# DETAIL DRAWINGS

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District Sanitary Sewer Notes:

1. The installation of all sewer lines and appurtenances shall comply with the *Highlands Ranch Water and Sewer Standard Specifications* manual (*HRWSSS* manual).
2. Existing utilities are to be field verified prior to beginning construction on District utilities.
3. Sewer lines shall be SDR-35 PVC unless otherwise noted.
4. Match pipe crowns at manholes where there is a change in pipe diameter.
5. Cover over sewer lines shall be a minimum of 4.5 feet.
6. In non-paved areas manhole rims shall be set 4” above finished grade with a 6” minimum concrete collar around the ring and cover.
7. All sewer line crossings shall comply with Section 5.01-C of the *HRWSSS* manual.
8. Sewer lines shall be bedded in accordance with Chapter V of the *HRWSSS* manual.
District Water Notes:

1. The installation of all water lines and appurtenances shall comply with the *Highlands Ranch Water and Sewer Standard Specifications (HRWSSS)* manual.
2. Existing utilities are to be field verified prior to beginning construction impacting District utilities and all existing District utilities shall be protected throughout construction. Notify the District a minimum of 48 hours prior to construction.
3. Water lines shall be DR 14 Class 200 PVC unless noted otherwise.
4. All fire hydrant leads and fire service lines shall be Class 50 ductile iron pipe.
5. Water line depressions shall be a minimum of C-900 Class 200 PVC.
6. No vertical and/or horizontal bends are allowed in fire hydrant leads and fire lines without approval of the District Engineer.
7. No fittings are allowed on domestic service lines between the main and the curb stop.
8. Cover over water lines shall be a minimum of 4.5 feet under pavement and 6 feet in open space; maximum allowable cover is 10 feet.
9. All water line crossings shall comply with Section 4.03-M of the HRWSSS manual.
10. Water lines shall be mechanically restrained and bedded in accordance with Chapter IV of the HRWSSS manual.
NOTE:
1. FITTINGS SHALL BE WRAPPED WITH 8 MIL MINIMUM THICKNESS POLYETHYLENE.
TYPICAL CROSS SECTION

MINIMUM BEARING SURFACE AREA
(IN SQUARE FEET)

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<td>36&quot;</td>
<td>18.9</td>
<td>37.5</td>
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NOTES:
1. D = PIPE DIAMETER.
2. ALL FITTINGS ARE TO BE POLY WRAPPED.
FINISH GRADE

4.5' MIN. COVER

MINIMUM 40' OF WATER LINE TO BE RESTRAINED IN BOTH DIRECTION OF DEPRESSION

MINIMUM 40' OF WATER LINE TO BE RESTRAINED IN BOTH DIRECTION OF DEPRESSION

18" MIN.

PIPE TO BE CLEARED

18" MIN.

M.J. 45' BENDS AS SHOWN (USE 22 1/2" FITTINGS WHEN SPACE ALLOWS.)

RESTRAINED JOINTS SEE DETAIL BELOW

MINIMUM ONE FULL PIPE LENGTH CENTERED BELOW CROSSING

TYPICAL DETAIL FOR WATER LINE DEPRESSION
4", 6", 8", 10" & 12" DIAMETERS

TYPICAL RESTRAINED JOINTS
MEG-A-LUG TYPE RESTRAINT OR APPROVED EQUAL

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

RESTRANDED JOINTS AT VERTICAL BENDS

APPROVED:
MAY 2019

WM–3
### PIPE SIZE

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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
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<tr>
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<td>3/4</td>
<td>5</td>
<td>1/2 x 3 1/2</td>
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<td>3/4</td>
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### NOTES:
1. DIMENSIONS ARE BASED ON BOX END WRENCH CLEARANCES.
2. DIMENSION "G" HAS BEEN SIZED TO ACCOMMODATE TWO (2) RODS IF NEEDED.
3. STEEL PLATE OR WASHERS ARE TO BE USED TO SECURE TIE-ROD.
4. CLAMPS SHALL BE EPOXY COATED.

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HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

TIE-ROD RETAINING CLAMP

WM - 4

APPROVED:
MAR 2018
<table>
<thead>
<tr>
<th>PIPE DIA.</th>
<th>N</th>
<th>O</th>
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<tr>
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<td>P</td>
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<td>2-3/4</td>
<td>1-1/4 1-1/8</td>
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INCHES
NOTE:
1. PLUG SHALL BE MECHANICALLY RESTRAINED:
   A. FOR SLEEVE TYPE MACHINED COUPLING
      PIPE TIE BACK TO NEXT COUPLING.
   B. FOR BELL AND SPIGOT PIPE TIE TO BELL.

PLAN VIEW

ELEVATION VIEW

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

STANDARD BLOW-OFF VALVE INSTALLATION

APPROVED:
MAR 2018

WM-6
NOTE:
FIRE HYDRANTS SHALL BE PLACED 36" FROM THE CENTER OF THE HYDRANT TO EITHER THE BACK-OF-CURB OR BACK-OF-WALK.
OTHER THAN FLANGED JOINTS, ALL PIPE MUST BE REstrained WITH RODS OR MECHA-nICAL JOINT RESTRaining GLANDS.

NOTES:
1. HYDRANT PIT SHALL CONTAIN A MINIMUM OF 1 CY OF ¾" CRUSHED ROCK.
2. REFERENCE SECTION 4.03-J FOR DISTANCE FROM BACK-OF-WALK.
NOTES:
1. 1½" ROCK SHALL BE PLACED IN BOTTOM OF MANHOLE TO CROWN OF PIPE ONLY.
2. ALL PIPE AND FITTINGS SHALL BE BRASS.
3. LINES 6" THRU 10" IN DIAMETER SHALL EACH HAVE TWO 1" COMBINATION AIR VALVES.
4. LINES 12" DIAMETER AND LARGER SHALL EACH HAVE TWO 2" COMBINATION AIR VALVES.
5. SUPPORT BAR SHALL BE CONSTRUCTED OF ¼" STEEL STRAPPING DRILLED TO MATCH AIR POT HOLES.
PIPING SCHEDULE

1. *" x 8" TEE (FL x FL x FL)
2. 8" GATE VALVE (FL x FL)
3. *" PRESSURE REDUCING/SUSTAINING VALVE; CLA–VAL SERIES 92G–01
4. *" DRESSER COUPLING
5. *" SPOOL (FL x PE)
6. 8" x 4" REDUCER (FL x FL)
7. 4" 90' BEND (FL x FL)
8. 4" GATE VALVE (FL x FL)
9. 4" SPOOL (FL x FL)
10. 4" DRESSER COUPLING
11. 4" PRESSURE REDUCING/SUSTAINING VALVE; CLA–VAL SERIES 92G–01
12. 4" SPOOL (FL x PE)
13. ADAPTOR (FL x Mj)
14. ALL FITTINGS AND PIPING WILL BE PAINTED "PRECAUTION BLUE" ENAMEL
NOTES:
1. EXTERIOR CONCRETE SURFACES SHALL BE DAMP-PROOFED IN ACCORDANCE WITH THE SPECIFICATIONS.
2. VAULT LID SHALL HAVE A REMOVABLE SECTION (MINIMUM 6" WIDE) WITH LIFTING RING.
MECHANICAL JOINT RESTRAINING GLANDS FOR P.V.C. OR D.I. PIPE.

GLANDS SHALL BE COLOR CODED: P.V.C. - C 900 RED
DUCTILE IRON BLACK

P.V.C. GLANDS 2000 MEG-A-LUG OR 1500 UNI-FLANGE OR APPROVED EQUAL
D.I. GLANDS 1100 MEG-A-LUG OR 1400 UNI-FLANGE OR APPROVED EQUAL

FOR INSTALLATION ON C-900 PVC OR DUCTILE IRON PIPE USE AS RECEIVED AND INSTALL PER INSTRUCTIONS.

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ROD DIAMETER, GRADE AND LENGTH OF RESTRAINED PIPE

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<th>8&quot;</th>
<th>12&quot;</th>
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<td>G</td>
<td>D</td>
<td>L</td>
<td>G</td>
<td>D</td>
<td>L</td>
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<td>M.S. 3/4</td>
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<td>M.S. 3/4</td>
<td>0</td>
<td>M.S. 3/4</td>
<td>3&quot;</td>
</tr>
<tr>
<td>11-1/4° BEND</td>
<td>3/4</td>
<td>0</td>
<td>M.S. 3/4</td>
<td>0</td>
<td>M.S. 3/4</td>
<td>0</td>
<td>M.S. 3/4</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

ALL VERTICAL BENDS TOTALLY RESTRAINED, L = 40'

1. LENGTH OF RESTRAINED PIPE MEASURED EACH WAY FROM BENDS.
2. CLAMPS AND RODS SHALL BE EXTENDED TO NEXT PIPE.
3. D = DIAMETER, L = LENGTH, G = GRADE, M.S. = MILD STEEL, H.S. = HIGH STRENGTH STEEL.
4. MINIMUM 4.5" OF GROUND COVER IS REQUIRED.
5. BASED ON 150 P.S.I., INTERNAL PRESSURE.
8. NUTS SHALL BE A.S.T.M., STANDARD DESIGNATION A-307, GRADE A OR B, HEXAGON HEAVY SERIES.
9. LENGTH REFERS TO THE AMOUNT OF PIPE WHICH MUST BE RESTRAINED TOGETHER, AND IS NOT NECESSARILY THE LENGTH OF THE RODS.
10. SEE PLAN AND PROFILE SHEETS FOR ACTUAL MINIMUM LENGTH OF RESTRAINED PIPE.
11. LENGTH OF TIED PIPE CHART IS ALSO FOR THE LENGTH OF JOINT RESTRAINT FOR MEG-A-LUGS.

APPROVED:
MAR 2018

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

MECHANICAL JOINT RESTRAINING RING AND RODDING

WM-12
NOTES:
1. SEE CHAPTER 4, PARAGRAPH 4.02 X FOR BEDDING MATERIALS.
2. SEE CHAPTER 4, PARAGRAPH 4.03 B.2 FOR BEDDING REQUIREMENTS.
'CP' TYPE GLENN 4 TEST STATION AT EACH FIRE HYDRANT HEAVY CAST IRON COVER (LOCKING) WITH 4 TERMINALS, 4" I.D. X 1'-6" SHAFT LENGTH

TRACER WIRE FROM C900 PVC WATER MAIN. PROVIDE AMPLE TRACER WIRE AT TEST STATION FOR REMOVING COVER AND TESTING.

PROFILE

PROPERTY LINE

6" FIRE HYDRANT LINE

RUN TRACER WIRE TO TEST STATION TERMINAL LOCATED AT FIRE HYDRANT.

PVC WATER LINE

TAPE TRACER WIRE TO C900 PVC PIPE WITH 2" WIDE PVC TAPE. WRAP TAPE ONCE AROUND PIPE DIA. (4 PLACES PER 20' OF PIPE TYPICAL)

REDUCING TEE DUCTILE IRON AT FIRE HYDRANT

TRACER WIRE 12 GA, TYPE UF, SINGLE STRAND COPPER, 600V

PLAN VIEW

SPLICE TRACER WIRES WITH '3M' TYPE DBY-6 LOW VOLTAGE DIRECT BURY SPLICE OR EQUAL INSTALL PER MANUFACTURER'S INSTRUCTIONS.
NOTE: WET TAP ON 16" OR LARGER MAINS SHALL BE A MINIMUM OF 4" DIAMETER.
STANDARD BEDDING

BEDDING MATERIAL

NOTES:
1. SEE CHAPTER 4, PARAGRAPH 4.02 X FOR BEDDING MATERIALS.
2. SEE CHAPTER 4, PARAGRAPH 4.03 B.2 FOR BEDDING REQUIREMENTS.
3. SEE CHAPTER 5, PARAGRAPH 5.06B FOR MATERIAL VARIANCE.

BEDDING W/ UNDERDRAIN

BEDDING MATERIAL

8 MIL POLY OR FILTER FABRIC

4" PERFORATED PIPE IN SOCK

12" Min.

1/4 Bc, 6" Min.

6" Min.

4" PERFORATED PIPE IN SOCK

12" Min.

1/4 Bc, 6" Min.

6" Min.

4" PERFORATED PIPE IN SOCK

12" Min.

1/4 Bc, 6" Min.

6" Min.
<table>
<thead>
<tr>
<th>PIPE I.D.</th>
<th>NO. OF LONGITUDINAL BARS &amp; LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>4 - NO. 4 BARS 1 EACH CORNER</td>
</tr>
<tr>
<td>10&quot;</td>
<td>8 - NO. 4 BARS 3 EACH SIDE</td>
</tr>
<tr>
<td>12&quot;</td>
<td>8 - NO. 4 BARS 3 EACH SIDE</td>
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<tr>
<td>15&quot;</td>
<td>8 - NO. 4 BARS 3 EACH SIDE</td>
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<td>18&quot;</td>
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<tr>
<td>21&quot;</td>
<td>12 - NO. 4 BARS 4 EACH SIDE</td>
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<tr>
<td>24&quot;</td>
<td>12 - NO. 4 BARS 4 EACH SIDE</td>
</tr>
<tr>
<td>27&quot;</td>
<td>12 - NO. 4 BARS 4 EACH SIDE</td>
</tr>
<tr>
<td>30&quot;</td>
<td>12 - NO. 4 BARS 4 EACH SIDE</td>
</tr>
<tr>
<td>33&quot;</td>
<td>12 - NO. 4 BARS 4 EACH SIDE</td>
</tr>
<tr>
<td>36&quot;</td>
<td>16 - NO. 4 BARS 5 EACH SIDE</td>
</tr>
</tbody>
</table>
MANHOLE RISERS AND ALTERNATE TOPS

4" x 4" - 4x4 WWM

GRADE RINGS
8" MAX.

PRECAST ECCENTRIC FLAT TOP
FOR 48", 60" OR 72" M.H.

ECCENTRIC CONE

24" OR 30"

26" MAX.

6"

5 1/4"

Mastic between joints

Steps shall be over outlet pipe

48", 60" OR 72" DIA.

6"

5"

12" MAX.

TYPICAL MANHOLE SECTION
WITH ECCENTRIC CONE

4 - #4 REBARS

6" MIN.

#4 REBAR

4"x4" - 4x4 WWM

5 1/4"

8" MIN.

6"

VARIABLE

ALTERNATE FLAT TOP

NOTES:
1. All joints to be rubbernek or ramnek if above the water table, flexible plastic sealing compound if below the water table, as per specification.
2. All joints shall be double sealed with flexible plastic joint sealing material to extrude into manhole, and be trimmed off.
3. All manholes placed in the "open space" areas shall be installed with the ring and cover at an elevation that is 6" above final grade with a collar of concrete.
4. Steps installed over downstream invert of manhole.

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

STANDARD SEWER MANHOLE
(DETAIL 1 OF 3)

SM-3A

APPROVED:
MAR 2018
NOTES:
1. MANHOLES SHALL HAVE REINFORCED CONCRETE BASES PER DETAIL SM–3C.
2. SQUARE BASES ARE ALLOWED PER DETAIL SM–11.
3. SEE DETAIL SM–3C FOR CROSS SECTIONS A–A AND B–B.
TYPE 1 MANHOLE BASE

SECTION A–A

SECTION B–B

ALL INFRASTRUCTURE TIE-IN’S WILL BE A MINIMUM OF 5 FT. I.D. MANHOLE.
THROUGH PIPE

ONE COLLECTION LINE

TWO COLLECTION LINES

INTERMEDIATE ANGLE
\( \alpha = 30^\circ \)

SHARP ANGLE
\( \alpha = 90^\circ \)

INTERMEDIATE ANGLE
\( \alpha = 45^\circ \)

OPPOSED LATERALS

MANHOLE OFFSET
AS SHOWN

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

SM-4

TYPICAL BASE AND DEFLECTOR DETAILS
NOTES:
1. TIE-INS SHALL ONLY BE PERMITTED THROUGH BASE WALL.
2. STEPS INSTALLED OVER DOWNSTREAM INVERT OF MANHOLE.
NOTE: CONCRETE COLLAR TO BE POURED AROUND BOTH RING AND LOCKING CLEANOUT.

30” STANDARD RING AND COVER

TYLER TYPE # 6855 CLEANOUT COVER WITH LOCKING LID MARKED “SEWER”

REDUCE TO 4” PVC

SDR 35 PVC PIPE
EPoxy CoAT INTeRIOR OF MANHOLE
SDR 35 CROSS
SDR 35 PVC PIPE
SUPPORT BRACKET PLACED EVERY 4’ ON CENTERS (SEE DETAIL)
C900 MALE X SDR 35 FEMALE GASKETED BELL ADAPTOR
C900 PVC 90° BEND
HARTCO OR APPROVED EQUAL

MANHOLE INTERIOR WALL

3/8” STAINLESS STEEL ALL THREAD

3/8” x 2”

BRACKET DETAIL
MANUFACTURE BRACKET FROM 3/8” STAINLESS STEEL.
ALL BRACING MATERIALS SHALL BE CONSTRUCTED USING STAINLESS STEEL.

NOTES:
1. MANHOLE SIZE VARIES WITH SIZE OF THE MAINLINE.
   1.1. 8”–10” MAINLINE = 5’ DIA. MANHOLE
   1.2. 12”–15” MAINLINE = 6’ DIA. MANHOLE
   1.3. MAINLINES LARGER THAN 15” = 7’ DIA. MANHOLE
2. STEPS INSTALLED OVER DOWNSTREAM INVERT OF MANHOLE.
NOTE: 
2. LETTERING ON COVER AS REQUIRED (I.E. WATER, SEWER).
3. ALL BEARING SURFACES TO BE MATCHED.
4. TOTAL MINIMUM WEIGHT APPROXIMATELY 400 LBS., CAST IRON ONLY.
5. LIFTING SLOT SHALL NOT EXTEND PAST INSIDE FACE OF RING SEAT.
6. MINIMUM FRAME WEIGHT – 235 LBS., MINIMUM LID WEIGHT – 165 LBS.
NOTES:
2. LETTERING ON COVER AS REQUIRED (I.E. WATER, SEWER).
3. ALL BEARING SURFACES TO BE MACHINED.
4. TOTAL MINIMUM WEIGHT APPROXIMATELY 400 LBS., CAST IRON ONLY.
5. LIFTING SLOT SHALL NOT EXTEND PAST INSIDE FACE OF RING SEAT.
6. MINIMUM FRAME WEIGHT – 235LBS., MINIMUM LID WEIGHT – 165 LBS.
Precast Concrete Manhole

Notes:

1. 60" or larger diameter manholes require a 30" opening.

Steps installed over downstream invert.

Base diameter is 5" - 10" on 48" 1 ¼" manhole.

Base diameter is 5" - 0" on 60" 1 ½" manhole.

Base diameter is 5" - 0".

Clay core rock.

GROUT fill.

Finish grade frame and cover.

Heavy duty cast iron manhole.

Section A-A

Pipe to manhole seal.

Evacuation:

Minimum evacuation 10'.

Required joint allows. 10'.

Vanes vary.

Section A-A

Conduit rings.

Concrete cover.

Finish grade.
DETAIL FOR M.A. INDUSTRIES STEP, OR APPROVED EQUAL

SECTION A–A

1/2" GRADE 60 STEEL REINFORCEMENT

TYPICAL STEP INSTALLATION

NOTES:
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2. STEPS SHALL BE IMPACT RESISTENT CO–POLYMER POLYPROPYLENE PLASTIC MOLDED AROUND 1/2" DIAMETER GRADE 60 REINFORCING STEEL, CAST IRON STEPS WILL NOT BE PERMITTED.
NOTES:
1. THE RE-BAR BASKET MAY BE EITHER CIRCULAR (SEE SM−12) OR SQUARE.
NOTES:
1. THE RE-BAR BASKET MAY BE EITHER CIRCULAR OR SQUARE (SEE SM-11).
NOTES:
1. CURB STOP BOX SHALL BE TYLER MODEL 6500 SERIES, SIZE 95E OR APPROVED EQUAL.
2. A 2" x 9" CONCRETE PAD SHALL BE PLACED UNDER THE CURB STOP VALVE AND BOX.

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

TYPICAL — CURB STOP FOR
3/4" AND 1" WATER SERVICE
NOTES:
1. WATER SERVICE SHALL BE LOCATED AT THE CENTERLINE OF LOT.
2. WATER SERVICE SHALL MAINTAIN A MINIMUM COVER OF 4.5 FEET.
3. AN 18" MINIMUM VERTICAL CLEARANCE SHALL BE MAINTAINED BETWEEN THE WATER AND SEWER SERVICES.
4. A 12" MINIMUM HORIZONTAL CLEARANCE SHALL BE MAINTAINED BETWEEN THE WATER AND SEWER SERVICES.
NOTES:
1. WATER SERVICE LINES SHALL BE CENTERED ON THE FRONT LOT LINE.
2. CURB STOP VALVES SHALL BE INSTALLED PER DETAIL WS-4.
NOTES:
1. A "V" SHALL BE CUT IN THE FACE OF CURB BY THE BUILDER TO PERMANENTLY MARK THE LOCATION OF THE CURB STOP BOX. THE "V" SHALL BE A MINIMUM OF 3" IN HEIGHT AND 3/8" IN DEPTH.
2. ALL WATER SERVICE LINES SHALL BE PLACED AT THE CENTER OF THE LOT.
NOTES:
1. A "V" SHALL BE CUT IN THE FACE OF THE CURB—AND—GUTTER BY THE BUILDER TO PERMANENTLY MARK THE LOCATION OF THE CURB STOP BOX.
2. ALL WATER SERVICE LINES SHALL BE PLACED AT THE CENTER OF THE LOT.
3. TYLER 95—E CURB BOX OR APPROVED EQUAL.
3/4” WATER METER LAYING LENGTH = 7.5”

NOTES:

1. THE WATER LINE MUST BE ANCHORED TO THE WALL ABOVE AND BELOW THE METER ASSEMBLY.
2. ENTRY VALVE REQUIRED IMMEDIATELY INSIDE OF THE STRUCTURE.
COMMERCIAL APPLICATION ONLY

RIGHT OF WAY
OR EASEMENT LINE

SADDLE WITH
CORPORATION STOP

4.5' MIN.

2" SQUARE NUT FOR 1.5" AND
2" BALL VALVES

CURB STOP & BOX

2" X 9" CONCRETE PAD

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

COMMERCIAL — CORPORATION TAP & SERVICE LINE DETAIL
OUTSIDE WALL OF STRUCTURE

5.0' MIN.

5.0' MIN.

3.0' MIN.

D.I.P. FIRE MAIN 4" MIN.

TEE (NEW CONSTRUCTION) OR REFERENCE TABLE IV-6 FOR WET TAPPING REQUIREMENTS.

GATE VALVES

NOTES:
1. ON 6" FIRE LINES OR LARGER WITH A 2" OR SMALLER DOMESTIC TAP, USE A DOUBLE STRAP BRONZE TAPPING SADDLE.
2. ON 4" FIRE LINES WITH A 2" DOMESTIC TAP, USE A 4" M.J. X 2" THD TEE.
3. ON 4" FIRE LINES WITH A 1½" DOMESTIC TAP, USE A 4" M.J. X 2" THD TEE WITH A BRASS BUSHING.
4. ON A 4" FIRE SERVICE WITH A ¾" OR 1" SERVICE, USE A DOUBLE STRAP BRONZE TAPPING SADDLE.
NOTES:
1. The center of the meter and backflow shall be placed 12" away from the adjacent wall with a minimum of 24" clear space in front of the device from floor to ceiling.
2. The water line must be anchored to the wall above and below the meter assembly.
3. Entry valve required immediately inside of structure within 6" of the outside wall.

WATER METER LAYING LENGTH

\[
\begin{align*}
\frac{3}{4}" & = 7-1/2" \\
1" & = 10-3/4"
\end{align*}
\]

ELEVATION VIEW

PLAN VIEW
METER YOKE LENGTH "L"
1-1/2" = 28"
2" = 32"

1. SWEAT GATE VALVE
2. SCREWED GATE VALVE
3. 1-1/4" BALL VALVE WITH LOCKING WING
4. FORD CUSTOM SETTER TEE
5. COMP. COPPER X MIPT ADAPTER
6. CLOSE BRASS NIPPLE
7. 1-1/4" X CLOSE BRASS NIPPLE
8. SWEAT 90 DEGREE BEND
9. MIPT X SWEAT ADAPTER
10. BRASS METER FLANGE
11. LOC-PAC COUPLING
12. CUT TYPE K – COPPER TUBING
13. PRESSURE REDUCING VALVE

NOTES:
1. AN APPROVED REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTION DEVICE IS REQUIRED DOWNSTREAM OF THE WATER METER FOR ALL COMMERCIAL PROPERTIES.
2. THE ASSEMBLY MAY BE CONSTRUCTED OF THREADED OR SWEAT FITTINGS.
3. A MINIMUM OF 24" CLEARANCE IS REQUIRED BETWEEN THE METER AND BACKFLOW DEVICE.
4. NO GALVANIZED FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
NOTES:
1. THE DEVICE SHALL BE INSTALLED BETWEEN 24” AND 48” ABOVE FINISHED FLOOR. THE DEVICE SHALL BE PLACED WITH A MINIMUM CLEARANCE, AS ILLUSTRATED, BETWEEN THE EDGE OF THE DEVICE AND THE ADJACENT WALL(S). A 24” CLEAR SPACE, FROM FLOOR TO CEILING, IS REQUIRED IN FRONT OF THE DEVICE.

2. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW (DIRECTLY UNDER THE DEVICE WHENEVER POSSIBLE).

3. METER SETTING MUST BE SECURED TO THE WALL ABOVE AND BELOW THE METER.
NOTES:
1. A REDUCED PRESSURE PRINCIPAL BACKFLOW DEVICE IS REQUIRED DOWNSTREAM OF THE WATER METER FOR ALL COMMERCIAL PROPERTIES.
2. WATER METER TO BE SECURED TO THE WALL AND SUPPORTED WITH JACK STANDS.
3. NO GALVANIZED PIPE FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
1. Hand Wheel Gate Valve
2. Flanged PRV
3. Tee
4. Dresser Coupling/Adaptor
5. Meter (Purchased from the District)
6. Bypass (Minimum of a 2 inch diameter line)
7. Locking Wing Ball Valve (Lockable in the closed position)
8. Reduced Pressure Principal Device Backflow Preventer

Notes:
1. No Galvanized pipes or fittings are allowed as part of the assembly.
2. All Valves shall be resilient epoxy coated, cast iron body, with a non-rising stem.
3. Gate Valves shall be Mueller, Clow, AFC, Waterous, or US Pipe Metro Seal.
1. NO GALVANIZED PIPES OR FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
2. ALL VALVES SHALL BE RESILIENT EPOXY COATED, CAST IRON BODY, WITH A NON-RISING STEM.
3. GATE VALVES SHALL BE MUELLER, CLOW, AFC, WATEROUS, OR US PIPE METRO SEAL.

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

COMMERCIAL – METER/BACKFLOW FOR 3” AND LARGER
SERVICE – HORIZONTAL SETTING

WS-13
NOTES:
1. WHEN LOCATED IN CONCRETE, THE DISTRICT MUST APPROVE THE METER PIT LOCATION AND THE PIT MUST HAVE A CAST IRON DOME AND COVER.

2. ALL METER PIT LIDS SHALL HAVE A 2" HOLE IN THE CENTER OF THE LID FOR THE PURPOSE OF INSTALLING A REMOTE SENSING UNIT.
NOTES:
1. METER TO BE INSTALLED IN A 24" CONCRETE METER PIT (SEE DETAIL WS–16A).
2. ALL METER PITS LOCATED IN CONCRETE, WHEN PERMITTED, SHALL HAVE A CAST IRON DOME AND COVER.
3. THE 3/4" METER SETTER SHALL BE A FORD SERIES 70 TANDEM COPPER SETTER, MODEL TV 73–36W, WITH PADLOCK WINGS ON INLET VALVE AND COMPRESSION END CONNECTIONS.
4. METER PITS INSTALLED IN PARKING OR ROADWAYS WILL REQUIRE THE INSTALLATION OF A 3/4" P.V.C. CONDUIT FOR THE REMOTE READOUT CABLE. METER PITS INSTALLED IN LANDSCAPED AREAS WILL REQUIRE THAT A 2" HOLE BE PROVIDED IN THE CENTER OF THE DOME LID FOR THE INSTALLATION OF A REMOTE READING SENSOR.
5. THERE SHALL BE A MINIMUM COVER OF 4.5' OVER THE PIPE.
6. THE 1" METER SETTER SHALL BE A FORD 70 SERIES TANDEM COPPER SETTER, MODEL TV 74–36W, WITH PADLOCK WINGS ON INLET VALVE AND COMPRESSION END CONNECTIONS.
7. WHEN USED FOR AN IRRIGATION SYSTEM, AN APPROVED BACKFLOW PROTECTION DEVICE MUST BE INSTALLED, INCLUDING A STOP AND WASTE VALVE ON THE CUSTOMERS SIDE OF THE PIT.
8. WHEN USED FOR AN IRRIGATION SYSTEM, ALL INSTALLATIONS WHERE THE STATIC PRESSURE EXCEEDS 100 P.S.I. WILL REQUIRE A P.R.V.
9. NO RESETTERS ALLOWED IN NEW CONSTRUCTION.

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO
IRRIGATION – METER PIT FOR
3/4" AND 1" SERVICE WITH TANDEM SETTER
(DETAIL 2 OF 2)
NOTES:
1. THE DISTANCE BETWEEN THE P.R.V. AND THE METER MUST BE AT LEAST 3 PIPE DIAMETERS.
2. P.R.V.’S ARE REQUIRED WHEN THE STATIC PRESSURE IS 100 P.S.I. OR MORE.
3. ALL METER PIT LIDS SHALL HAVE A 2” HOLE IN THE CENTER OF THE LID FOR THE PURPOSE OF INSTALLING A REMOTE SENSING UNIT.
4. NO GALVANIZED PIPES OR FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
PIPING AND VAULT — PLAN VIEW

VAULT LID — PLAN VIEW

NOTES:
1. P.R.V.'S ARE REQUIRED WHEN THE STATIC PRESSURE IS 100 P.S.I. OR MORE.
2. ALL METER VAULT LIDS SHALL HAVE A 2” HOLE IN THE CENTER OF THE LID FOR THE PURPOSE OF INSTALLING A REMOTE SENSING UNIT.
3. NO GALVANIZED PIPES OR FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
4. ALL VALVES SHALL BE RESILIENT EPOXY COATED, CAST IRON BODY, WITH A NON-RISING STEM.
5. GATE VALVES SHALL BE MUELLER, CLOW, AFC, WATEROUS, OR US PIPE METRO SEAL.
24" RING AND COVER MARKED "WATER" WITH 2" HOLE.

CONCRETE RINGS TO GRADE

4"—6" MINIMUM COVER

2'-0"

2'-0"

1-1/2" ROCK 2' x 2' x 2'

MIN. 6" OF 3/4" CRUSHED ROCK

ADJUSTABLE SUPPORT

SECTION A

NOTE: RAMEK ALL EXTERIOR JOINTS

SECTION B

16" O.C. (TYP.)

12" DIA. SUMP

18"

18"

6"

6"


1. STOP & WASTE GATE VALVE OR BALL VALVE
2. GATE VALVE
3. WATER METER
4. PRESSURE REDUCING VALVE
5. GATE VALVE WITH DRAIN
NOTES: ALL BACKFLOW PREVENTERS ARE REQUIRED TO BE AN APPROVED REDUCED PRESSURE PRINCIPAL ASSEMBLY.
NOTES:


2. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW (DIRECTLY UNDER THE DEVICE WHENEVER POSSIBLE).

3. ALL VALVES SHALL BE RESILIENT EPOXY COATED, CAST IRON BODY, WITH A NON-RISING STEM.

4. NO GALVANIZED FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY.
NOTES:

2. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW (DIRECTLY UNDER THE DEVICE WHENEVER POSSIBLE).

3. ALL VALVES SHALL BE RESILIENT EPOXY COATED, CAST IRON BODY, WITH A NON–RISING STEM.

4. NO GALVANIZED FITTINGS ARE ALLOWED AS PART OF THE ASSEMBLY UNLESS APPROVED BY DISTRICT ENGINEER.
DEVICE SIZE

1/4" THRU 3/4"
1" THRU 2"
2 1/2" AND LARGER

* THE OFFSET FROM THE WALL TO THE CENTER OF THE DEVICE ONLY APPLIES WHEN THE TEST COCKS ARE POINTED UP OR AWAY FROM THE ADJACENT WALL. OTHERWISE THE DEVICE SHALL BE PLACED 12 INCHES AWAY FROM THE ADJACENT WALL.

PLAN VIEW

ELEVATION VIEW

NOTE: THE BACKFLOW PREVENTER IS REQUIRED TO BE DOWNSTREAM OF THE WATER METER ASSEMBLY. THE DRAIN FROM THE BACKFLOW PREVENTER SHALL NOT EXTEND OUTSIDE THE STRUCTURE TO DAYLIGHT.
1/8" BEND CONNECTION TO WYE

STAINLESS STEEL STRAPS

1/8" BEND CONNECTION TO TAPPING SADDLE

SERVICE LINE SIZING CRITERIA (MINIMUM SLOPE)

4"  2.08%
6"  1.04%
8"  0.50%
NOTES:
1. COVER SHALL HAVE A LOCKING LID MARKED "SEWER".
2. TYLER SERIES 6855 SLIP TYPE TOP SECTION, D & L SUPPLY SERIES M8056 OR EQUAL.
3. I.D. = 6¾".

PLAN VIEW

COVER DETAIL
NOTES:
1. SECONDARY COMPARTMENT HAS VOLUME EQUAL TO 1/3 OF TOTAL CAPACITY.
2. ALL PIPE AND FITTINGS SHALL BE SOLVENT WELDED SCHEDULE 40 P.V.C. MIN. 3" DIA. WITHIN TRAP.
3. WALLS AND BOTTOM REINFORCED THROUGHOUT WITH 2x16 6/10 REMESH.
4. COVERS TO BE REINFORCED LONGITUDINALLY WITH NO. 6 REBAR ON 6" CENTERS, NO. 4 REBAR ON 6" CENTERS WIDTHWISE, AND NO. 8 REBAR DIAGONALLY AROUND ACCESS HOLES.
5. CLEAN OUT SHALL BE PVC SCREW PLUG.
6. VENT PIPE MAY BE CAST IRON OR PVC SCHEDULE 40, TO A POINT 6" ABOVE ROOF LINE.
7. MANHOLE RING AND COVER SHALL BE 24" DENVER HEAVY, OR EQUAL. SEE 4.02 W THESE SPECIFICATIONS (SEE SM-7)
8. CHECK WITH SUPPLIER FOR EXACT DIMENSIONS.
9. ALL BRACING SHALL BE CONSTRUCTED OF STAINLESS STEEL MATERIALS (SEE SM-6)
10. NO BOLT DOWN COVERS ALLOWED WITHOUT PERMISSION FROM HIGHLANDS RANCH METROPOLITAN DISTRICT.
11. SEE SECTION 5.05–E4

<table>
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<tr>
<th>WATER CAPACITY APPROX. GALLONS</th>
<th>TWO COMPARTMENT TANK INCHES</th>
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<td>320</td>
<td>48 72 22 30 44 24</td>
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<tr>
<td>500</td>
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<tr>
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<td>48 96 40 48 62 32</td>
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<tr>
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<td>72 102 34 42 56 34</td>
</tr>
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</table>
NOTES:

1. SECONDARY COMPARTMENT HAS VOLUME EQUAL TO 1/3 OF TOTAL CAPACITY.
2. ALL PIPE AND FITTINGS SHALL BE SOLVENT WELDED SCHEDULE 40 P.V.C. MIN. 3" DIA. WITHIN TRAP.
3. WALLS AND BOTTOM REINFORCED THROUGHOUT WITH 2x16 6/10 REMESH.
4. COVERS TO BE REINFORCED LONGITUDINALLY WITH NO. 6 REBAR ON 6" CENTERS, NO. 4 REBAR ON 6" CENTERS WIDTHWISE, AND NO. 8 REBAR DIAGONALLY AROUND ACCESS HOLES.
5. CLEAN OUT SHALL BE A PVC SCREW PLUG.
6. VENT PIPE MAY BE CAST IRON OR PVC, SCHEDULE 40, TO A POINT 6" ABOVE GROUND.
7. MANHOLE RING AND COVER SHALL BE J-MARK #1161 OR EQUAL. SEE 4.02 W THESE SPECIFICATIONS (SEE SM-7).
8. NO BOLT DOWN COVERS ALLOWED WITHOUT PERMISSION FROM HIGHLANDS RANCH METROPOLITAN DISTRICT.
9. GREASE CAPACITY RATED FOR LARGE COMPARTMENT ONLY.
10. CHECK WITH SUPPLIER FOR EXACT DIMENSIONS.
11. SEE SECTION 5.03-D.
12. ALL BRACING SHALL BE CONSTRUCTED OF STAINLESS STEEL MATERIALS (SEE SM-6).

<table>
<thead>
<tr>
<th>Water Capacity (Approx. Gallons)</th>
<th>Dimensions Inches</th>
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<td>3445</td>
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</table>
NOTES:

1. SECONDARY COMPARTMENT HAS VOLUME EQUAL TO 1/3 OF TOTAL CAPACITY.
2. ALL PIPE AND FITTINGS SHALL BE SOLVENT WELDED SCHEDULE 40 P.V.C. MIN. 3" DIA. WITHIN TRAP.
3. WALLS AND BOTTOM REINFORCED THROUGHOUT WITH 2x16 6/10 REMESH.
4. COVERS TO BE REINFORCED LONGITUDINALLY WITH NO. 6 REBAR ON 6" CENTERS, NO. 4 REBAR ON 6" CENTERS WIDTHWISE, AND NO. 8 REBAR DIAGONALLY AROUND ACCESS HOLES.
5. CLEAN OUT SHALLOW BE PVC SCREW PLUG.
6. VENT PIPE MAY BE CAST IRON OR PVC SCHEDULE 40, TO A POINT 6" ABOVE GROUND.
7. MANHOLE RING AND COVER SHALL BE 24" DENVER HEAVY, OR EQUAL. SEE 7.02-H THESE SPECIFICATIONS (SEE SM-7).
8. ALL BRACING SHALL BE CONSTRUCTED OF STAINLESS STEEL MATERIALS (SEE SM-6).
9. CHECK WITH SUPPLIER FOR EXACT DIMENSIONS.
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<tr>
<th>WATER CAPACITY</th>
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HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

SAND AND OIL INTERCEPTOR
(320 TO 1060 GALLON CAPACITY)
NOTE:
IF DEPTH OF COVER IS GREATER THAN 48", A 36" ACCESS W/ 24" COVER IS REQUIRED.

PLAN VIEW

section

3/4" CRUSHED ROCK

WATER LEVEL

MH COVER (SEE DETAIL SM-7)

PIPE O.D.
+2"

PIPE BRACE

GROUT

WATER LEVEL

2" 24"

8" 24"

8" 8"

6" 12'-0"

6" 48"

6" 6"

5"

6" MIN.

NOTE:
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5. CLEAN OUT SHALL BE A PVC SCREW PLUG.
6. VENT PIPE MAY BE CAST IRON OR PVC, SCHEDULE 40, TO A POINT 6" ABOVE ROOF LINE.
7. MANHOLE RING AND COVER SHALL BE J-MARK #1161 OR EQUAL. SEE 4.02 W THESE SPECIFICATIONS (SEE SM-7).
8. NO BOLT DOWN COVERS ALLOWED WITHOUT PERMISSION FROM HIGHLANDS RANCH METROPOLITAN DISTRICT.
9. GREASE CAPACITY RATED FOR LARGE COMPARTMENT ONLY.
10. CHECK WITH SUPPLIER FOR EXACT DIMENSIONS.
11. SEE SECTION 5.03-E4.
12. ALL BRACING SHALL BE CONSTRUCTED OF STAINLESS STEEL MATERIALS (SEE SM-6).

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HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

SAND AND OIL INTERCEPTOR
(1565 TO 3445 GALLON CAPACITY)

APPROVED:
MAR 2018

SS-6
PALMER–BOWLUS FLUME

CAST IRON RING AND COVER

CONCRETE RINGS

PRECAST MANHOLE SECTIONS

MANHOLE STEPS OVER BENCH (15” O.C.)

EQUIP. RINGS (4 REQ.)

POUR BENCH TO TOP OF PIPE

FLUME BLOCK OUT

GROUT

CAST IN PLACE MANHOLE BASE

FLOW DEPTH MEASUREMENT LOCATION

EQUIPMENT RINGS

PLAN

SECTION

A

A

6” MIN.  3” MIN.

MANHOLE I.D. + 16”

15” MIN.

HIGHLANDS RANCH METROPOLITAN DISTRICT
DOUGLAS COUNTY, COLORADO

WASTE METERING MANHOLE
(DETAIL 1 OF 4)

SS–7A

APPROVED:
MAR 2018
## FLUME DESIGN CRITERIA

<table>
<thead>
<tr>
<th>MAXIMUM DISCHARGE</th>
<th>HEAD</th>
<th>MODEL</th>
<th>DIMENSIONS (INCHES)</th>
<th>MANHOLE SIZE I.D.</th>
<th>SLOPE UPSTREAM (%)</th>
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</table>
WASTE METERING MANHOLE NOTES

STRUCTURE:
1. Shape and smooth manhole inverts by forming or shaping with cement mortar.
2. All precast manhole sections, bases, flat tops, barrels, reducers, etc., shall conform to ASTM, C-478, and these Standard Specifications.
3. Reinforcing in base is required for 6’ & 7.5’ diameter manholes. The Owner shall be responsible for structural requirements under the specific loading conditions, (Dead load plus live load or H-20 for Traffic).
4. Manhole ring, cover and leveling rings shall be set in a fill bed of mortar.
5. Eccentric cone sections may be used in lieu of flat top sections, provided cover over top of pipe is greater than 4.5 feet.
6. Flexible plastic sealant is required in all joints.
7. Ventilator may be required; District Engineer shall decide when this is necessary, and approve method of providing ventilation.

FLUME:
1. The flume shall be a Palmer—Bowlus flume, with integral approach section, or approved equal.
2. It is suggested that the Owner place concrete for manhole bench in two pours. (a) Pour bench, leaving adequate “Block out” area to fit flume. (b) Grout flume into “Block out” at existing or new sewer line slope.
3. Construction of a bypass channel for flume shall be at the Owner’s option, this can be accomplished in pour (a). This type of construction will require a larger structure. The design of any bypass channel shall be such as to induce minimum turbulence in normal flume flow channel.
4. Flume selection shall be based upon the flow to be measured and not upon the pipe size.
5. Flume selection calculations will be submitted to District Engineer for concurrence as will flume calibration curves and data.
6. A mounting bracket shall be provided to support the District’s flow recording transducer. The bracket shall be installed so that the transducer face is over the center of the channel.
1. SHALL BE A MILLTRONICS OCM III – NON–CONTACTING ULTRASONIC FLOW METER, TWO–WAY COMMUNICATIONS – DATA LOG WITH 2 YEAR HISTORY.

2. CHART RECORDER – FOXBORO 740 SERIES, OR APPROVED EQUAL, WITH 100 PROPERLY SCALLED CHARTS FOR THE SIZE OF FLUME UTILIZED.

3. THE TRANSDUCER MOUNTING HARDWARE SHALL BE FIBERGLASS UNISTRUT WITH STAINLESS STEEL ANCHORS & BOLTS. THE MOUNT SHOULD BE DESIGNED TO ALLOW LEVELING OF TRANSDUCER FACE AND OFFERING SOME LATERAL ADJUSTMENTS.

4. CONDUIT FROM MANHOLE TO PANEL SHALL BE PVC JACKETED GRC, (USING ONLY WIDE RADIUS BENDS).
   REQUIRED (1) 3/4” FOR TRANSDUCER CABLE
   (1) 1” FOR ISCO SAMPLE LINE
   (1) 3/4” SPARE

5. EQUIPMENT ENCLOSURE SHALL BE A NEMA 4, WITH DOUBLE DOOR ACCESS, MOUNTED ON A CONCRETE PAD.
   PANEL SHOULD INCLUDE THE FOLLOWING:
   – ELECTRICAL DISTRIBUTION BOX WITH (6) 20 AMP GFI CIRCUIT BREAKERS.
   – HEATER WITH THERMOSTAT.
   – EXHAUST FAN WITH LOUVERS.
   – LIGHT
   – UTILITY OUTLETS
   – SIZED ACCORDINGLY TO ACCOMMODATE AN ISCO SAMPLER, MODEL #3700

6. FLUME LENGTH FOR 8” PALMER–BOWLUS WITH APPROACH SECTION, (4 x DIAMETER) + 1” e.i. 32”+ 1” = 33”
NOTE:

1. SEWER SERVICE LINES (INDIVIDUAL TRENCH) SHALL BE LOCATED A MAXIMUM OF 1.5' ON EITHER SIDE OF THE CENTER LINE OF THE LOT.
2. FOR JOINT TRENCH INSTALLATIONS, SEWER SERVICE LINES SHALL BE LOCATED IN ACCORDANCE WITH WS–2.