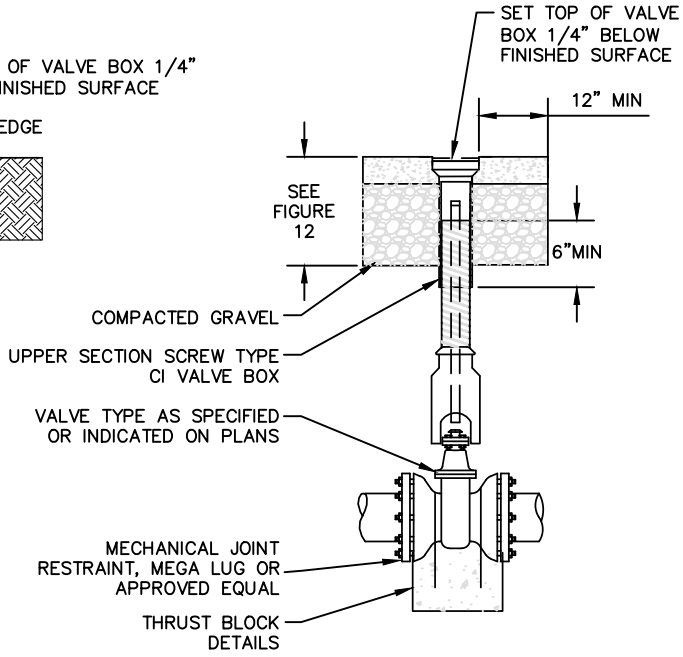
Townsend, Montana

FIGURE

05



SHOULDER OR DIRT ROAD



PAVED/ UNIMPROVED AREAS

NOTES:

1. ADJUST VALVE BOXES UPWARD OR DOWNWARD AS REQUIRED.
2. CONCRETE COLLARS SHALL BE POURED IN PLACE AT EACH WATER VALVE. IN PAVED AREAS CONCRETE COLLARS SHALL BE POURED AFTER PAVING. SEE FIGURE 12 FOR CONCRETE COLLAR DETAILS.
3. COMPACT ALL BACKFILL AROUND THE VALVE BOX UPPER SECTION BY MEANS OF HAND TAMPING.
4. ANY VALVE BOX UNCOVERED BY FINAL GRADING OPERATION SHALL BE PROVIDED WITH A CONCRETE COLLAR AS PER ABOVE DETAIL.
5. VALVES SHALL CLOSE IN THE CLOCKWISE DIRECTION.

RPA

SCALE: NONE

SHEET TITLE

VALVE SETTING

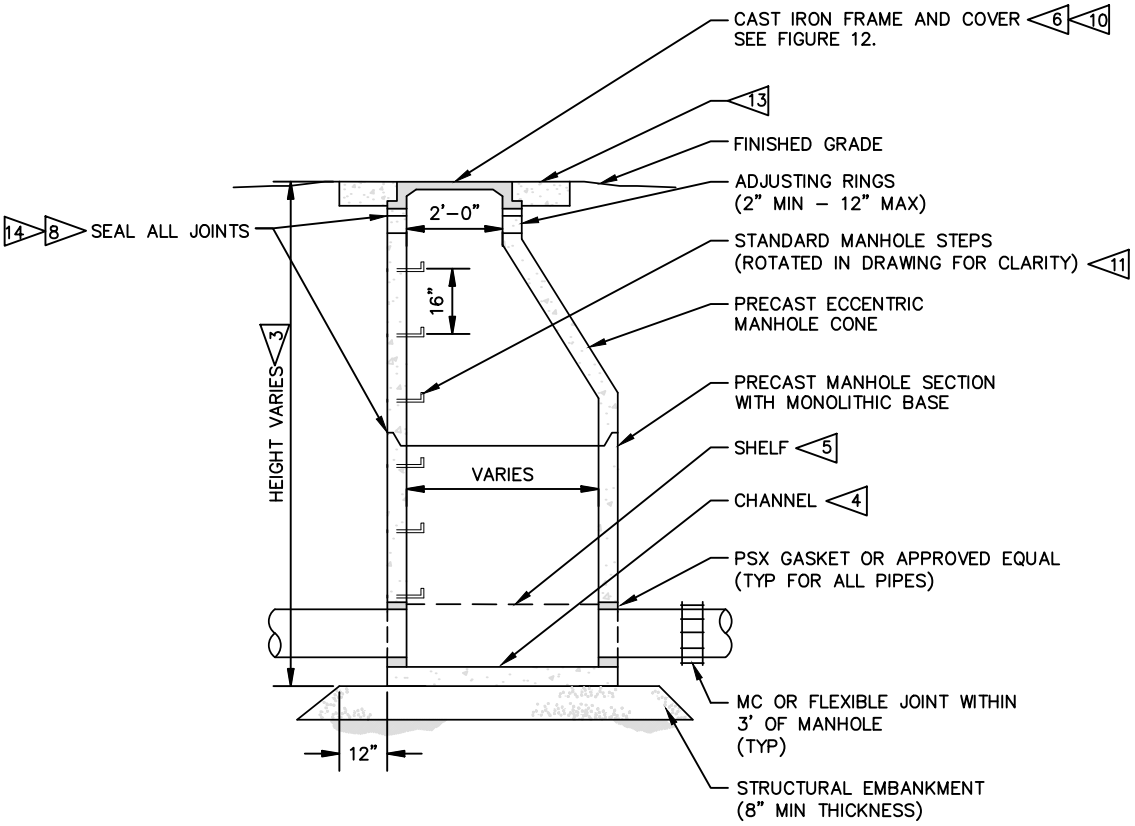
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

06



CONSTRUCTION NOTES:

1. PRECAST CONCRETE MANHOLES SHALL CONFORM TO ASTM C478.
2. PROVIDE 3" GROUT SPACE AROUND ALL PIPE. ALL JOINTS SHALL BE GROUTED WATERTIGHT.
3. IF MANHOLE IS LESS THAN 6'–0", OMIT ECCENTRIC CONE AND PROVIDE PRECAST STANDARD STRAIGHT MANHOLE WITH FLAT LID, RISER SECTION, AND COVER.
4. CHANNEL SHALL BE HALF THE DIAMETER OF THE PIPE. CONSTRUCT PER MPW.
5. CONCRETE SHELVES SHALL SLOPE TOWARD THE CHANNEL AT 1" PER FOOT.
6. MANHOLE COVER SHALL BE MARKED "SEWER" FOR THE WASTEWATER MANHOLES.
7. NEW MANHOLES SHALL BE COATED WITH AN EXTERIOR DAMPPROOFING; BITUMINOUS COAT OR COAL TAR EPOXY.
8. JOINT MATERIAL SHALL BE "RUBBER–NEK" OR APPROVED EQUAL.
9. FINISHED MANHOLES SHALL BE IN COMPLIANCE WITH LATEST EDITION OF MPWSS STANDARD SPECIFICATIONS.
10. FIELD SET COVER FLUSH W/ PAVEMENT, CONCRETE AND GRASS OR LAWN SURFACE. FIELD SET COVER 3" BELOW GRADE IN GRAVEL SURFACE.
11. STEPS SHALL BE PLACED AT 90° TO THE LINE OF SEWER PIPE WHERE APPLICABLE.
12. PROVIDE ALL SHORING NECESSARY TO PROTECT EXISTING STRUCTURES AND INFRASTRUCTURE.
13. INSTALL 12" COLLAR (6" THICK) AROUND COVER. INSTALL 2 REBAR HOOPS (#4 BAR).
14. WRAP EXTERIOR MANHOLE JOINTS WITH HIGH STRENGTH, WATERTIGHT ADHESIVE TAPE. ADHESIVE TAPE SHALL BE EZ–WRAP OR APPROVED EQUAL.

RPA

SCALE: NONE

SHEET TITLE

STANDARD MANHOLE

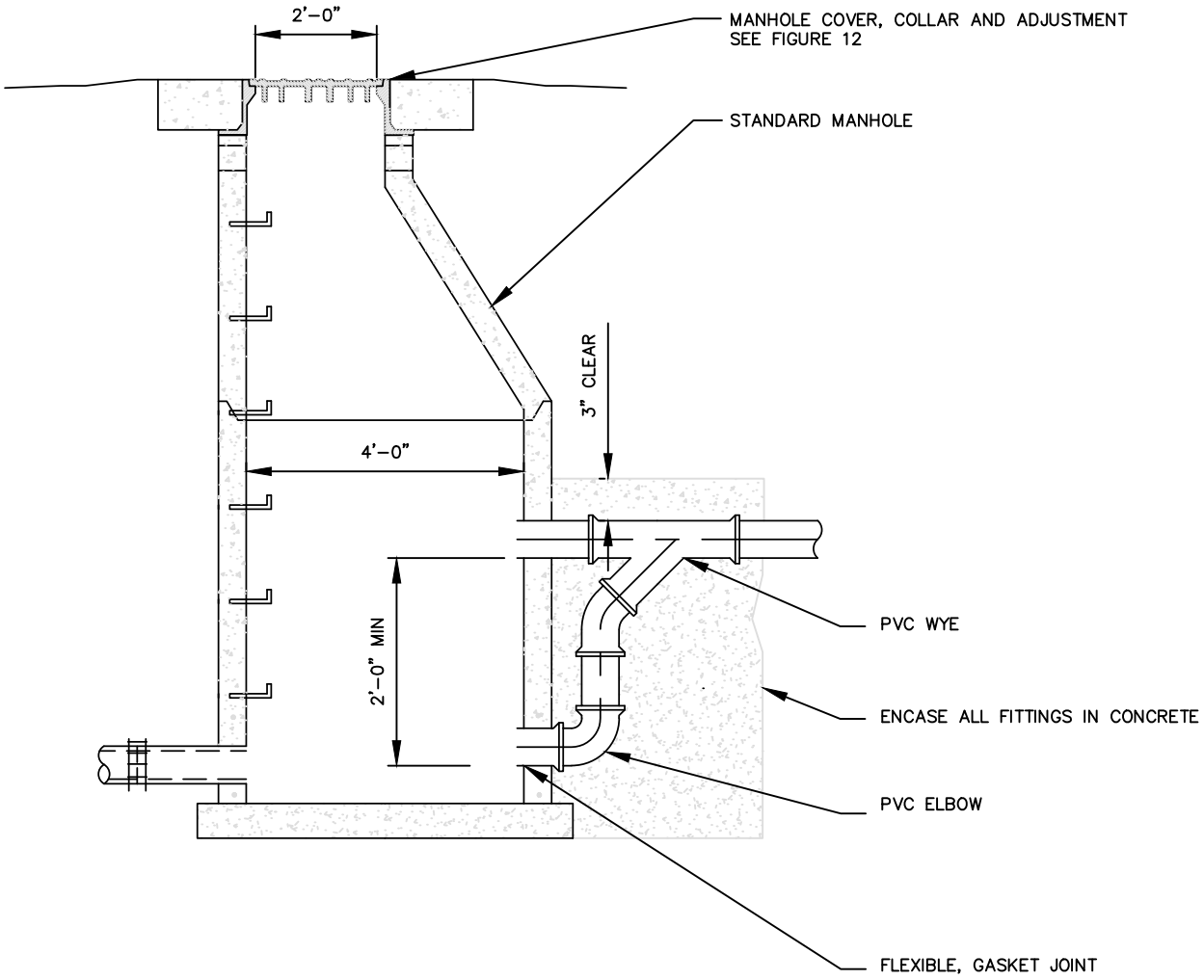
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

07



NOTES:

1. PROVIDE A DROP INLET WHENEVER THE PIPE INVERT IS MORE THAN 2'–0" ABOVE THE LOWEST MANHOLE INVERT.

SCALE: NONE

SHEET TITLE

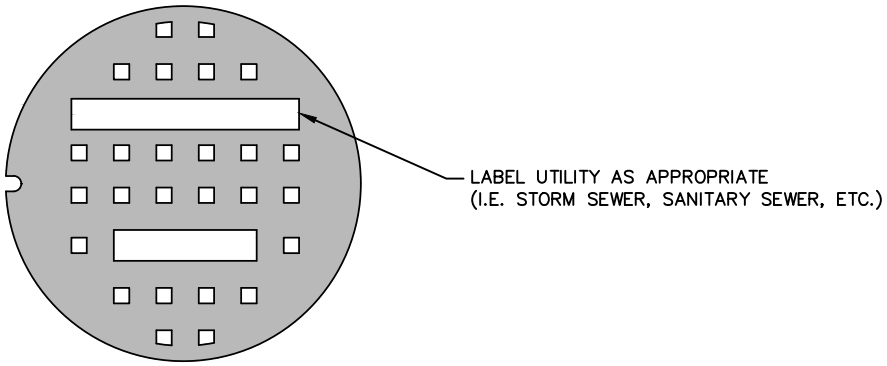
DROP MANHOLE

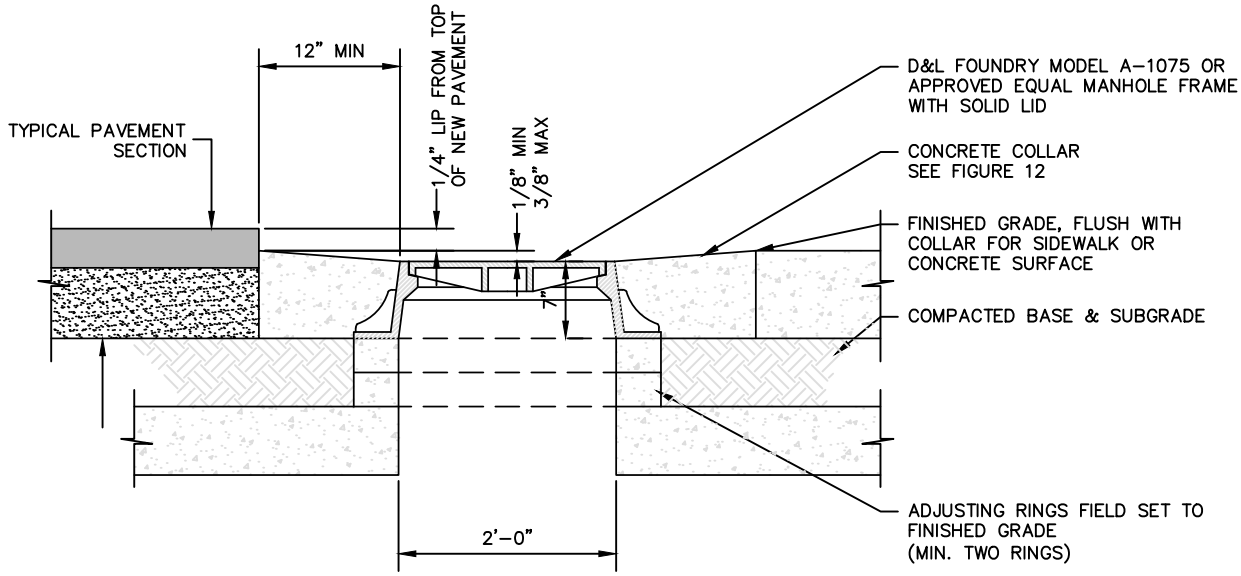
PROJECT TITLE

STANDARD DRAWINGS
Townsend, Montana

FIGURE

08





NOTES:

1. ADJUST MANHOLES UPWARD WITH CONCRETE ADJUSTMENT RINGS UNDER FRAME, 2" MINIMUM, 12" MAXIMUM.
2. SLOPE MANHOLE RING AS REQUIRED TO MATCH LONGITUDINAL & TRANSVERSE GRADE ON STREET. NO PAYMENT SHALL BE MADE FOR ADJUSTMENT OF NEW MANHOLES TO FINAL GRADE.
3. INSTALL CONCRETE COLLAR EXTENDING OUT FROM MANHOLE LID ON ALL SIDES, WHETHER IN STREET OR LANDSCAPED CONDITIONS.
4. WATERPROOF MANHOLE RINGS & LIDS ARE REQUIRED ON MANHOLES LOCATED IN GUTTER LINES, FLOW LINES, OR OUTSIDE THE ROADWAY.
5. SANITARY SEWER MANHOLE LIDS IN LANDSCAPED AREAS SHALL BE SLOPED TO DRAIN AWAY FROM LID.

RPA

SCALE: NONE

SHEET TITLE

MANHOLE COVER, COLLAR & ADJUSTMENT

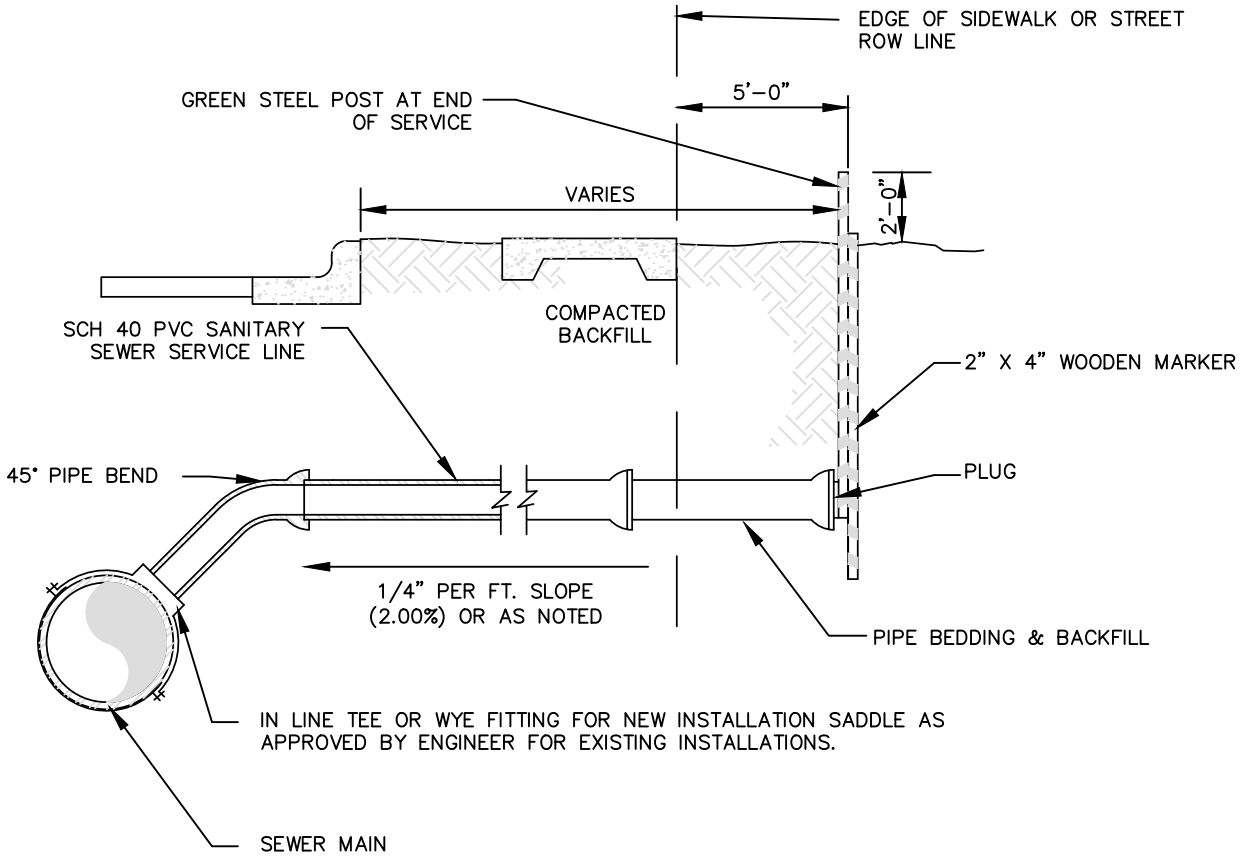
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

09



NOTES:

1. SERVICE CONNECTIONS MUST BE INSPECTED BY CITY PERSONNEL AND ARE SUBJECT TO FEE(S) PER CITY ORDINANCE.

RPA

SCALE: NONE

SHEET TITLE

SANITARY SEWER SERVICE LINE INSTALLATION

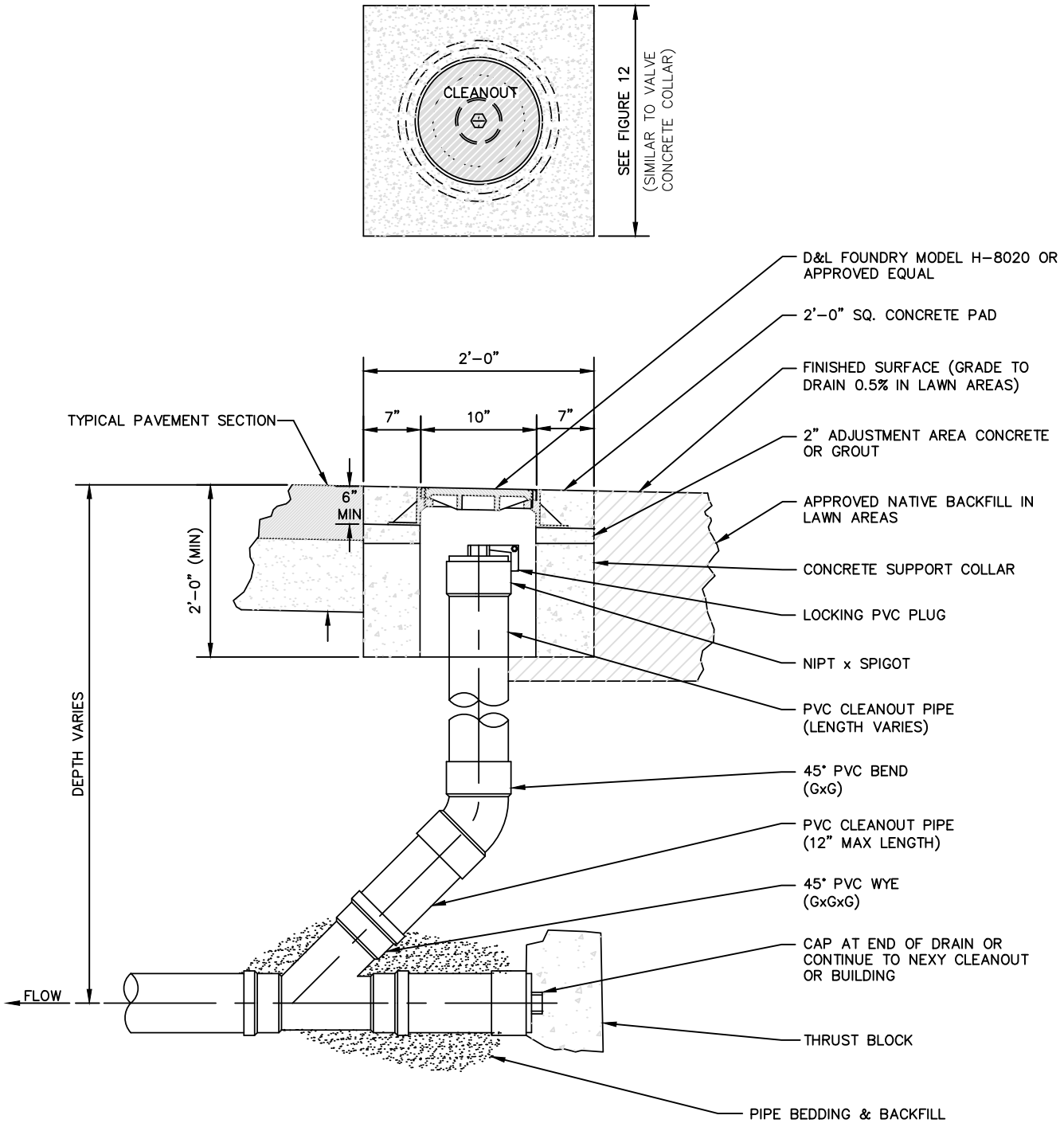
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

10



NOTES:

1. STUB CLEANOUT 6" ABOVE GROUND SURFACE UNTIL FINAL LANDSCAPING/GRADING/PAVING IS COMPLETED, AT WHICH TIME THE STUB CLEANOUT SHALL BE LOWERED TO NO MORE THAN 6" BELOW FINAL GRADE.
2. ADJUST CLEANOUT COVER 1/4" BELOW FINISHED GRADE ON PAVED SURFACE.
3. CLEANOUT SHALL BE LOCATED 5 FT. FROM BUILDING FACE OR AS SPECIFIED ON THE PLANS.
4. PRECAST TRAFFIC BOXES MUST BE RATED FOR HS20 LOADING & MUST BE SUBMITTED FOR APPROVAL IF CLEANOUT IS PLACED IN ANY LOCATION WERE TRAFFIC MAY BE PRESENT.

RPA

SCALE: NONE

SHEET TITLE

CLEANOUT AND COVER

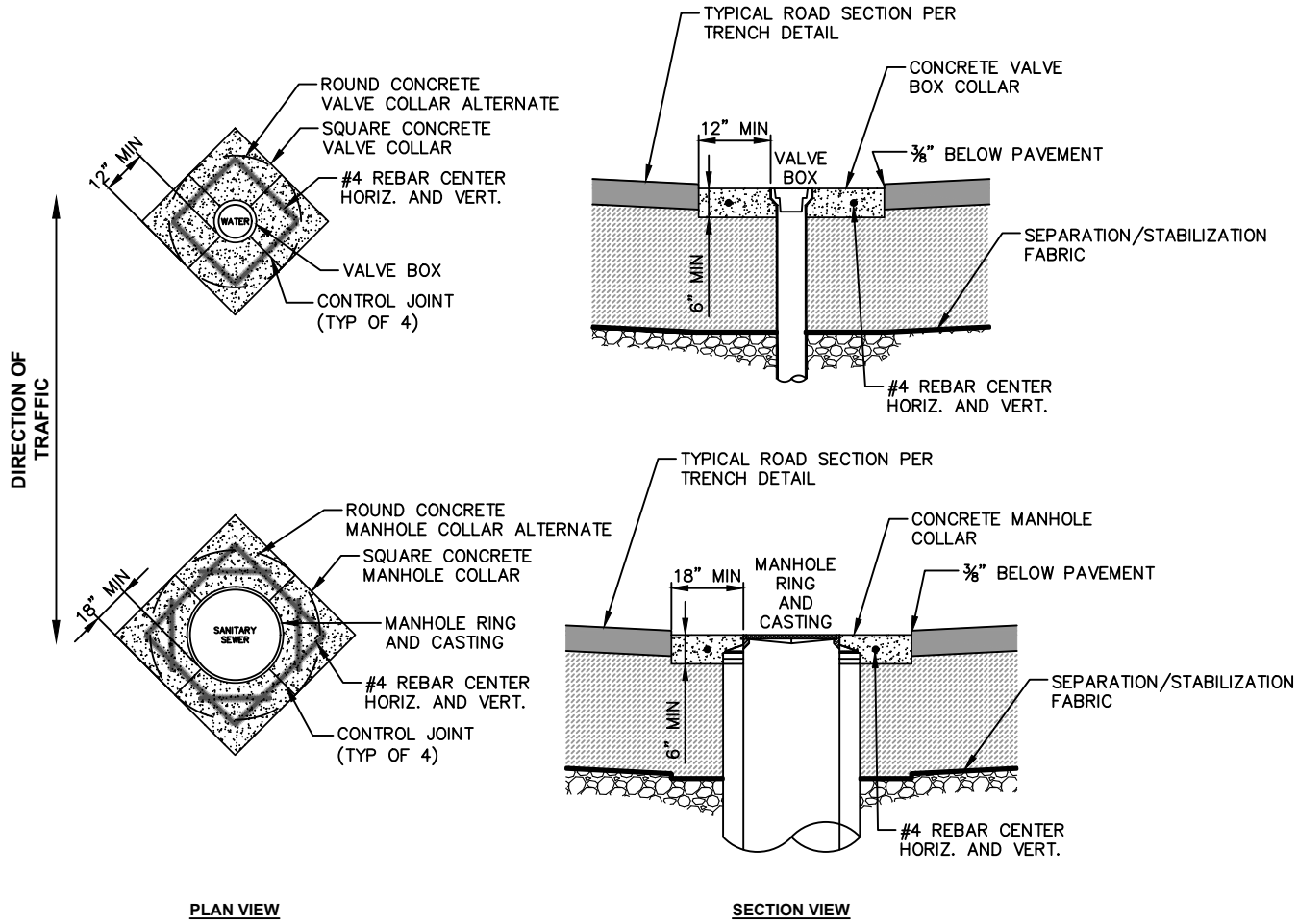
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

11



PLAN VIEW **SECTION VIEW**

NOTE:

1. ALL VISIBLE CONCRETE EDGES AND JOINTS SHALL BE ROUNDED WITH A ¼" RADIUS EDGING TOOL.
2. CONCRETE SHALL BE M-4000 WITH 3/4" MAX. AGGREGATE, MIN. 28 DAY STRENGTH OF 4000 PSI, 6% +/- 1.5% AIR ENTRAINMENT AND MAX SLUMP OF 4".
3. ALL EXISTING ASPHALT AND CONCRETE SHALL BE SAW CUT.

RPA

SCALE: NONE

SHEET TITLE

CONCRETE COLLAR

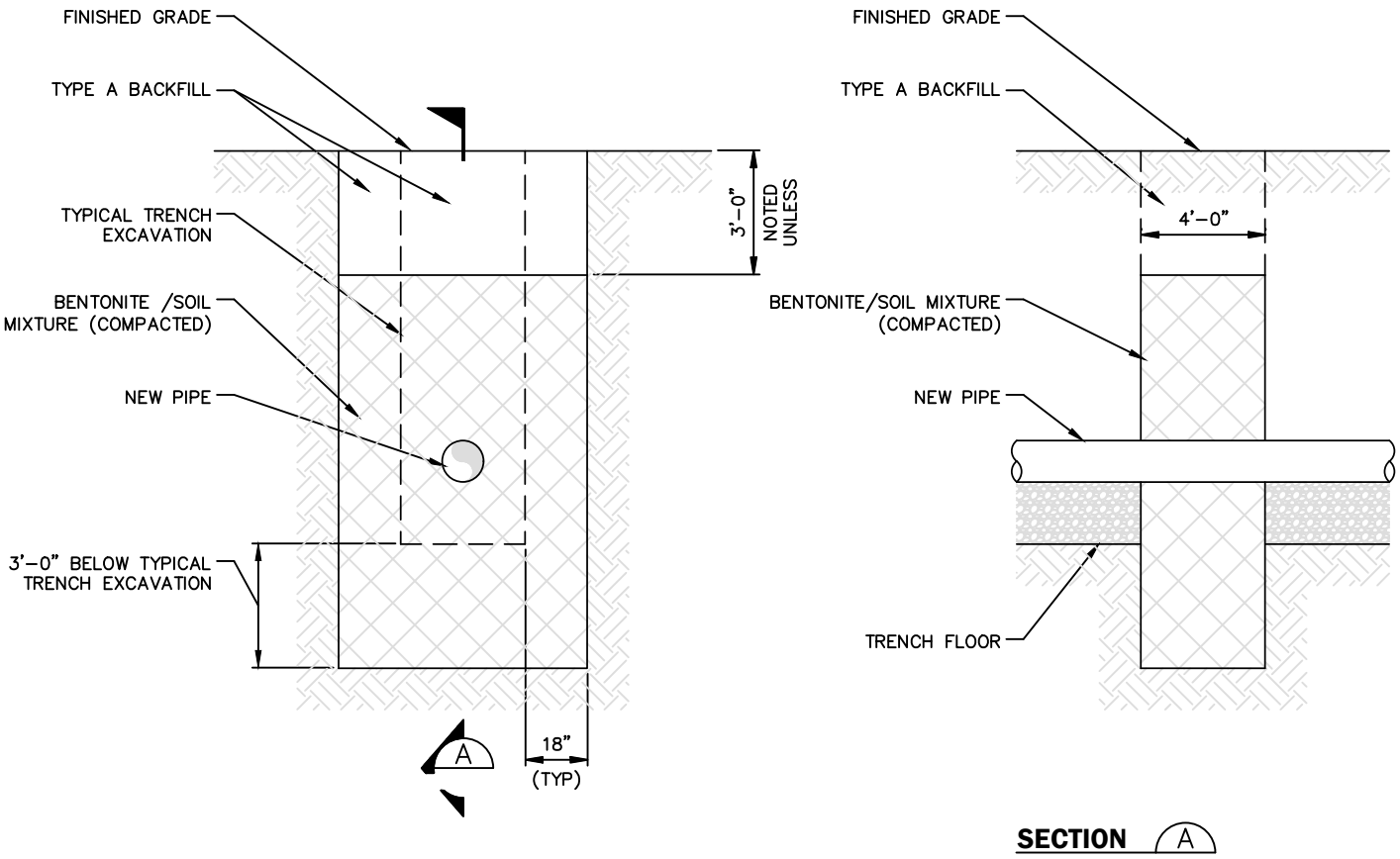
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

12



SECTION (A)

NOTES:

1. THE PURPOSE OF THE TRENCH WATER STOP IS TO PREVENT TYPE 1 & TYPE 2 BEDDING FROM BECOMING A CONDUIT FOR GROUNDWATER.
2. PROVIDE THE MIXTURE PROPORTIONING OF THE BENTONITE MATERIAL WITH ON–SITE LEAN CLAYS. ALL TRENCH WATER STOPS SHALL BE CONSTRUCTED TO HAVE AN IN–PLACE PERMEABILITY RATE OF 1x10–7 CM/SECOND OR LESS. THE A MIX PROPORTION DESIGN & CERTIFIED TESTING RESULTS FROM A PROFESSIONAL LAB INDICATING THE CONFORMANCE WITH THIS PERMEABILITY RATE SHALL BE SUBMITTED.
3. TRENCH WATER STOPS SHALL BE INSTALLED AT A MINIMUM OF 400'–0" APART, OR CROSSINGS OF STREAMS, DITCHES, OR OTHER SOURCES OF GROUNDWATER.

RPA

SCALE: NONE

SHEET TITLE

TRENCH PLUG

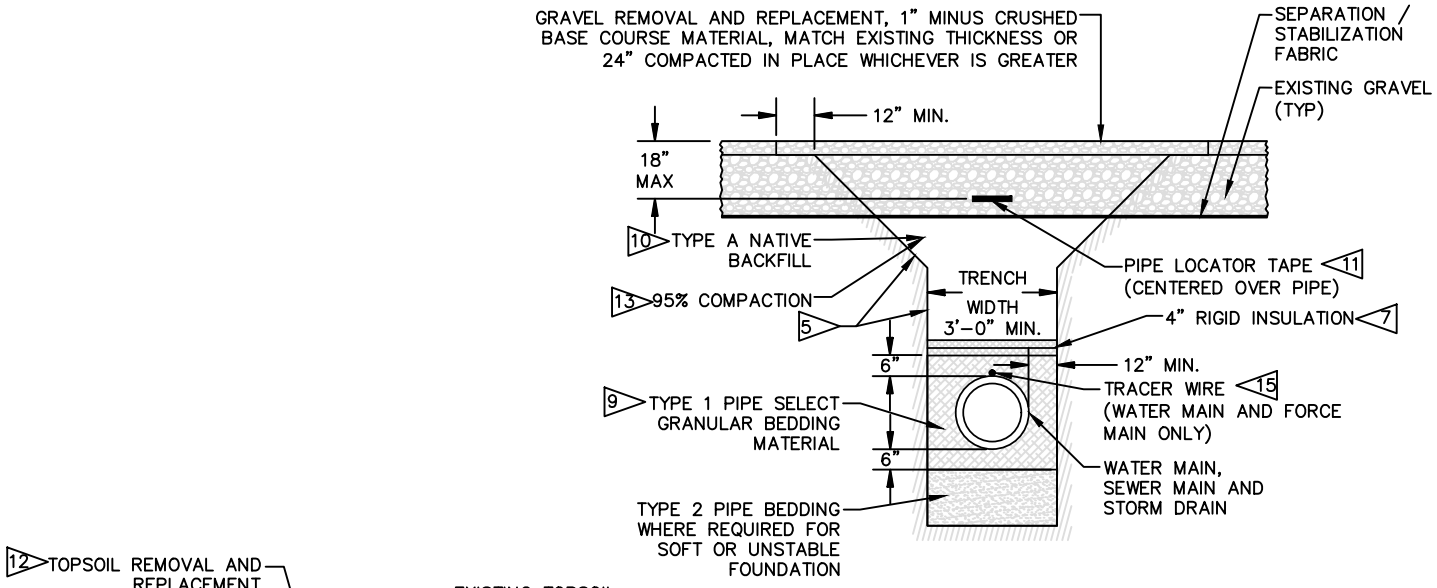
PROJECT TITLE

STANDARD DRAWINGS

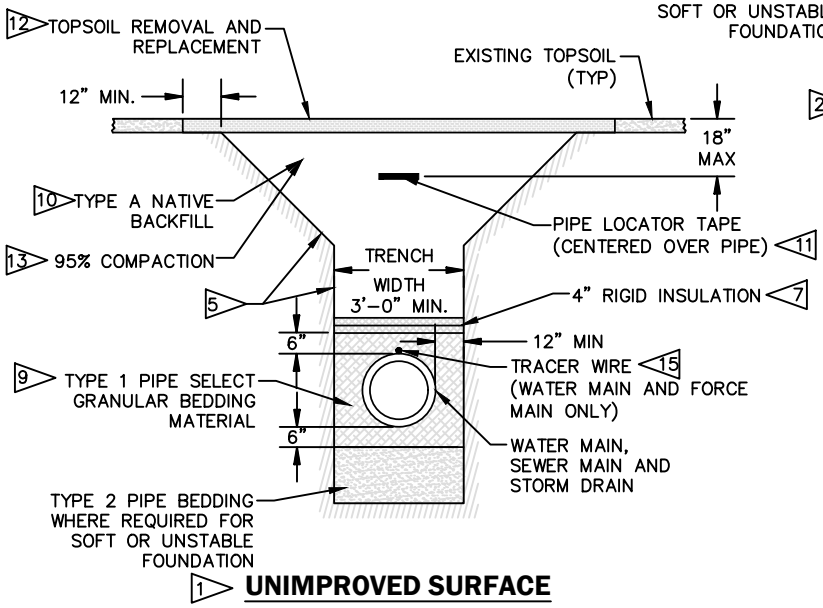
Townsend, Montana

FIGURE

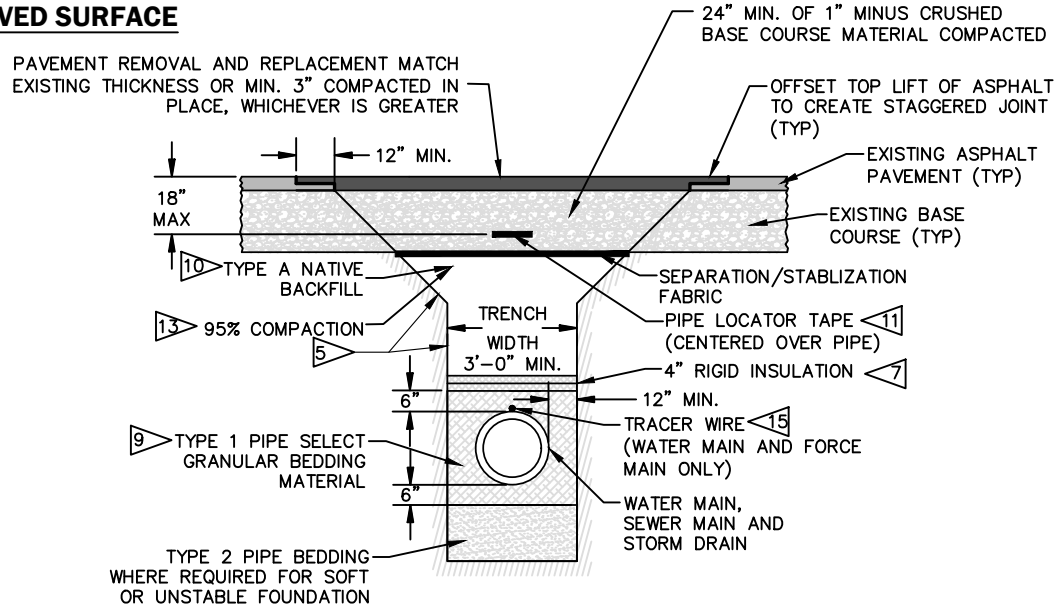
13



2 GRAVELED SURFACE



1 UNIMPROVED SURFACE



3 PAVED SURFACE

NOTES:

SEE SHEET 14A.

RPA

SCALE: NONE

SHEET TITLE

UTILITY TRENCH

PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

14

CONSTRUCTION NOTES:

1> WHERE TRENCH PASSES THROUGH UNIMPROVED SURFACES THE TOPSOIL SHALL BE REMOVED AND REPLACED A MAXIMUM OF 20' FROM THE CENTERLINE OF THE PIPE. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES BEYOND THIS WIDTH AT THEIR OWN EXPENSE.

2> WHERE TRENCH PASSES THROUGH EXISTING GRAVEL THE GRAVEL SHALL BE REMOVED AND REPLACED A MAXIMUM OF 10' FROM THE CENTERLINE OF THE PIPE. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES BEYOND THIS WIDTH AT THEIR OWN EXPENSE.

3> WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT THE PAVEMENT SHALL BE CUT ALONG A NEAT VERTICAL LINE A MAXIMUM OF 5' FROM THE CENTERLINE OF THE PIPE. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES BEYOND THIS WIDTH AT THEIR OWN EXPENSE.

4. VERIFY THAT COMPACTION METHODS ARE COMPARABLE WITH PIPE MANUFACTURER'S RECOMMENDATIONS. ANY DAMAGE TO THE PIPE WILL BE THE CONTRACTOR'S RESPONSIBILITY.

5> TRENCH SHALL BE CONSTRUCTED TO OSHA SPECIFICATIONS FOR EXCAVATION. DRAWINGS DO NOT SHOW TRENCH DIMENSIONS OR BACKSLOPES THAT MAY BE REQUIRED. CONTRACTOR REQUIRED TO DETERMINE WHICH OSHA SPECIFICATIONS ARE APPLICABLE.

6. CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND DISPOSAL OF ALL SPOILS.

7> INSTALL 4" OF RIGID INSULATION (BLUEBOARD OR APPROVED EQUAL) THE FULL WIDTH OF THE TRENCH WHEN BURY TO TOP OF PIPE IS LESS THAN 6'–0".

8. ALL ROCKS GREATER THAN 12" IN ANY DIMENSION SHALL BE HAULED OFF SITE AND DISPOSED OF PROPERLY.

9> NO ROCKS OR LUMPS LARGER THAN 2" IN ANY DIMENSION SHALL BE ALLOWED WITHIN 6" OF THE PIPE.

10> USE SUITABLE NATIVE MATERIAL FOR BACKFILL. SEE TECHNICAL SPECIFICATIONS FOR CONDITIONS REQUIRING IMPORTED TRENCH BACKFILL.

11> USE LABELED AND COLOR–CODED TAPE FOR THE APPROPRIATE UTILITY PIPE, PLACED 18" MAXIMUM BELOW FINISHED SURFACE.

12> SEED, FERTILIZE, AND MULCH ALL DISTURBED AREAS WHICH ARE NOT PAVED, CONCRETED, OR GRAVELED PER SPECIFICATIONS.

13> COMPACTION REFERS TO PERCENT OF MAXIMUM DENSITY DETERMINED BY A STANDARD PROCTOR. ASTM D 698–91. TRENCHES EXCEEDING 10 FEET IN DEPTH SHALL BE COMPACTED TO 98% OF MAXIMUM DENSITY PER ASTM D 698–91.

14. FINISHED GRADE MUST MATCH THE ORIGINAL EXISTING GRADE WHERE PIPE IS INSTALLED UNLESS OTHERWISE NOTED.

15> TRACER WIRE SHALL BE 12 AWG TW DIRECT–BURY SOLID COPPER WIRE WITH CROSS–LINKED POLYETHYLENE INSULATION.

16. GRAVEL THICKNESS OR GRAVEL SECTION DESIGN (I.E. FULL DEPTH RECYCLING) CAN BE REDUCED WITH A SUBMITTAL OF A STAMPED GEOTECHNICAL REPORT AND SUBMITTED TO THE CITY AND CITY ENGINEER FOR REVIEW AND APPROVAL.

RPA

SCALE: NONE

SHEET TITLE

UTILITY TRENCH DETAILS

PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

14A

F:\waste\17801 – Townsend Wastewater Improvements\Design Standards\Standard Drawings\14_UTILITY TRENCH UNIMPROVED SURFACE.dwg Feb 25, 2022

RPA

SCALE: NONE

SHEET TITLE

THRUST BLOCKING

PROJECT TITLE

STANDARD DRAWINGS

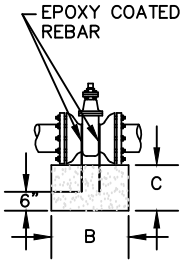
Townsend, Montana

FIGURE

15

VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)

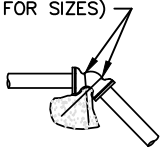
FITTING SIZE (INCHES)	BEND ANGLE		
	45°	22–1/2°	11–1/4°
4	0.8	0.3	0.1
6	2.0	0.8	0.3
8	3.0	1.1	0.4
10	4.5	1.7	0.7
12	6.4	2.4	1.0
14	8.6	3.2	1.3
16	11.1	4.2	1.7
18	14.1	5.3	2.2
20	17.3	6.6	2.7
24"	24.2	9.2	3.8



VERTICAL BEND REBAR

FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14" – 16"	#8	36"
18" – 20"	#10	36"
24"	#11	42"

EPOXY COATED REBAR OVER FITTING AND EMBEDDED IN CONCRETE (SEE TABLE FOR SIZES)



VERTICAL BEND

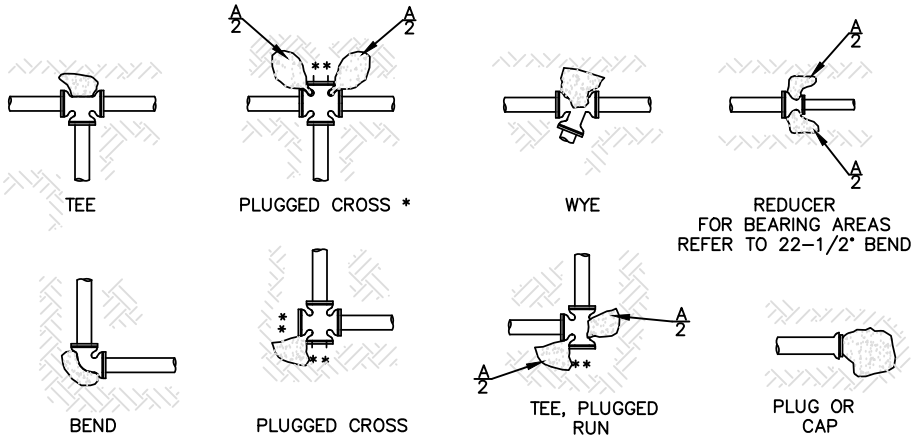
BEARING AREA OF THRUST BLOCKS IN SQFT (HORIZONTAL BENDS)

FITTING SIZE (INCHES)	TEE, WYE, PLUG, OR CAP	90° Bend, PLUGGED CROSS	TEE, PLUGGED RUN		BEND ANGLE		
			A 1	A 2	45°	22–1/2°	11–1/4°
4	1.3	1.8	1.3	1.8	1.0	1.0	–
6	3.0	4.2	3.0	4.2	2.3	1.2	1.0
8	5.3	7.6	5.3	7.6	4.1	2.1	1.0
10	8.3	11.8	8.3	11.8	6.4	3.3	1.6
12	12.0	17.0	12.0	17.0	9.2	4.7	2.4
14	16.3	23.1	16.3	23.1	12.5	6.4	3.2
16	21.4	30.2	21.4	30.2	16.3	8.3	4.2
18	27.0	32.0	27.0	32.0	20.7	10.5	5.3
20	33.4	47.2	33.4	47.2	25.5	13.0	6.5
24	40.3	55.0	40.3	55.0	35.7	18.0	9.0

NOTE: DIMENSION 'A' IS WIDTH OF THRUST BLOCK (PERPENDICULAR TO PAGE)

VALVE THRUST BLOCK DIMENSIONS

VALVE SIZE	REBAR SIZE	100 PSI			150 PSI		
		A	B	C	A	B	C
4"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
6"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
8"	#6	2.0'	2.0'	2.0'	2.0'	2.0'	2.0'
10"	#6	2.0'	2.0'	2.0'	2.5'	2.5'	2.0'
12"	#6	2.3'	2.0'	2.0'	3.0'	3.0'	2.7'
14"	#8	2.3'	2.0'	2.3'	3.4'	3.0'	3.0'
16"	#9	3.0'	3.0'	2.9'	4.3'	3.0'	3.0'
18"	#10	3.7'	3.0'	3.0'	5.4'	3.0'	3.0'
20"	#10	3.9'	3.3'	3.3'	5.7'	3.3'	3.3'
24"	#11	4.3'	4.0'	4.0'	6.4'	4.0'	4.0'

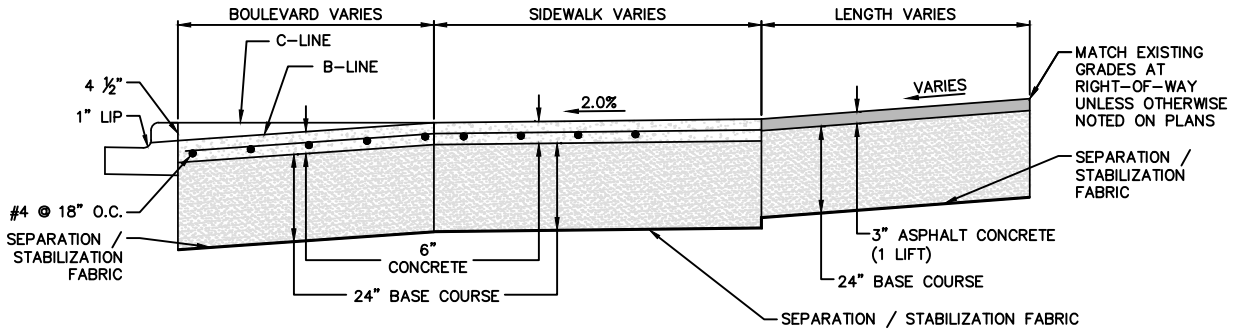


*EACH AREA (A/2) IS 1/2 OF TABULATED TOTAL AREA

** RESTRAINED PLUG

THRUST BLOCK NOTES:

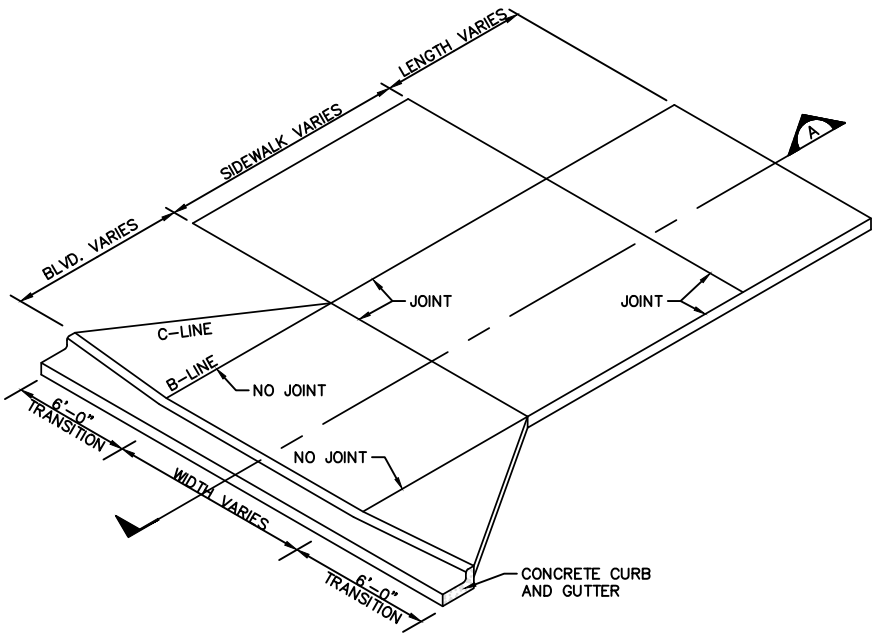
1. KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
2. POUR THRUST BLOCKING AGAINST UNDISTURBED EARTH.
3. REQUIRED VOLUMES AND BEARING AREAS SHALL BE AS SHOWN IN THE TABLE AND ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS OF 2000 LBS/SQFT.
4. BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS/SQFT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES USE THE FOLLOWING:
   $B_1 = B(13.33)(P_1/2000)$ WHERE:
   P_1 = ACTUAL TEST PRESSURE, PSIG
   B_1 = COMPUTED BEARING AREA
   B = BEARING AREA FROM TABLE
5. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE = 4050 LBS/CU YD. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES USE THE FOLLOWING:
   ACTUAL VOLUME = (TEST PRESSURE/150) X (TABLE VOLUME).
6. VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS AND HORIZONTAL BENDS, HAVE THE SAME THRUST BLOCK REQUIREMENTS.
7. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SPECIFIED OR SHOWN ELSEWHERE IN THESE PLANS TAKE PRECEDENCE OVER THIS STANDARD DETAIL.
8. THRUST BLOCK BEARING AREA SHALL NOT BE LESS THAN 1.0 SQFT.
9. TEST PRESSURES ARE INDICATED IN THE SPECIFICATIONS AND THE ALLOWABLE SOIL BEARING STRESS IS 2000 LBS/SQFT.
10. CONTRACTOR SHALL PROVIDE THRUST BLOCKING FOR ALL BURIED FITTINGS AND VALVES.



SECTION A

NOTES:

1. PLACE #4 REBAR @ 18" O.C. SUPPORTED BY 3" TALL CHAIRS IN ALL 6" CONCRETE.
2. SEE MPWSS 02529 FOR JOINT REQUIREMENTS.
3. BASE COURSE SHALL BE 1" MINUS CRUSHED BASE COURSE.
4. GRAVEL THICKNESS OR GRAVEL SECTION DESIGN (I.E. FULL DEPTH RECYCLING) CAN BE REDUCED WITH A SUBMITTAL OF A STAMPED GEOTECHNICAL REPORT AND SUBMITTED TO THE CITY AND CITY ENGINEER FOR REVIEW AND APPROVAL.



RPA

SCALE: NONE

SHEET TITLE

DRIVEWAY APPROACH

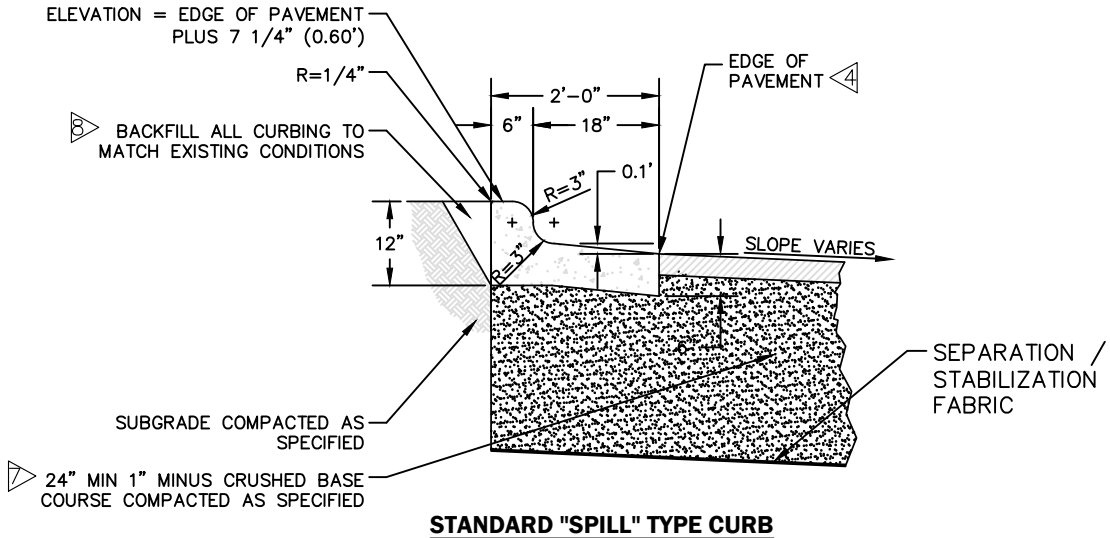
PROJECT TITLE

STANDARD DRAWINGS

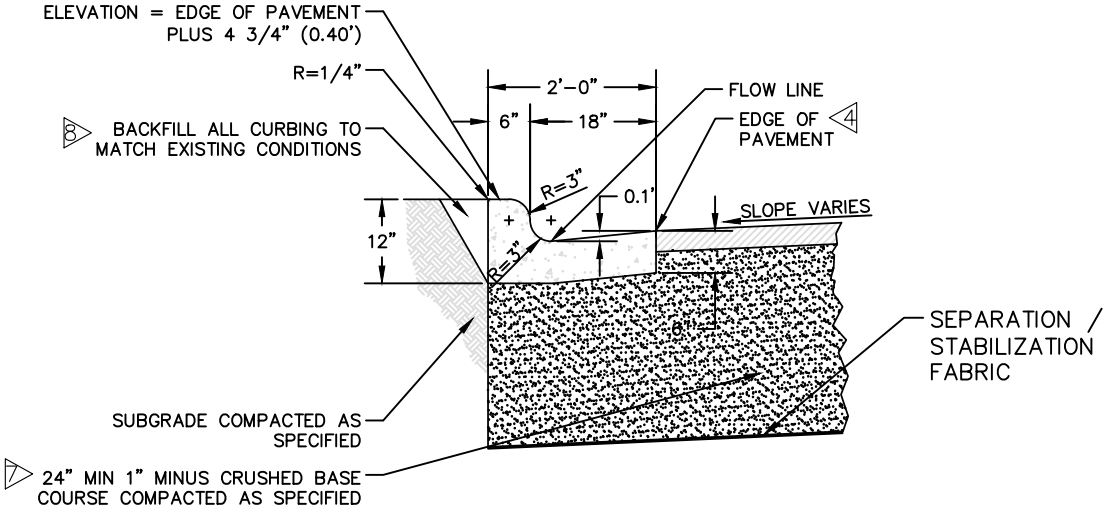
Townsend, Montana

FIGURE

16



STANDARD "SPILL" TYPE CURB



STANDARD "CATCH" TYPE CURB

NOTES:

1. CONTRACTION JOINTS SHALL BE PLACED EVERY 10 FT. IN ACCORDANCE WITH MPWSS 02528. CONTRACTION JOINTS SHALL BE 1 TO 1 ½" DEEP.
2. EXPANSION JOINTS OF 1/2 IN. PRE FORMED MASTIC MATERIAL SHALL BE PLACED AT THE FOLLOWING LOCATIONS: PC'S & PT'S OF CURVE, GRADE BREAKS, JUNCTIONS WITH EXISTING CONCRETE, OPPOSITE TO OR AT EXPANSION JOINTS IN ADJACENT CONCRETE, AT MAXIMUM 300 FT. INTERVALS, 4 IN. ON EITHER SIDE OF A DRAINAGE STRUCTURE, AND AT OTHER LOCATIONS AS SPECIFIED BY THE ENGINEER.
3. UNLESS OTHERWISE SPECIFIED IN THESE PLANS; CONSTRUCTION MATERIALS & PROCEDURES SHALL CONFORM TO MPWSS CURRENT EDITION.

4 FINISHED PAVEMENT SURFACE SHALL BE 1/8" TO 1/4" ABOVE LIP OF CURB ON STANDARD "CATCH" TYPE CURBS & FLUSH WITH END OF CURB ON STANDARD "SPILL" TYPE CURBS.

5. ALL CURBS TO BE "CATCH" TYPE, UNLESS OTHERWISE NOTED.
6. TRANSITION FROM "CATCH" TO "SPILL" CURBS OVER A 10'-0" TRANSITION CENTERED ON THE DIVIDING LINE SHOWN ON THE PLAN SHEET.

7 BASE COURSE BELOW CURB & GUTTER SHALL BE A MINIMUM 21 INCHES THICK OR THE BALANCE OF THE TYPICAL SECTION, WHICH EVER IS GREATER.

8 ALL NEW CURB SHALL BE BACKFILLED IN SUCH A MANNER AS TO MATCH EXISTING OR NEW ADJACENT AREAS.

9. GRAVEL THICKNESS OR GRAVEL SECTION DESIGN (I.E. FULL DEPTH RECYCLING) CAN BE REDUCED WITH A SUBMITTAL OF A STAMPED GEOTECHNICAL REPORT AND SUBMITTED TO THE CITY AND CITY ENGINEER FOR REVIEW AND APPROVAL.

RPA

SCALE: NONE

SHEET TITLE

CONCRETE CURB & GUTTER

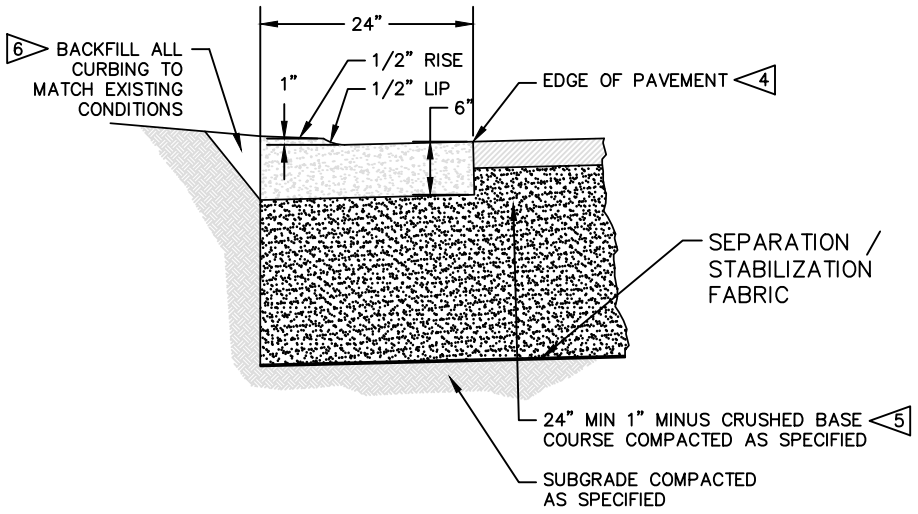
PROJECT TITLE

STANDARD DRAWINGS

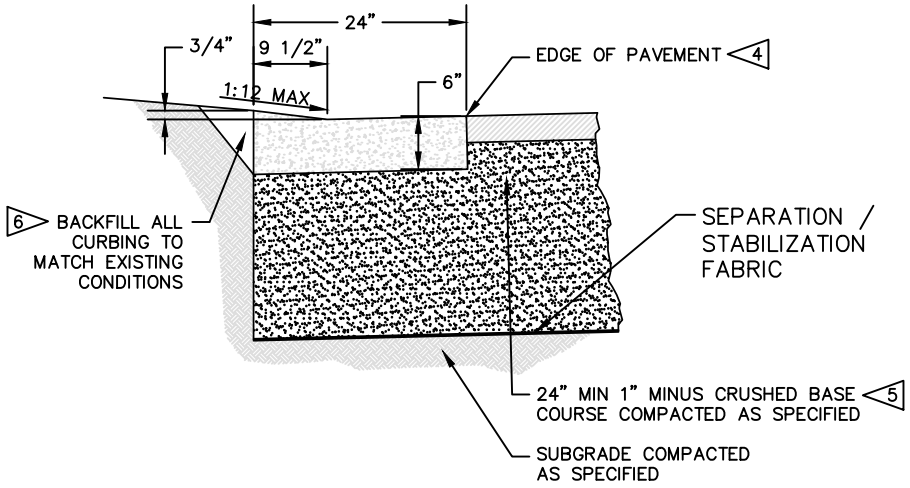
Townsend, Montana

FIGURE

17



STANDARD DRIVEWAY & DUMPSTER LAYDOWN CURB



STANDARD HANDICAP RAMP LAYDOWN CURB

NOTES:

1. CONTRACTION JOINTS SHALL BE PLACED EVERY 10 FT. IN ACCORDANCE WITH MPWSS 02528. CONTRACTION JOINTS SHALL BE 1 TO 1 ½" DEEP.
2. EXPANSION JOINTS OF 1/2 IN. PRE FORMED MASTIC MATERIAL SHALL BE PLACED AT THE FOLLOWING LOCATIONS: PC'S & PT'S OF CURVE, GRADE BREAKS, JUNCTIONS WITH EXISTING CONCRETE, OPPOSITE TO OR AT EXPANSION JOINTS IN ADJACENT CONCRETE, AT MAXIMUM 300 FT. INTERVALS, 4 IN. ON EITHER SIDE OF A DRAINAGE STRUCTURE, AND AT OTHER LOCATIONS AS SPECIFIED BY THE ENGINEER.
3. CONSTRUCTION MATERIALS & PROCEDURES SHALL CONFORM TO MPWSS CURRENT EDITION.

4 FINISHED PAVEMENT SURFACE SHALL BE 1/8" TO 1/4" ABOVE LIP OF CURB ON STANDARD "CATCH" TYPE CURBS & FLUSH WITH END OF CURB ON STANDARD "SPILL" TYPE CURBS.

5 BASE COURSE BELOW CURB & GUTTER SHALL BE A MINIMUM 21 INCHES THICK OR THE BALANCE OF THE TYPICAL SECTION, WHICHEVER IS GREATER.

6 ALL NEW CURB SHALL BE BACKFILLED IN SUCH A MANNER AS TO MATCH EXISTING OR NEW ADJACENT AREAS.

7. GRAVEL THICKNESS OR GRAVEL SECTION DESIGN (I.E. FULL DEPTH RECYCLING) CAN BE REDUCED WITH A SUBMITTAL OF A STAMPED GEOTECHNICAL REPORT AND SUBMITTED TO THE CITY AND CITY ENGINEER FOR REVIEW AND APPROVAL.

RPA

SCALE: NONE

SHEET TITLE

LAYDOWN CURB

PROJECT TITLE

STANDARD DRAWINGS

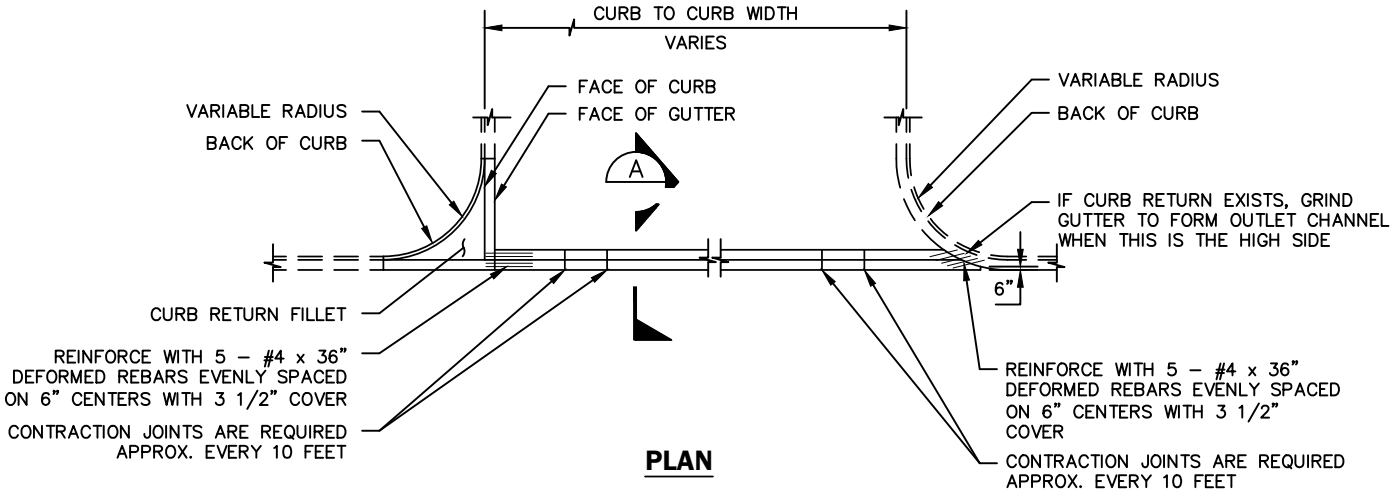
Townsend, Montana

FIGURE

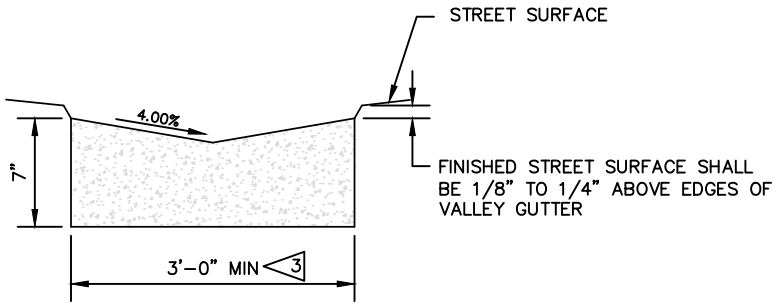
18

CURB RETURN FILLET REQUIRED FOR NEW CURB & GUTTER INSTALLATIONS (TYPICAL)

EXISTING CURB & GUTTER INSTALLATION WITHOUT CURB RETURN FILLET



PLAN



SECTION A

NOTES:

1. INSTALL REINFORCEMENT AT ALL CONSTRUCTION JOINTS.
2. CONTRACTION JOINTS ARE 1/8" MIN. AND 3/8" MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1". FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1".

3 DIMENSIONS WILL VARY DEPENDING ON FLOW CONDITIONS.

RPA

SCALE: NONE

SHEET TITLE

CONCRETE VALLEY GUTTER

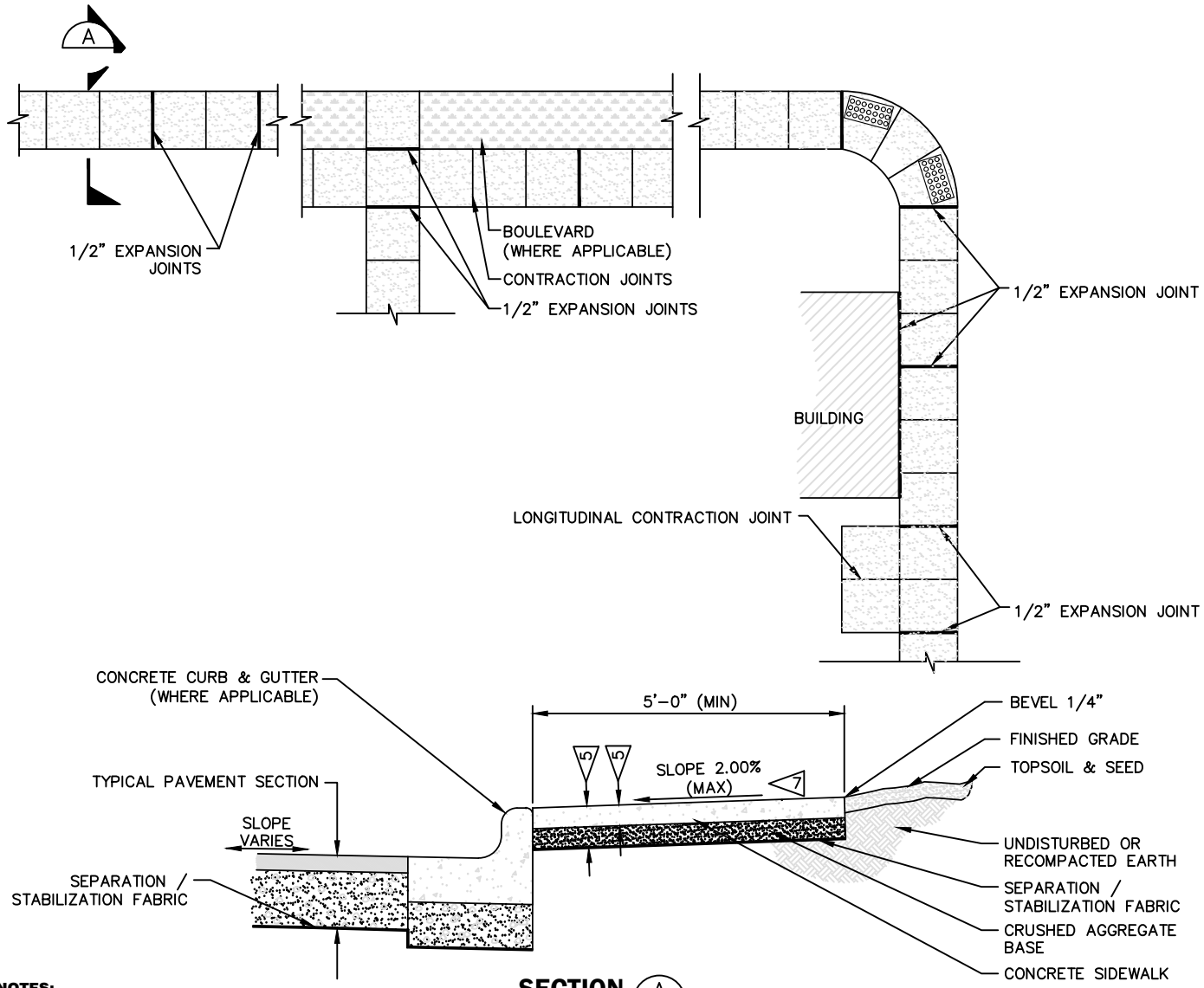
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

19



SECTION A

NOTES:

1. PREFORMED SEMI-RIGID, CLOSED-CELL POLYPROPYLENE FOAM JOINT FILLER SHALL BE INSTALLED AT EXPANSION JOINTS FOR THE FULL THICKNESS OF THE SIDEWALK & WILL BE USED AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK & STRUCTURES IN PLACE.
2. ALL JOINTS SHALL BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE & SURFACE OF THE SIDEWALK. ALL JOINTS, WHERE APPLICABLE, SHALL ALIGN WITH LIKE JOINTS IN ADJOINING WORK. JOINTS SHALL BE USED TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH SHALL BE, SO FAR AS POSSIBLE, SQUARE.
3. CONTRACTION JOINTS SHALL NOT BE MORE THAN 1/8" WIDE AND NOT LESS THAN 1" IN DEPTH & MAY BE CUT BY A GROOVE FORMING TOOL. CONTRACTION JOINTS WITHIN SIDEWALKS SHALL BE REQUIRED AT INTERVALS EQUAL TO THE WIDTH OF THE SIDEWALK OR CENTERLINE CONTRACTION JOINT WIDTH. CONTRACTION JOINTS SHALL HAVE A BEVELED 1/4" RADIUS.
4. ALL SIDEWALKS WIDER THAN 5'-0" SHALL HAVE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF THE SIDEWALK.

5> UNLESS OTHERWISE SPECIFIED, ALL SIDEWALKS SHALL BE 4" THICK & SHALL BE UNDERLAIN WITH 24" OF 1" MINUS CRUSHED BASE COURSE AS SPECIFIED OR 3/4" MINUS WASHED ROCK. WHERE SIDEWALKS CROSS ROADWAY APPROACHES, OR OTHER TRAFFIC AREAS, THE SIDEWALK SHALL BE 6" THICK UNDERLAIN BY 24" OF 1" MINUS CRUSHED BASE COURSE AS SPECIFIED OR 3/4" MINUS WASHED ROCK AND SEPARATION / STABILIZATION FABRIC.

6. EXPANSION JOINTS IN SIDEWALKS SHALL BE REQUIRED AT 50'-0" INTERVALS O.C. FOR STRAIGHT SECTIONS. EXPANSION JOINTS ARE NECESSARY AT CHANGES IN SIDEWALK SLOPES, INTERCEPTS WITH DRIVEWAYS, OTHER SIDEWALKS & AT BEGINNING & ENDING LOCATIONS ON EACH POINT-OF-CURVATURE FOR RADII GREATER THAN 10'-0"

7> SLOPE SIDEWALKS 2.00% TO GUTTER OR BOULEVARD.

8. ALL NEW SIDEWALKS SHALL BE BACKFILLED IN SUCH A MANNER AS TO MATCH EXISTING OR NEW ADJACENT AREAS.
9. COMPACT ALL SUBGRADE AND BASE COURSE MATERIALS TO 95% OF STANDARD PROCTOR.
10. FOR SLAB AREAS, CONTRACTION OR CONSTRUCTION JOINTS SHALL BE SPACED A MINIMUM OF 8'-0" ON CENTER.

RPA

SCALE: NONE

SHEET TITLE

CONCRETE SIDEWALK

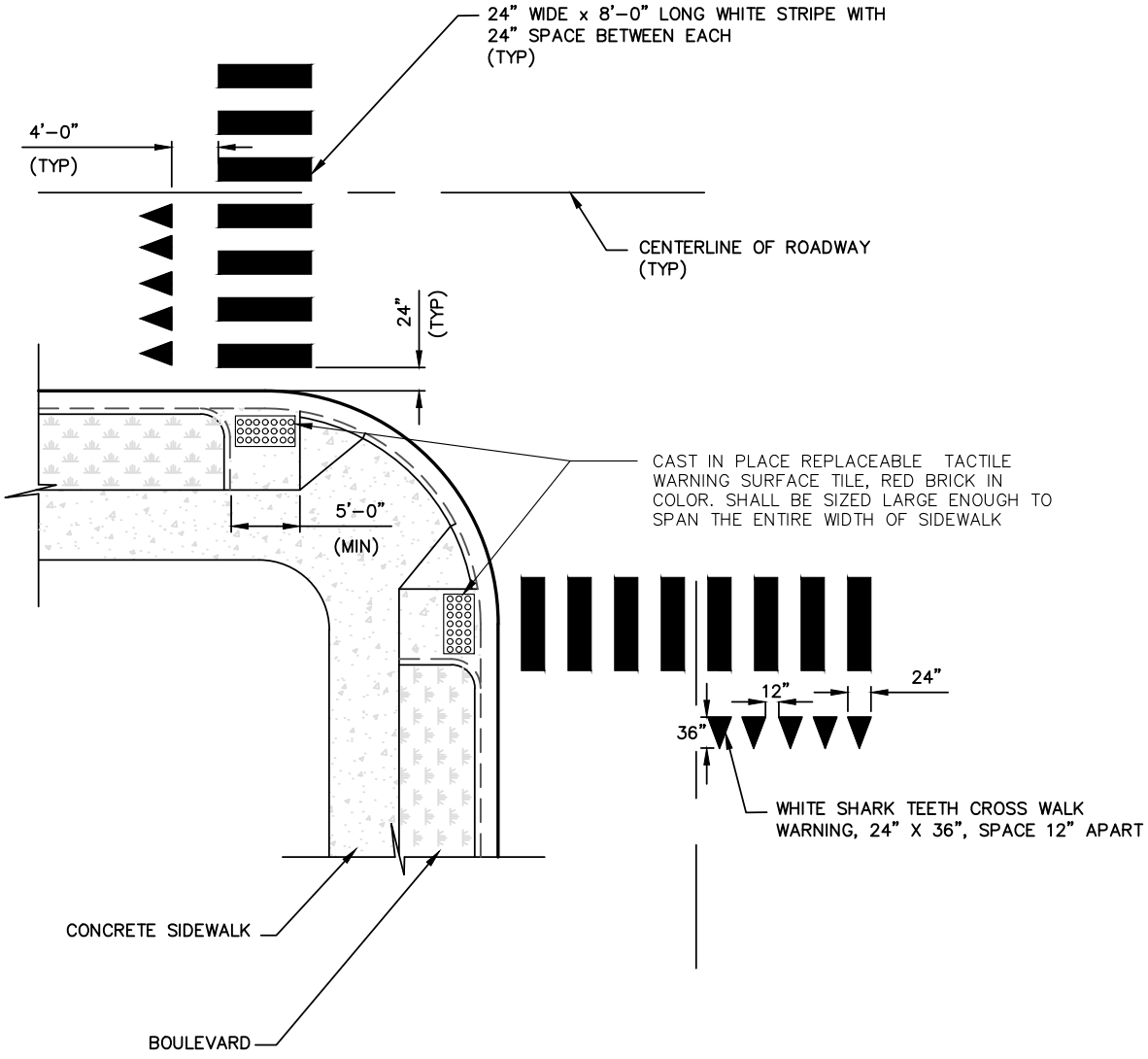
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

20



NOTES:

1. CROSSWALK LOCATIONS VARY. LOCATIONS AND STRIPING DIMENSIONS ARE DEPENDANT UPON THE ORIENTATIONS OF THE SIDEWALK AND CURB RAMPS.
2. CROSSWALK AND SHARK TEETH MARKINGS (ONLY) SHALL BE REFLECTIVE THERMOPLASTIC. MATERIALS AND APPLICATION SHALL CONFORM TO SECTIONS 620 AND 714 OF THE MONTANA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (CURRENT EDITION). THERMOPLASTIC MARKING MATERIAL SHALL BE EXTRUDED INTO CUT OR GROUND GROOVES (INLAID).
3. QUANTITIES OF STRIPES ARE DEPENDANT ON WIDTH OF ROAD.
4. PEDESTRIAN RAMPS SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT/ACCESSIBILITY GUIDELINES FOR BUILDING AND FACILITIES.

RPA

SCALE: NONE

SHEET TITLE

TYPICAL PEDESTRIAN CROSSING

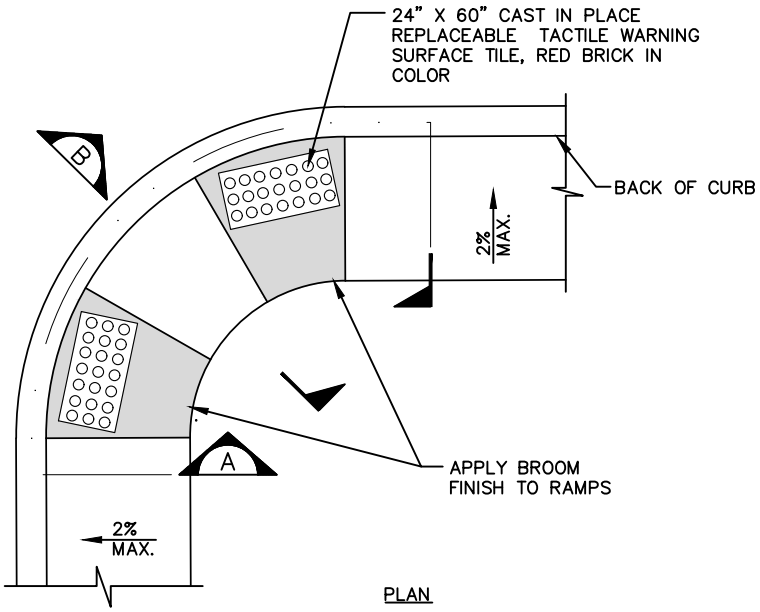
PROJECT TITLE

STANDARD DRAWINGS

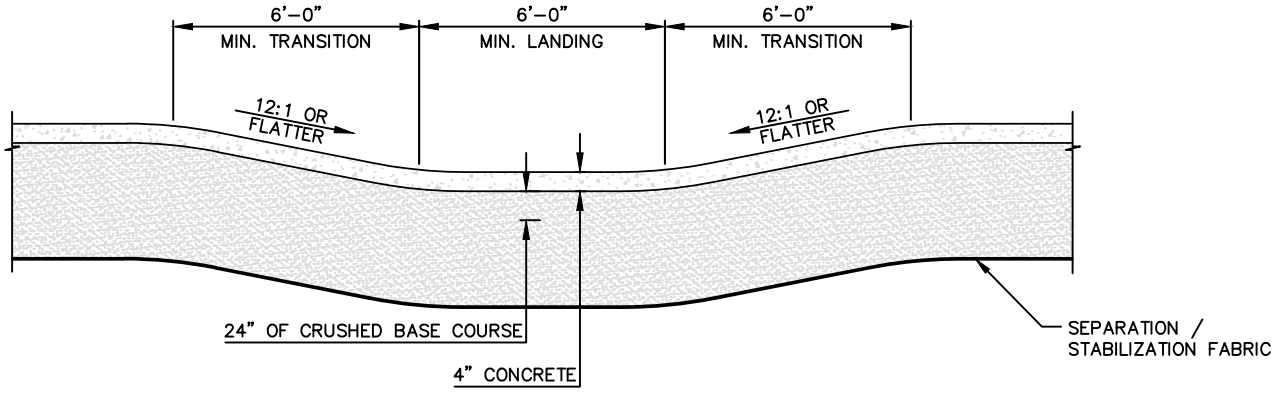
Townsend, Montana

FIGURE

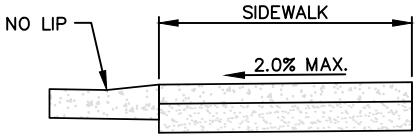
21



PLAN



SECTION A



SECTION B

NOTES:

1. THIS DETAIL IS ONLY APPLICABLE IN AREAS WITH NO BOULEVARD.
2. BASE COURSE SHALL BE 1" MINUS CRUSHED BASE COURSE.

RPA

SCALE: NONE

SHEET TITLE

PEDESTRIAN RAMP

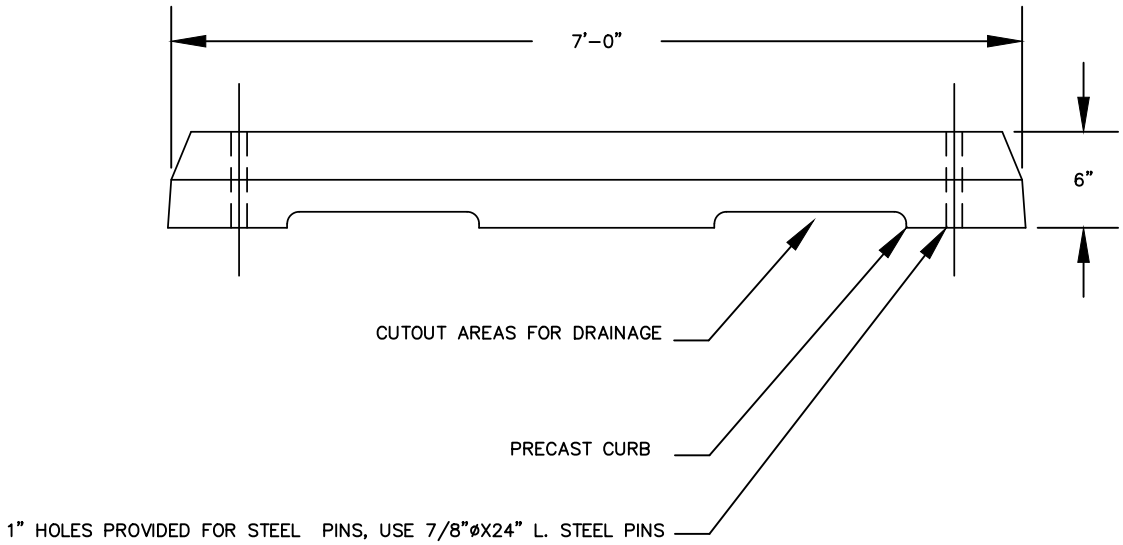
PROJECT TITLE

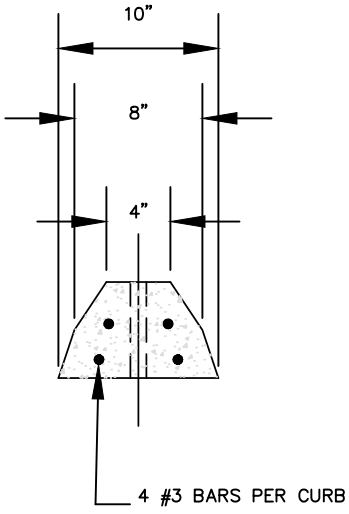
STANDARD DRAWINGS

Townsend, Montana

FIGURE

22





RPA

SCALE: NONE

SHEET TITLE

PRECAST CONCRETE PINDOWN CURB

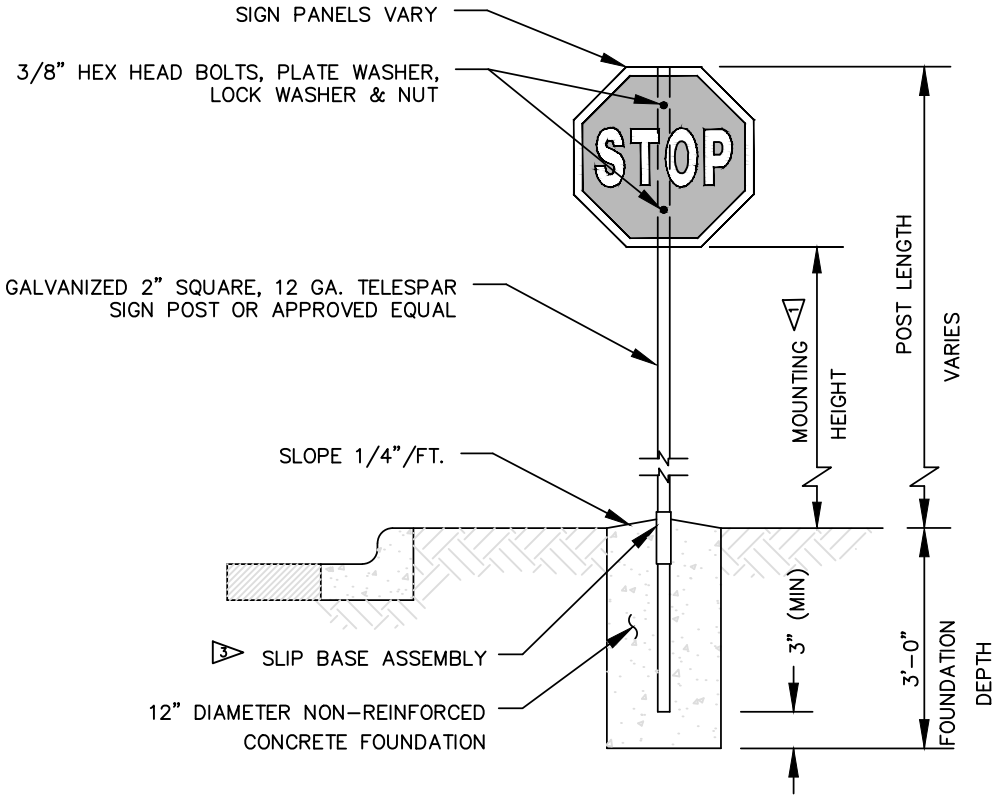
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

23



NOTES:

1. WHERE PARKING OR PEDESTRIAN MOVEMENTS OCCUR, THE SIGN SHALL BE MOUNTED WITH A MINIMUM CLEARANCE OF 7'-0" FROM GROUND SURFACE TO BOTTOM OF THE PRIMARY SIGN PANEL.

2. SIGN PANELS SHALL BE OF SHEET ALUMINUM. ALL SIGNS SHALL BE FABRICATED AND CONSTRUCTED IN ACCORDANCE WITH THE MDT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2014 EDITION.

3. ALL SIGNS SHALL BE PLACED WITH TELESPAR BOLTED SLIP BASE BREAKAWAY ANCHOR ASSEMBLY OR APPROVED EQUAL.

4. COLOR AND SHAPE OF SIGN PANELS SHALL BE IN ACCORDANCE WITH MUTCD, LATEST EDITION.

RPA

SCALE: NONE

SHEET TITLE

SIGN & POST INSTALLATION

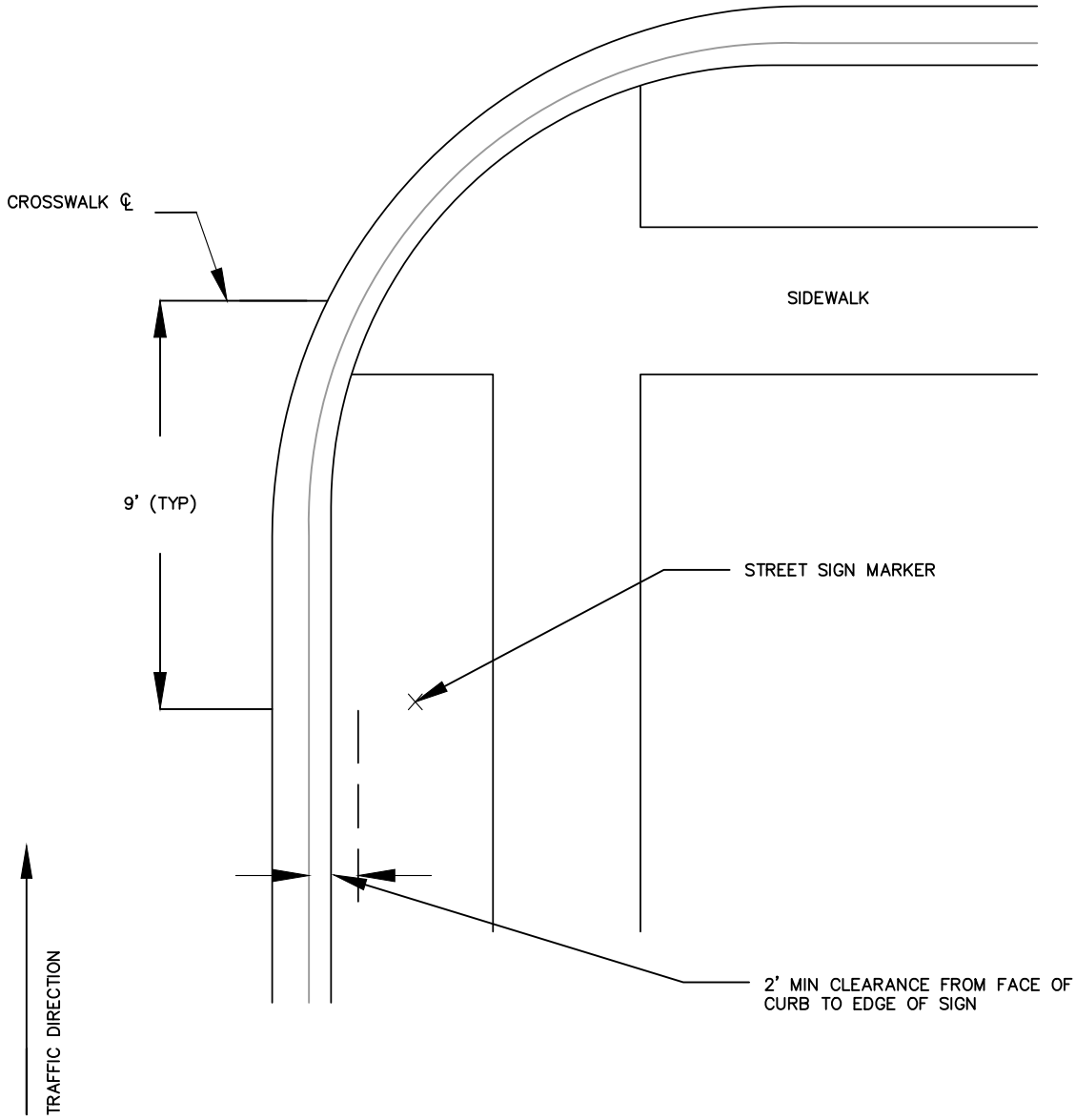
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

24



CONSTRUCTION NOTES:

1. STREET SIGNS SHALL BE .808 GAUGE ALUMINUM DOUBLE SIDED 6" TALL BLADES WITH GREEN BACKGROUND, WHITE TRIM AND WHITE TEXT. TEXT SHALL BE 4" TALL UPPER CASE B SERIES. BLADES SHALL HAVE STANDARD RADIUS CORNERS WITH NO PUNCH.

RPA

SCALE: NONE

SHEET TITLE

STREET SIGN LOCATION

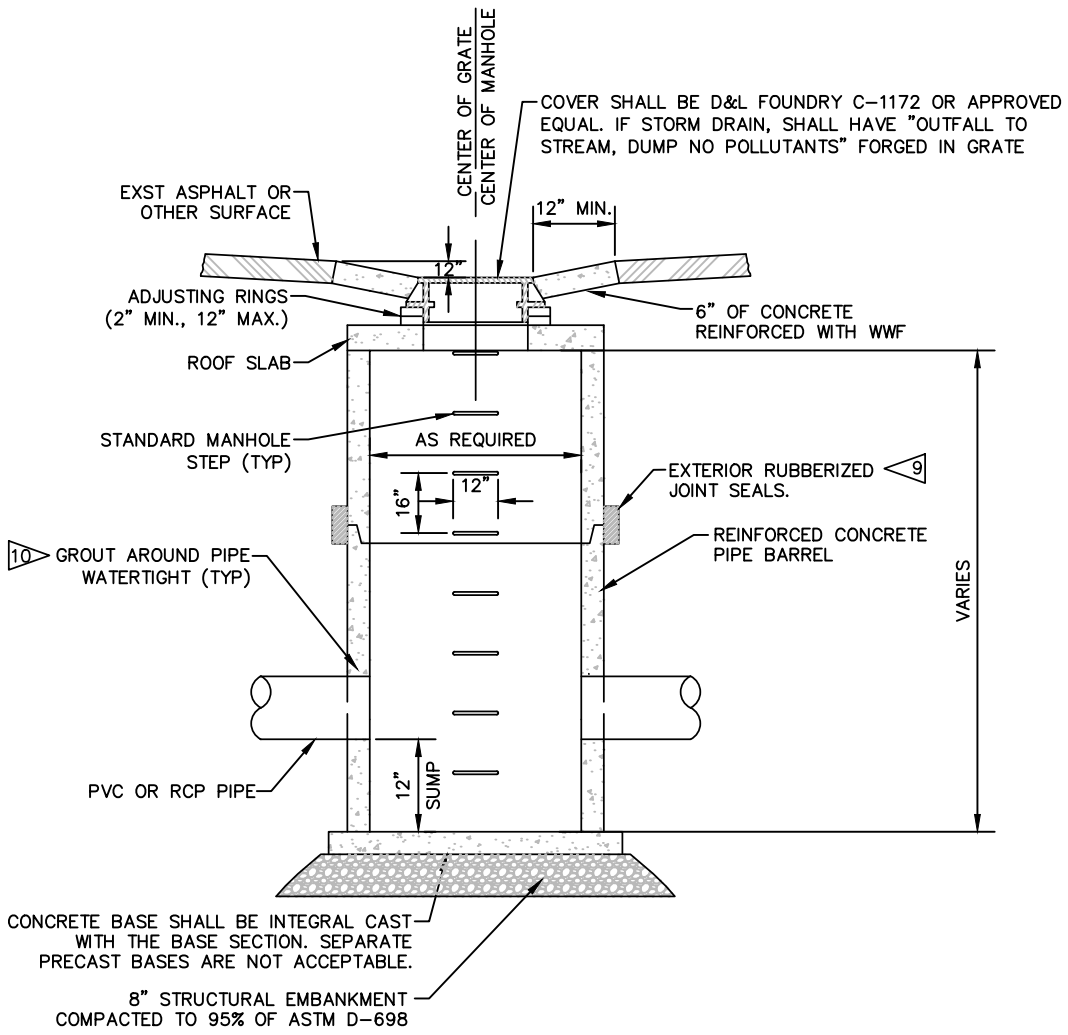
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

25



NOTES:

1. ALL GRATES SHALL BE D&L FOUNDRY C-1172 OR APPROVED EQUAL.
2. AS DESIGNED AND LAID OUT, GRATES ARE TO BE CENTERED ON MANHOLE BARREL.
3. ALL JOINTS BETWEEN MANHOLE SECTIONS, ADJUSTING RINGS, AND MANHOLE FRAME SHALL BE WATERTIGHT. JOINT MATERIAL SHALL BE "RAM-NEK" OR EQUAL.
4. PRECAST REINFORCED CONCRETE MANHOLES SHALL CONFORM TO ASTM C-478.
5. ALL HOLES IN NEW MANHOLES SHALL BE CAST OR CORED.
6. ALL STORM MANHOLES SHALL BE STRAIGHT MANHOLES.
7. ADJUST FRAME AND GRATE TO MATCH CROWN AND GRADE OF STREET.
8. ALL MANHOLES SHALL BE CONSTRUCTED TO HANDLE HS-20 LOADING.

9 EXTERIOR RUBBERIZED JOINT SEALS, MEETING ASTM C-877. TYPE II WITH A MINIMUM WIDTH OF 9".

10 PSX GASKET SHALL BE USED ON ALL PVC PIPE PENETRATIONS.

RPA

SCALE: NONE

SHEET TITLE

COMBINATION MANHOLE & INLET

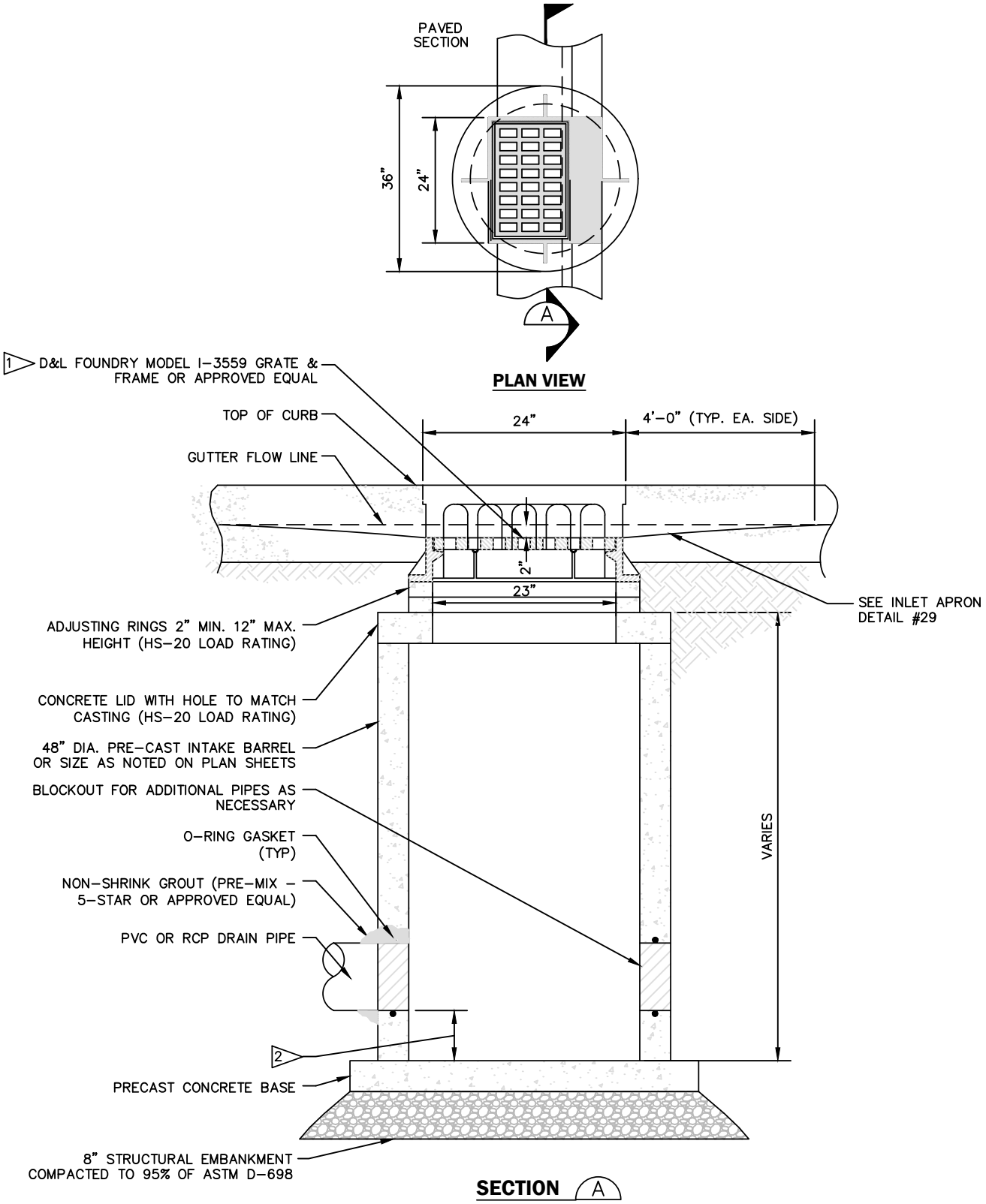
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

26



NOTES:

1. SET TOP OF CURB INLET GRATE 2" BELOW GUTTER GRADE. HANDWORK CONCRETE ON GUTTER FLOW LINE WITHIN 4'-0" ON EACH SIDE TO MATCH GRATE ELEVATION.
2. INLET BARREL SHALL INCLUDE A MINIMUM SUMP OF 12".

RPA

SCALE: NONE

SHEET TITLE

CURB INLET

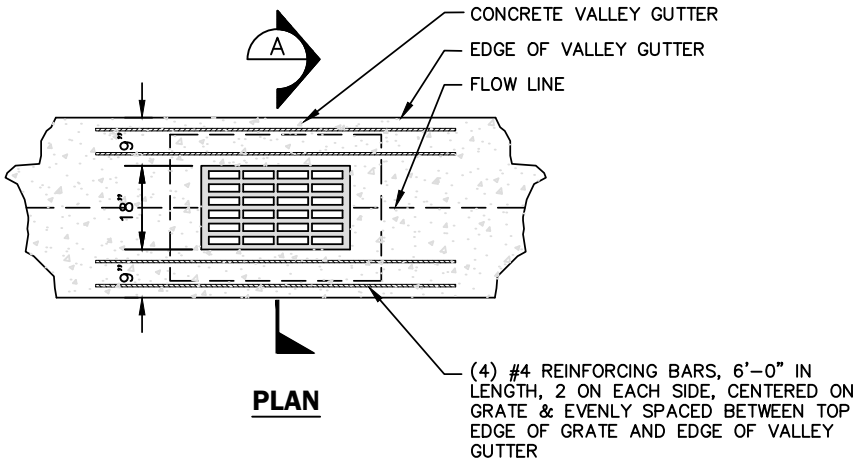
PROJECT TITLE

STANDARD DRAWINGS

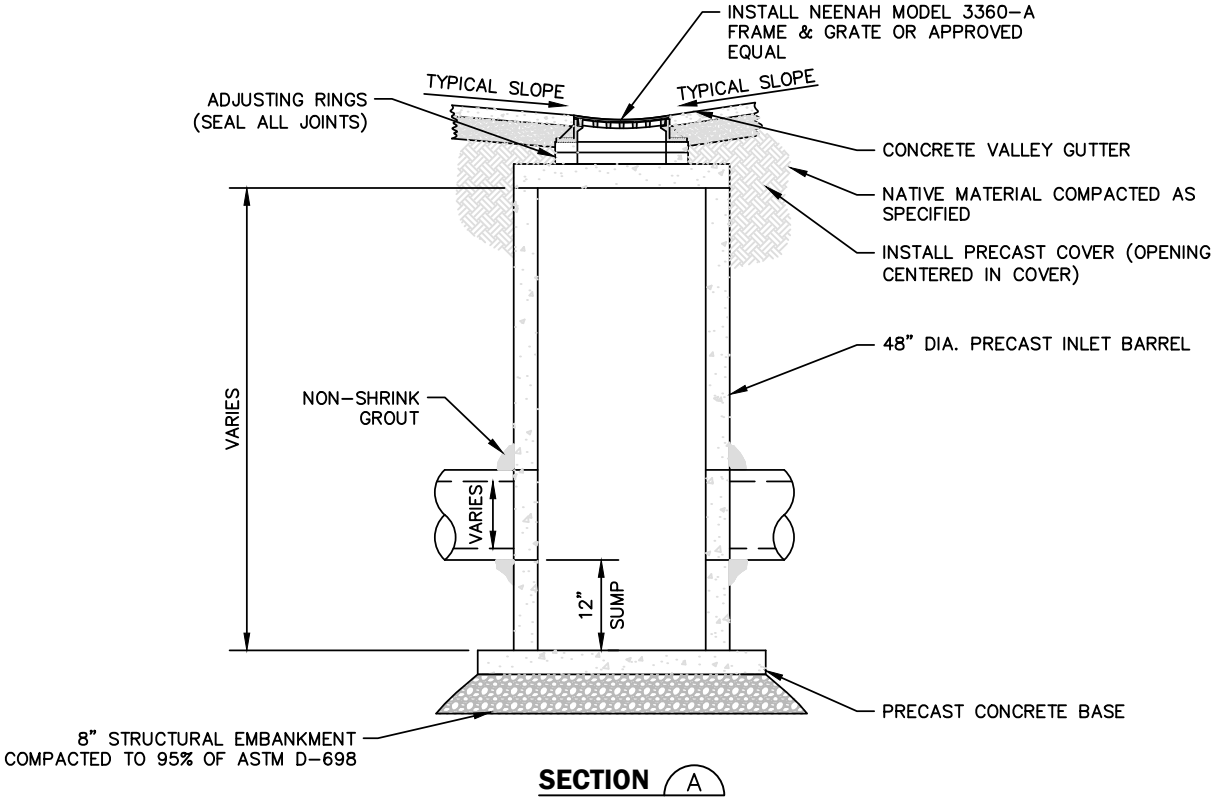
Townsend, Montana

FIGURE

27



PLAN



SECTION A

NOTES:

1. PRECAST REINFORCED CONCRETE MANHOLE BARREL MUST MEET ASTM C-478 STANDARDS.
2. ALL JOINTS SHALL BE WATERTIGHT. JOINT MATERIAL SHALL BE "RAM-NEK" OR APPROVED EQUAL.
3. PROVIDE A 3" GROUT SPACE ALL AROUND EACH CONNECTING PIPE.
4. ADJUST GRATE TO PROPER GRADE WITH ADJUSTMENT RINGS PRIOR TO PLACING CONCRETE.
5. MINIMUM SLAB THICKNESS BELOW PIPE SHALL BE 8" FOR POURED-IN-LACE BASE AND 6" FOR PRECAST BASE.
6. PLACE ADJUSTMENT RINGS & FIELD SET TO MATCH PAVEMENT/CONCRETE GRADES (MIN. 2", MAX, 12" RISE HEIGHT).

RPA

SCALE: NONE

SHEET TITLE

VALLEY GUTTER INLET

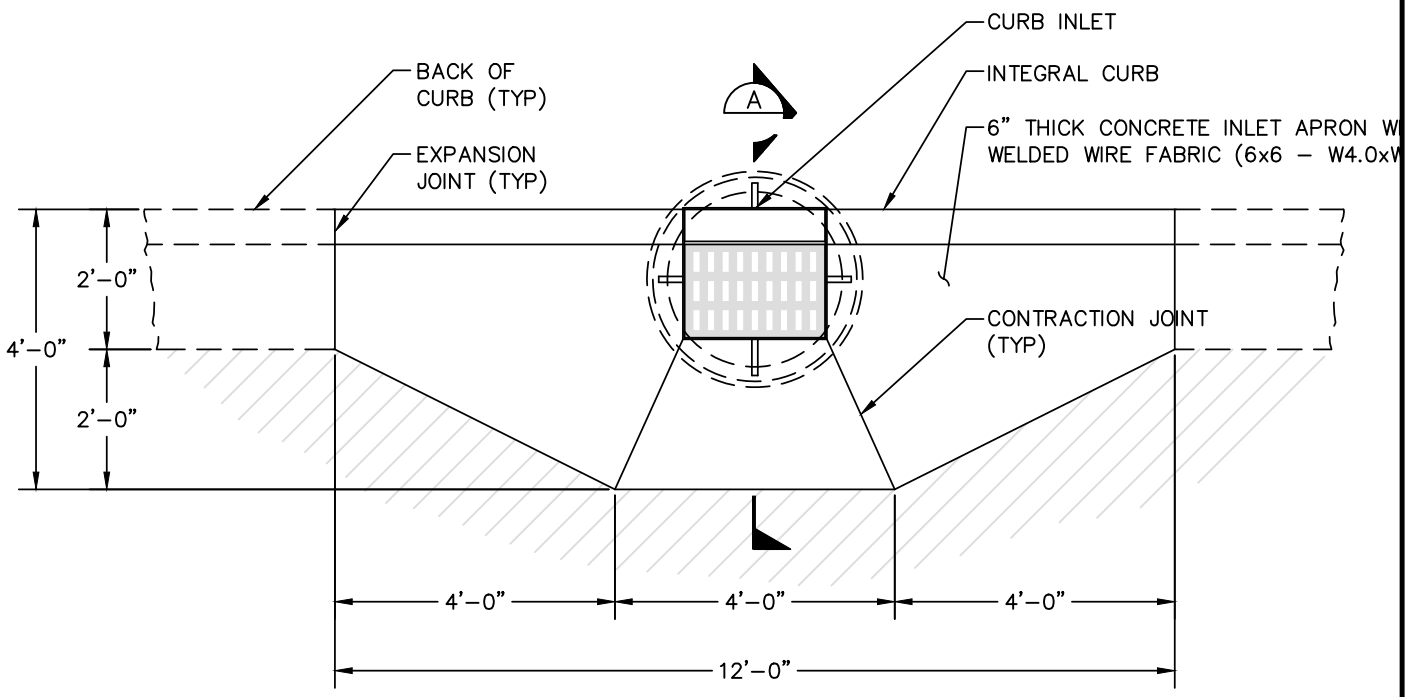
PROJECT TITLE

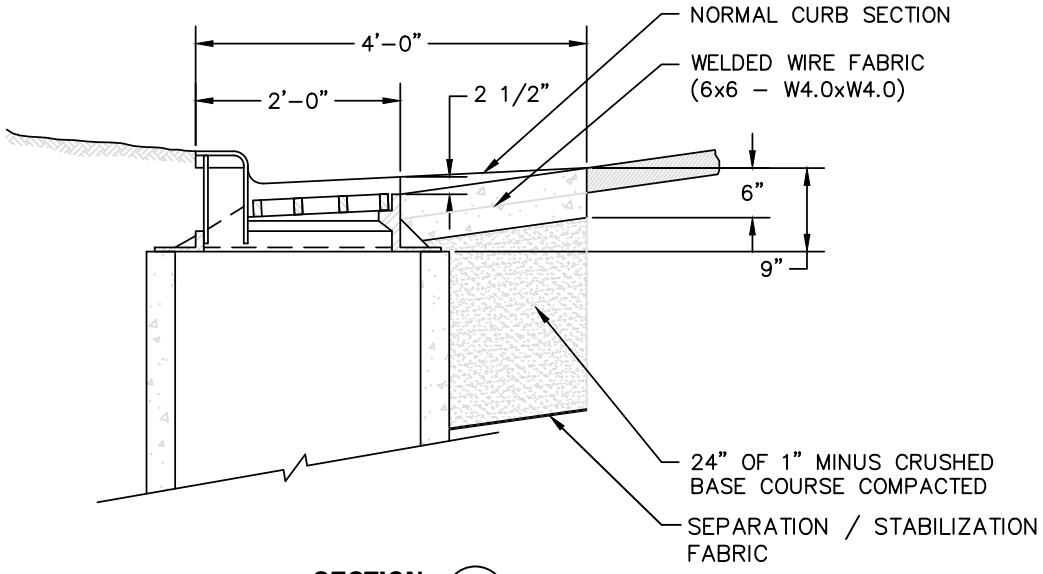
STANDARD DRAWINGS

Townsend, Montana

FIGURE

28





SECTION (A)

NOTES:

1. PROVIDE CONCRETE INLET APRONS AT ALL INLETS.

RPA

SCALE: NONE

SHEET TITLE

INLET APRON

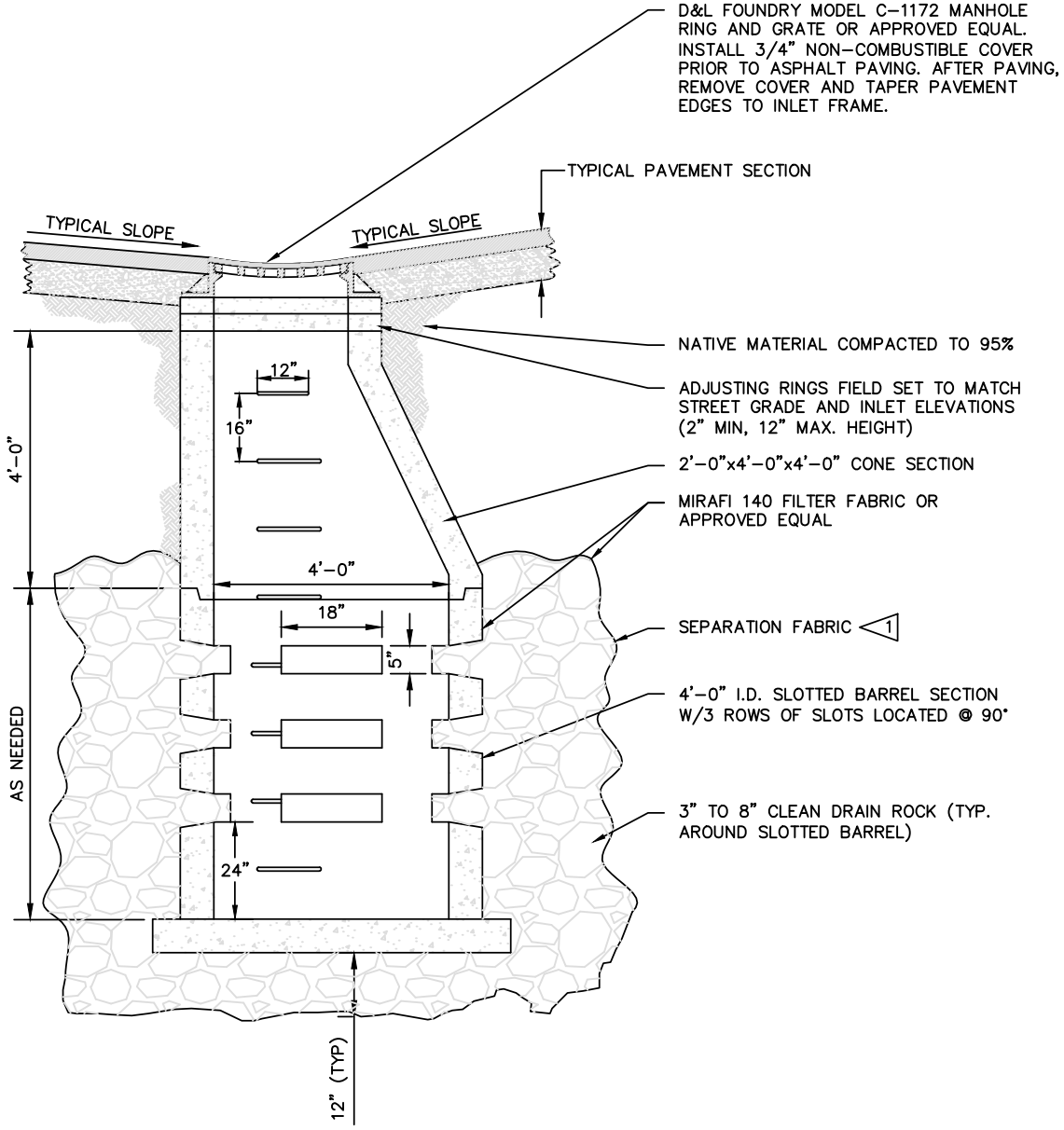
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

29



CONSTRUCTION NOTES

1 SEPARATION FABRIC SHALL BE MIRAFI 500X, OR APPROVED EQUAL.

RPA

SCALE: NONE

SHEET TITLE

SUBSURFACE DRAIN SUMP

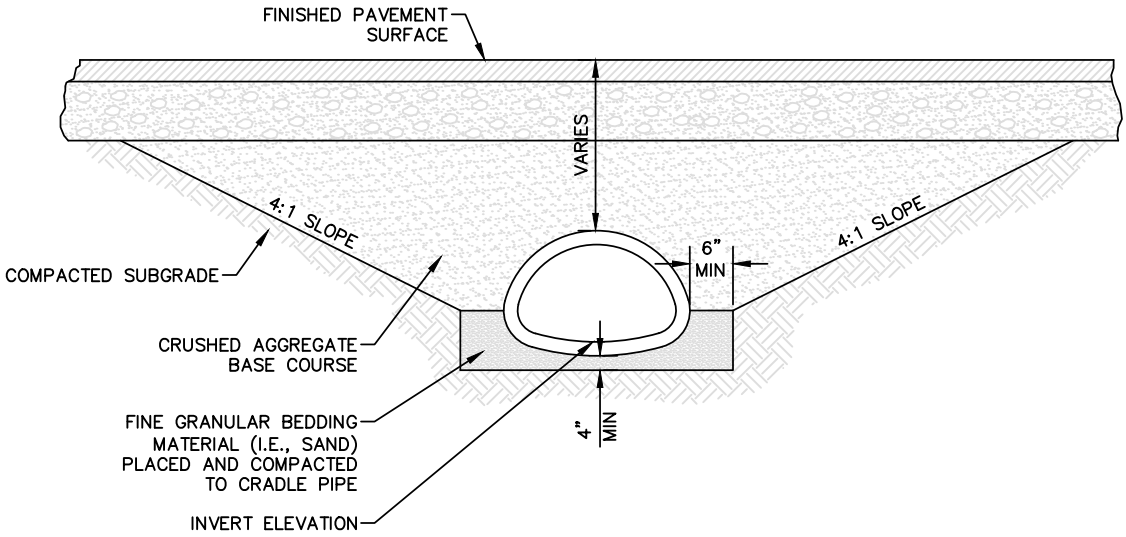
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

30



RPA

SCALE: NONE

SHEET TITLE

TYPICAL CULVERT SECTION

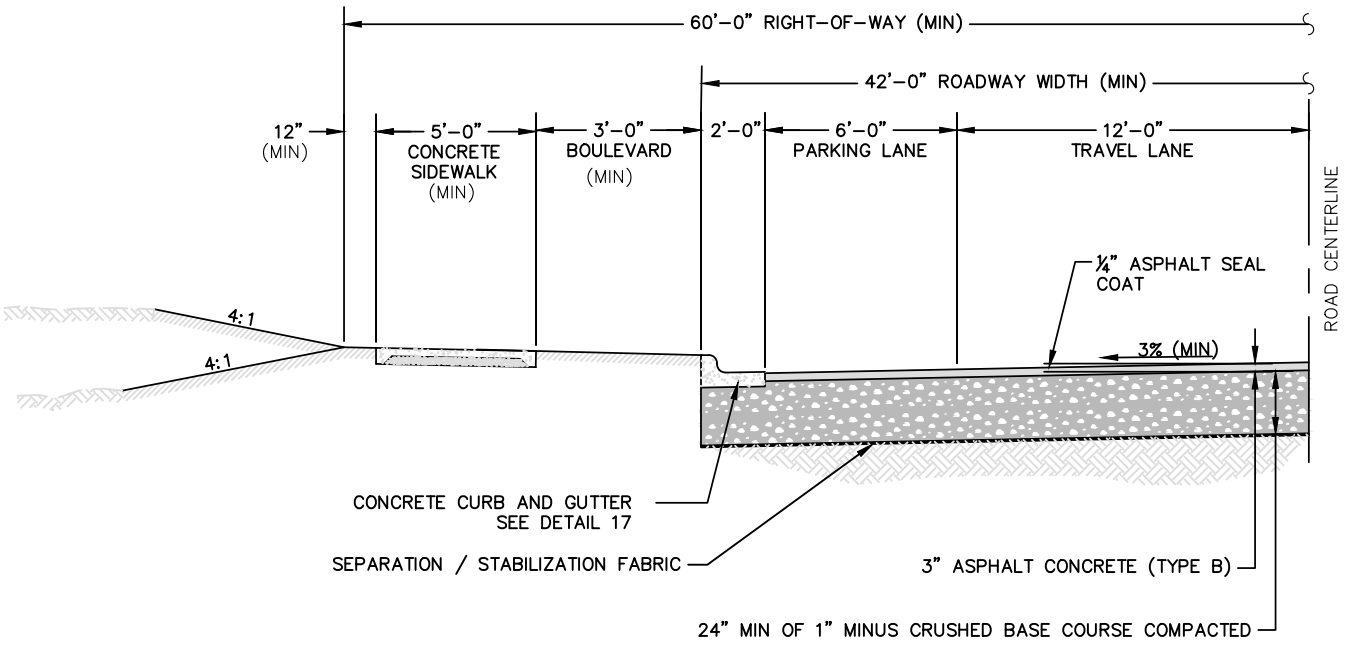
PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

31



NOTES:

1. SEE CURRENT TOWNSEND SUBDIVISION REGULATIONS FOR MINIMUM COLLECTOR AND LOCAL ROAD SLOPE AND WIDTH REQUIREMENTS.
2. GRAVEL THICKNESS OR GRAVEL SECTION DESIGN (I.E. FULL DEPTH RECYCLING) CAN BE REDUCED WITH A SUBMITTAL OF A STAMPED GEOTECHNICAL REPORT AND SUBMITTED TO THE CITY AND CITY ENGINEER FOR REVIEW AND APPROVAL.

RPA

SCALE: NONE

SHEET TITLE

TYPICAL COLLECTOR ROAD SECTION

PROJECT TITLE

STANDARD DRAWINGS

Townsend, Montana

FIGURE

32