June, 2020

TO: All holders of Wastewater Standard Details

SUBJECT: Revisions to Wastewater Standard Details

The attached Wastewater Standard Details drawings were revised to reflect current standard construction methods, practices and procedures, and details were cleaned up to remove conflicting information, and for better clarity. Materials were not reviewed, vetted, or revised as a part of these revisions. Future revisions may include structural and material updates.

The most prominent, and only structural update in this set of revisions was to the inlet details. The original details were only to be used for inlets up to 6 feet deep, and were limited in length to a single, double or triple Number 16 inlet, or 6', 9' or 12' for Number 14 inlets. The new inlet details are applicable for inlets up to 12 feet deep, and up 75 feet long.

The attached Standard Details are to be used for all storm and sanitary sewer construction done under the jurisdiction of the City and County of Denver, Department Transportation and Infrastructure. These standards are to be used in conjunction with the technical specifications and the established ordinances of the City and County of Denver and in case of conflict, the technical specifications which are to be used in conjunction with these standards shall govern.

These drawings may be updated from time to time and the user is responsible for obtaining updated or revised standards. The City shall not be held liable for use of outdated standards by the contractor, consultant, developer, or engineer.
CITY AND COUNTY OF DENVER
WASTEWATER STANDARD DETAILS

APPROVED BY:

CITY ENGINEER
JUNE 2020
TABLE 1. Bd, Bf, Bp VALUES

<table>
<thead>
<tr>
<th>D'</th>
<th>Bd</th>
<th>Bf</th>
<th>Bp</th>
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<td>16'-21&quot;</td>
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<td>8.0</td>
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<tr>
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<td>144&quot;</td>
<td>20.0</td>
<td>22.0</td>
<td>25.0</td>
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</table>

**PAY ITEM NOTES:**

1. Bf = Pay for pay item 20-1 asphalt surface course pay-for-pay thickness (7th min thickness) value as shown in Table unless otherwise shown on plans.
2. Bf = Pay for pay item 20-1 asphalt base course pay-for-pay thickness (7th min thickness) value as shown in Table unless otherwise shown on plans.
3. S = See pay item 20-4 for rototilling. Rototilling will be paid for the 2" each side of Bf before placement of the 2" asphalt surface course pay item 20-1. Rototilling for the width and length trench extends (X) should be included in the price of pipe.
4. Payment may be made for excavation outside of the limits shown above due to slope or bedding trench or other construction means and methods.
5. Excavation performed on the plans, no payment will be made for removal, replacement, or relocation of curb and gutter, utilities, sidewalks, structures, etc. outside the maximum limits of excavation.
TYPICAL CUTOFF WALL LOCATIONS

CUTOFF WALL NOTES:

2.1 Normal spacing is 500 ft., typically at
intersection and end of use of cutoff wall, or
as specified on plans or as directed by the
City.

2.2 When groundwater is encountered, install
cutoff wall per detail.

TYPICAL CUTOFF WALL LOCATIONS

CONCRETE CUTOFF WALL

CLAY CUTOFF WALL

TABLE 2. CONCRETE BEDDING REQUIREMENTS

<table>
<thead>
<tr>
<th>NOMINAL DIAMETER (D)</th>
<th>MINIMUM THICKNESS (T)</th>
<th>MIN. WIDTH OF CONCRETE ARCH (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot; &amp; SMALLER</td>
<td>4&quot;</td>
<td>0.0 + 4.5&quot;</td>
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<td>0.0 + 4.5&quot;</td>
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<td>27&quot; TO 33&quot;</td>
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<td>0.0 + 4.5&quot;</td>
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</tr>
<tr>
<td>48&quot; &amp; LARGER</td>
<td>10&quot;</td>
<td>1.25 DO</td>
</tr>
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</table>

LEGEND

S = Trench width, including bedding (See S-301.1)
D = Inside diameter of pipe, or span dimension for
arch or electrical
O = Outside diameter of pipe
A = Concrete bedding thickness
GRANULAR BEDDING REQUIREMENTS

TABLE 3. CLASS 67 GRADATION

<table>
<thead>
<tr>
<th>PIPE SIZE (in.)</th>
<th>D</th>
<th>d</th>
<th>d°</th>
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<td>10</td>
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<tr>
<td>1&quot;</td>
<td>80</td>
<td>100</td>
<td>15</td>
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</table>

TABLE 4. MIN. DEPTH OF BEDDING MATERIAL BELOW BOTTOM OF PIPE

<table>
<thead>
<tr>
<th>PIPE SIZE (in.)</th>
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<th>d°</th>
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<tr>
<td>1&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

LEGEND:
- Trench width, including shaping (See S-301.1)
- Inside diameter of pipe, or span dimension for arch or ellipsoidal
- Depth of bedding material below bottom of pipe
- Outside diameter of pipe

GRANULAR BEDDING NOTES:

1. These details are typical for normal conditions. For installations other than these (such as embankment or tunnel installations, etc.), excavation, bedding and backfill requirements shall be detailed on the construction drawings and shall be designed in accordance with the referenced noted (NIPC Manual, Practice No. 9, A.S.C.E. Manual No. 37 latest revision) and approved by the design engineer. For unusual or unstable soil conditions, trench and bedding details shall be a special design.

2. Ultimate backfill loads and structural design of pipe or conduit shall be based upon sub-constant water as set forth in the American Concrete Pipe Association Design Manual.

3. Bedding shall be mechanically rammed in 6" lifts and small, conforming to ASTM C532, Gradation Size 270 (HLCWCM) standard construction specifications, Section 4.00 and 5.00 and Table 3 (above).

4. Bell holes shall be excavated at all end and joint points.

5. Subgrade pipe to be an approved perforated pipe conforming to applicable requirements of the specifications.

6. Excavation for pipe backfill to be computed to 6" depth, as shown in Table 3.

7. Filter fabrics for granular bedding material as shown in Ideal Trench Conditions detail in all cases.

8. Design engineer to specify when filter fabric is necessary between existing subgrade and granular backfill. Refer to current Colorado Department of Transportation Standards (Section 2.2.10) on piping and permeability criteria. Use granular backfill in this detail as the pipe in roadway. Refer to note 5 above.

9. For 60° and larger, use special bedding and filter fabrics may be omitted.
GENERAL NOTES FOR TYPE I, II & III ENCASEMENT:

4.1 Concrete to be cast against undisturbed soil or sheeting. If optional construction joint is used and bottom half of encasement is poured separately, a one inch layer of sand or mortar shall be placed between bottom of sanitary sewer and top of concrete.

4.2 Length of encasement required:
(a) Type I and II encasement shall extend full trench width exchanged for proposed sewer or conduit.
(b) Type III encasement shall extend at least 10 feet each side of water main.

4.3 Unless otherwise noted on plan and profile drawings, Type I, II & III encasements need not be reinforced. Reinforcement, if required, to be specified and detailed separately on plan and profile drawings.

4.4 Type I, II or III encasement required under following conditions:
(a) Type I or II if D < 12" (D12") except for sanitary sewers crossing over or under water mains.
(b) Type III required for sanitary sewers crossing under water mains and D > 12" (D12").
(c) Type III required for sanitary sewers crossing under top of water main, regardless of dimension D12".
(d) Except for unusual circumstances, water main crossings, or where unstable soil conditions are encountered, Type I encasement will normally be satisfactory.
(e) If the sanitary sewer is replaced or constructed of cast iron pipe (SNI SNI or C-150) or ductile iron pipe (SNI SNI or C-150), concrete encasement may not be required.

4.5 Fillers material between conduits to be:
(a) Approved cementitious material, such as shotcrete, etc., if D < 12".
(b) Compressed granular filling if D ≥ 12", if Type III encasement pour concrete on undisturbed soil.
(c) Or specified by utility owner.

4.6 Sheet of sheeting, if used, to be cut off at top of encasement.

4.7 These encasement designs may also be applicable for conduits other than those shown on sanitary sewer installations.

4.8 In certain situations where the existing conduit diameter is extremely large, fillers supports on each side of sanitary sewer may also be required. If required, supports to be specified and detailed separately on plan and profile drawings. No pipe joints over top of water main.

4.9 International plumbing code approved materials allowed.
PIPE JOINT NOTES:

5.1 The contractor shall submit all tolerances and dimensions, required by the specific pipe joint details shown on the drawing, prior to fabrication.

5.2 All dimensions shall be given in inches, unless otherwise noted, and are for bell and spigot in conjunction position. Deflected pipe joint tolerances and dimensions shall also be furnishered.

5.3 Joint clearance dimension C is at closest joint within distance A.

5.4 Horizontal 0° O-RING gaskets shall be in conformance with ASTM C-643 or C-361.

5.5 Applicable concrete pipe joint specifications:
   A. ASTM C-76
   B. ASTM C-361

5.6 Steel reinforcement shall be in accordance with the appropriate ASTM specification for the pipe size and strength class as specified on plan/profile drawings.

5.7 No connection to go through joint without prior City approval.

SPIGOT GROOVE DETAIL
TYPICAL FOR CONCRETE PIPE J OINT
NO SCALE

CONCRETE PIPE O-RING JOINT
NO SCALE

STANDARD DETAILS
SHIPLAP JOINTS-PIPE JOINTS
NO SCALE

STEEL END RING DETAIL (FOR JACKED PIPE)
NO SCALE
INLET CONNECTION NOTES:

6.1 The type of connection shall only be used if the following conditions are met:
   (A) $D \leq 3/4$ in. and $W \leq 25$ ft.
   (B) The point of connection to the sewer main is not more than 70 feet from the nearest manhole on the sewer main.
   (C) Inlets are not connected in series.
   (D) Only one inlet connection allowed for each manhole.

6.2 For conditions other than that specified in Note 6.1, a manhole on the sewer main will be required.

6.3 This detail applies to storm sewer connections only. Sanitary sewer inlets shall be made only with approved mechanical joining equipment and approved joining materials.

INLET CONNECTION INTO STORM SEWER MAIN
(Storm Sewer Installation Only)
No Scale

PIPE COLLAR NOTES:
6.4 For line laterals only, not to be used on sanitary or mainline storm sewers.
6.5 A concrete collar is required where the change in grade exceeds 0.10 foot per foot, and where gap limits exceed the pipe manufacturer's recommendations.
6.6 If the gap exceeds 6 inches, a manhole structure is required.
6.7 Reinforcing shall be used where the gap is 2 1/2' or larger. Three circular ties shall be used per the vertical section above.
6.8 Concrete collar shall not be used for a size change on the main line.
6.9 For pipe size not listed size next size larger.
6.10 Where reinforcing is required, the diameter of the circular ties shall be 1/2" thick, minimum.
6.11 An interior form of uncedar shall be used to provide a smooth interior joint. The paper form may be left in place.
6.12 Pipes 24" and larger to be designed by engineer and approved by City.

VERTICAL SECTION

TABLE 5. MIN. PIPE COLLAR DIMENSIONS

<table>
<thead>
<tr>
<th>D</th>
<th>L</th>
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<td>18&quot;</td>
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<td>12</td>
</tr>
<tr>
<td>24&quot;</td>
<td>12&quot;</td>
<td>12</td>
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</table>

STORM LATERAL PIPE COLLAR DETAIL (21" DIA. OR LESS)
(TO BE USED ONLY WHERE NECESSARY AND AS AUTHORIZED BY THE CITY)

NO SCALE
MANHOLE NOTES:

7.1 Flat top sections may be used in lieu of concentric manholes when specifically approved by the project engineer.

7.2 For manhole depths less than 4' flow at the top of the manhole, risers with precast flat top sections are required.

7.3 All precast flat top sections, covers, and gratings, etc. shall comply to the latest revision of ASTM C-467, Standard Specification for Precast Precast Reinforced Concrete Manhole Sections.

7.4 Flat tops shall be capable of withstanding 440 psi live loads.

7.5 Manhole risers, covers, flat top sections, and rings shall be provided by the manufacturer, and ASTM C-478.

7.6 For depths greater than 25' (7.6 m), shop drawings, calculations of walls, top, and bottom slabs shall be submitted.

7.7 All precast concrete manhole sections are required in shop drawings and in joint design, flat top sections, concrete sections, etc.

7.8 Design engineers or project engineers may request manhole sizes for special design considerations.

7.9 Manhole steps shall not be installed over the flow channel.

7.10 6' of pipe installed only with special approval of the engineer.

7.11 At or above a larger pipe shall use type A (S-500) or type P (S-504).

TABLE 6. MIN. MH RISER DIAMETER & WALL THICKNESS

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Min. Riser ID</th>
<th>Min. Wall Thickness, T</th>
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<tr>
<td>30&quot; or less</td>
<td>3&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>4&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

Note: Min. riser diameter specified in Table 7.6 for situations where one pipe is | Connected to | One pipe. When | One pipe. If | Than the | Diameter | Section. | Diameter | Section. |

LEGEND

M = MANHOLE DIAMETER
C = OUTSIDE DIAMETER OF MANHOLE
T = MANHOLE WALL THICKNESS
CAST-IN-PLACE MANHOLE BASE:

**CAST-IN-PLACE MANHOLE BASE NOTES:**

8.1 MANHOLE STEEL HINGED SHALL CONFORM TO TABLE 8, S-501.1.

8.2 CUSHION FLOW CHANNELS AND GROOVES MAY BE FORMED BY SHAPING WITH LEAN CONCRETE (5000 PSI MUM), ALL OTHER CONCRETE SHALL BE 6000 PSI MUM.

8.3 ALL END MANHOLE SHALL BE STAKED AT 0.25" VERTICAL GAP.

8.4 STAB-OUTS SHALL EXTEND 2-1/2" MIN. PAST MANHOLE C.O. AND BE FACTORY PLEDGED.

8.5 HINGING IS REQUIRED FOR ALL MANHOLE BASES.

8.6 SLIP MANHOLE BENCH 1/2" MINIMUM TOWARD FLOW CHANNEL.

8.7 FOR SANITARY SEWERS, IF 4" IN. AN OUTSIDE DROP MANHOLE IS REQUIRED (S-503).

8.8 SHIPLAP JOISTS ON MANHOLE BARGE NEAR 2" CONFORM TO DOT STANDARDS AND SPECIFICATIONS (S-405).

8.9 ALL MANHOLE & SPECIAL STRUCTURES TO BE PLACED ON SUBGRADE SUITABLE MATERIAL, IF SUBGRADE CONDITONS WARRANT, UNSTABLE FOUNDATION MATERIAL WILL BE OVER DUG, A SELECT SUITABLE MATERIAL WILL BE PLACED AS PER SECTION 5.9.5.0 OF THE AWWA STANDARD CONSTRUCTION SPECIFICATIONS. (S-507)

8.10 GRANULAR JOISTING MATERIAL SHALL BE COMPACT TO 95% MAXIMUM DRY DENSITY IN ACCORDANCE WITH AWWA A-5.

8.11 ALL PIPE OPENINGS SHALL BE CONSTRUCTED WITH AN APPROVED FLEXIBLE MIDDLE-TYPE GASKET CONFORMING TO ASTM C-443 WHICH SHALL BE CAPABLE OF PROVIDING A WATER TIGHT SEAL WITH ZERO LEAKAGE AROUND THE INSTALLED PIPE CONCRETE TO CONCRETE SOME WITHOUT WATER STOP GASKETS FOR STONE SEWER WILL BE AT THE LOCATION OF THE CITY (S-506).

8.12 ALL CAST-IN PLACE MANHOLE JOISTS, CONCRETE, GRADE PLATES, ETC. SHALL CONFORM TO THE LATEST EDITION OF AWWA C-478, STANDARD SPECIFICATIONS FOR CAST-IN PLACE REINFORCED CONCRETE JOISTS.

8.13 NO MODIFICATIONS TO A CAST IN PLACE MANHOLE WILL BE ACCEPTED AFTER CASTING.
CHANNELIZATION NOTES:

12.1 DETAILS SHOWN ARE TYPICAL ONLY FOR INSTALLATIONS WITH ALL INLETS AT SAME RELATIVE ELEVATION.

12.2 FOR EXCESSIVE ELEVATION DIFFERENCE BETWEEN INLETS, ETC. SPECIAL BASE/CHANNEL DETAIL SHALL BE SHOWN ON PLANS.

12.3 CHANNELIZATION DETAILS & STEP PLACEMENT TYPICAL FOR BOTH STORM AND SANITARY SEWER.

12.4 THE MINIMUM VERTICAL DROP THRU MANHOLE BASE SHALL BE 0.10 FOOT FOR STORM SEWER AND 0.2 FOOT FOR SANITARY SEWER.

12.5 FOR SANITARY SEWER, VERTICAL DROPS IN EXCESS OF 1' REQUIRE AN OUTSIDE DROP. SEE S-530.
MANHOLE OUTSIDE DROP NOTES:

13.1 Outside drop required for any drop greater than 18".
13.2 All pipe and fittings to be ASTM and city approved.
13.3 For pavement purposes, all fittings, pipe, concrete engagement shall be
    included in the unit price of the outside drop.
13.4 Diameter of the pipe shall not be less than main line pipe diameter.
13.5 For 18" diameter and larger, outside drop shall be a special design.
13.6 The approximate value for the design of the connection shall be used for the
    specified pipe material and shall be approved by the city.
13.7 Outside drop shall be constructed of redwood.
13.8 Concrete engagement shall be a minimum of 6" deep around.
13.9 Pipe dimensions are approximate and may vary from the manufacturer to
    another.
13.10 All required wall openings shall be precast block-outs or core drilled with
    manufacturer of opening & not imagined.

<table>
<thead>
<tr>
<th>TABLE 9. MINIMUM DROP DIMENSIONS FOR PVC PIPE</th>
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<tbody>
<tr>
<td>DIMENSIONS (INCHES)</td>
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<tr>
<td>PIPE DIAMETER (INCHES)</td>
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<tr>
<td>WALL (DIMENSIONS INCHES)</td>
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</tbody>
</table>

MANHOLE OUTSIDE DROP
FOR PIPE DIAMETER LESS THAN 18"
NO SCALE
MH WATER STOP GASKET

CAST-IN-PLACE MANHOLE CONNECTION DETAILS FOR DISSIMILAR PIPE (NON-POUROUS PIPE)

PRECAST MANHOLE CONNECTION DETAILS FOR ANY TYPE OF PIPE

WATER STOP GASKET NOTES:

14.1 PLACE STOP ON PIPE NEAR CENTER OF MANHOLE WALL
14.2 WHERE STEEL BAND TO ACHIEVE POSITIVE SEAL AGAINST PIPE EXISTENCE, A ROUND RING MAY BE USED TO TAPER UP INTERNAL SPACE BUT A SECTOR WRENCH (C/3" THICKNESS) IS PREFERRED TO ENSURE PROPER THICKNESS.
14.3 CONCRETE (2" MOLD) IS NOT ACCEPTABLE.
14.4 MORTAR, EPOXY, OR APPROVED EQUAL MAY BE USED FOR LARGE DIAMETER PIPE (2") OR GREATER AT THE DISCRETION OF THE CITY.
SINGLE NUMBER 16 INLET NOTES:

15.1 For payment purposes, inlet structures shall also include 2'-0" curb & gutter transition section at each end of inlet plus separate sections where required before inlet structure and transition sections.

15.2 Sub-grade shall be 0'-3" of Class B bedding compacted per NRM standard construction specifications. On subgrade, an undisturbed material, if available, the subgrade shall be disregarded and stabilized with Class B bedding per NRM standard construction specifications.

15.3 Floor slope may be poured without base.

15.4 S = Slope of connection = 2:1 Min.

15.5 Unless otherwise specified on the drawings or otherwise approved, all No. 16 inlets shall be constructed with an adjustable cast iron curb box (S-716).

15.6 Design conditions for inlet allowing getting of 12'-0" max. For inlets more than 12'-0" feet in depth, shop drawings and design analysis shall be submitted for approval.

15.7 All reinforcing steel shall be ASTM A-410, Grade 60 deformed bars. Diameter of bend measured on the inside of the bar shall be a minimum of 5" inside diameter.


15.9 No16 resultant small work remain future structure when complete.

15.10 Concrete mix for Gutter and any exposed street panels shall meet Class 3 requirements for serviceability in accordance with test standard section 601.04 on streets where maximum chloride chemical contents are applied. Refer to NRM standard construction specifications, section 11 for requirements for serviceability in concrete exposed to chlorides.

15.11 Splicing of reinforcing steel shall be permitted only where detailed in drawings.

15.12 Inlet walls shall be formed from inside and outside. Casting of this panels against earth is not permitted.

15.13 Lean concrete fill to be F.C. = 3200 psi. Inlet structure, first street curb and gutter, and pavement to be F.C. = 4500 psi. F.C. = 20 day compressive strength requirement for mix design, field acceptance.

15.14 For through structures, petals must come to top of pipe.

15.15 No corner penetrations on structure.

15.16 See NRM standard construction specifications, section 11.04 storm inlets for more information. Use of this detail without specifications shall be considered non-conformant.

15.17 See 5-616.2 for bypass placement at wall penetration detail.

15.18 Refer to "Transportation Standards and Details for the Engineering Division" for adjacent roadway and sidewalk design criteria.
PLAN
NO SCALE

SECTION
NO SCALE

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

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

DETAIL - REBAR PLACEMENT AROUND CONNECTOR PIPE
NO SCALE

DETAIL - CONNECTOR OUTLET
NO SCALE

DETAIL - CONNECTION SCHEMATIC (NO. 16 INLET)

THIS DIAGRAM IS PROVIDED FOR GENERAL GUIDANCE ONLY. THE DESIGNER IS RESPONSIBLE FOR VERIFYING PROJECT SPECIFIC GEOMETRY.

DOUBLE NUMBER 16 INLET NOTES:

16.1 SEE DETAIL SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION. USE OF THIS DETAIL WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT.
16.2 SEE GENERAL NOTES ON S-616.1
16.3 EXPANSION JOINT MATERIAL SHALL BE PLACED FULL DEPTH OF THE CURB AND GUTTER, SIDEWALK, CONCRETE PAVEMENT, AS APPLICABLE. THE TOP PORTION OF THE JOINT SHALL BE REAMED WITH ELASTIC SEALANT.
16.4 SEE S-616.1 FOR REBAR PLACEMENT AT HAIL PENETRATION DETAIL.

* STANDARD DETAIL S-716 APPLIES TO ALL OF THE CURB & FRAME GEOMETRIC DIMENSIONS FOR THE DOUBLE NUMBER 16 INLET EXCEPT FOR THE FRAME LENGTH. FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT ON THIS SHEET.
TABLE 10. NO. 16 TOTAL INLET LENGTH

<table>
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<tr>
<th>INLET CONFIGURATION</th>
<th>Lw or Iw INLET LENGTH</th>
<th>Ew or Ef TOTAL BOTTOM SEAL LENGTH</th>
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</tbody>
</table>

* STANDARD TRIPLE 10'-9" ATTACH TO ALL OF THE CURB & GUTTER CONCRETE BLOCKOUTS FOR THE TOTAL NUMBER 16 INLET EXCEPT FOR THE 10'-9" LENGTH WHERE LENGTHS SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALL-OUT ON THIS SHEET.

TRIPLE NUMBER 16 INLET NOTES:
17.1 SEE WORK STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11.05 STORM INLETS FOR MORE INFORMATION.
17.2 SEE GENERAL NOTES ON S-816.3
17.3 EXPANSION JOINT MATERIAL SHALL BE PLACED FULL DEPTH OF THE CURB AND GUTTER, SIDEWALK, CONCRETE PAVER, AS APPLICABLE. THE TOP PORTION OF THE JOINT SHALL BE TREATED WITH TURNICE SEALANT.
17.4 SEE S-816.3 FOR TRUNK LINE REINFORCEMENT AROUND CONNECTION PIPE.

S-816.3

DESIGNED BY: ASPP/JDMT
APPROVED BY: ---
DRAWN BY: ---
DATE: 2020.3
SHEET NO.: 17
TRIPLE NUMBER 16 INLET
NO. 16 TOTAL INLET LENGTH
NUMBER 16 VALLEY INLET NOTES:

18.1 SEE WCPM STANDARD CONSTRUCTION SPECIFICATIONS SECTION 11.03 STORM INLETS FOR MORE INFORMATION. USE OF THE DETAILS WITHOUT SPECIFICATIONS SHALL BE CONSIDERED NON-COMPLIANT

18.2 SEE GENERAL NOTES ON S-616.1

18.3 SEE STANDARD DETAIL S-718 FOR FRAME AND GRATE DETAILS.

18.4 SEE STANDARD DETAIL S-616.3 FOR ADDITIONAL STRUCTURE AND FABRICATION NOTES.

* STANDARD DETAIL S-718 APPLIES TO ALL OF THE FRAME AND FRAME GEOMETRIC DIMENSIONS FOR THE NUMBER 16 VALLEY INLET EXCEPT FOR THE FRAME LENGTH. FRAME LENGTH SHOULD BE MANUFACTURED FOR THE DIMENSIONS CALLED OUT ON THIS SHEET.

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

TABLE 10v. NO. 16 VALLEY TOTAL INLET LENGTH

<table>
<thead>
<tr>
<th>INLET CONFIGURATION</th>
<th>Lw or L1</th>
<th>Total Inlet Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE NO. 16 VALLEY</td>
<td>10'-6&quot;</td>
<td>13'-6&quot;</td>
</tr>
<tr>
<td>DOUBLE NO. 16 VALLEY</td>
<td>16'-0&quot;</td>
<td>17'-6&quot;</td>
</tr>
</tbody>
</table>

Example Configuration:
10'-6", 12'-6", 7'-6"
31'-6"
GRADE RING NOTES:

21.1 Concrete shall be Type I cement, 4,000 psi minimum compressive strength, and conform to the Denver Sewer District's standard construction specifications.

21.2 All manholes shall be lined with a 3" of concrete, 3-1/2" riser, and 1-1/2" riser, set on full bed of non-shrink grout.

21.3 The test bar designation is not defined at this time.

21.4 Cast-in-place concrete shall be used in non-paved areas and optional in paved areas, at the request of the Project Engineer.

21.5 Covers to display on cover surface, 69-35 (for Mr. Don Cherry, Weller's logo or name, year 2005).
MANHOLE STEP NOTES:

23.1 ASTM SPECIFICATIONS

   (A) ASTM C-428 (Manhole Steps and Ladders)
   (B) ASTM A-505 (Grade 50 Steel Screws)
   (C) ASTM 4101 (Polypropylene)

23.2 STEPS SHALL BE INSTALLED BY THE "PRESS-FIT" METHOD UTILIZING A SPECIALLY TAPED PIN TO FORM THE INSERT HOLE AS SHOWN, FOLLOWING MANUFACTURER'S RECOMMENDED PROCEDURE AND SHALL NOT BE DRIVEN IN PLACE.

23.3 INSTALLED STEPS SHALL BE CAPABLE OF WITHSTANDING A PULL OUT FORCE OF 2500 LBS PER LED FOR A MINIMUM PERIOD OF TWO MINUTES.

23.4 PINS MUST BE SMOOTH AND CONTINUOUSLY TAPPED. MADE INSTALLATIONS REQUIRE A MATCHED COMBINATION OF A TAPPED HOLE PIN AND MANHOLE STEP, AS RECOMMENDED OR REQUIRED BY SPECIFIC MANUFACTURER OF THE STEP TO BE USED.

23.5 THIS STEP CAN ALSO BE USED IN THE POCKET INSTALLATIONS PROVIDED 6" THE CLEARANCE IS ALLOWED. MANHOLE STEPS SHALL NOT BE INSTALLED OVER THE FLOOR CHANNEL. THEY SHALL BE PLACED 12" MINIMUM OR 18" MAXIMUM IN STRAIGHT VERTICAL ALIGNMENT WITH THE BOTTOM STEP AT THE DESIGN MINIMUM. SEE STANDARD DETAIL S-500.