

## Gravity Sewer Design Requirements

Revised 2022-09-16

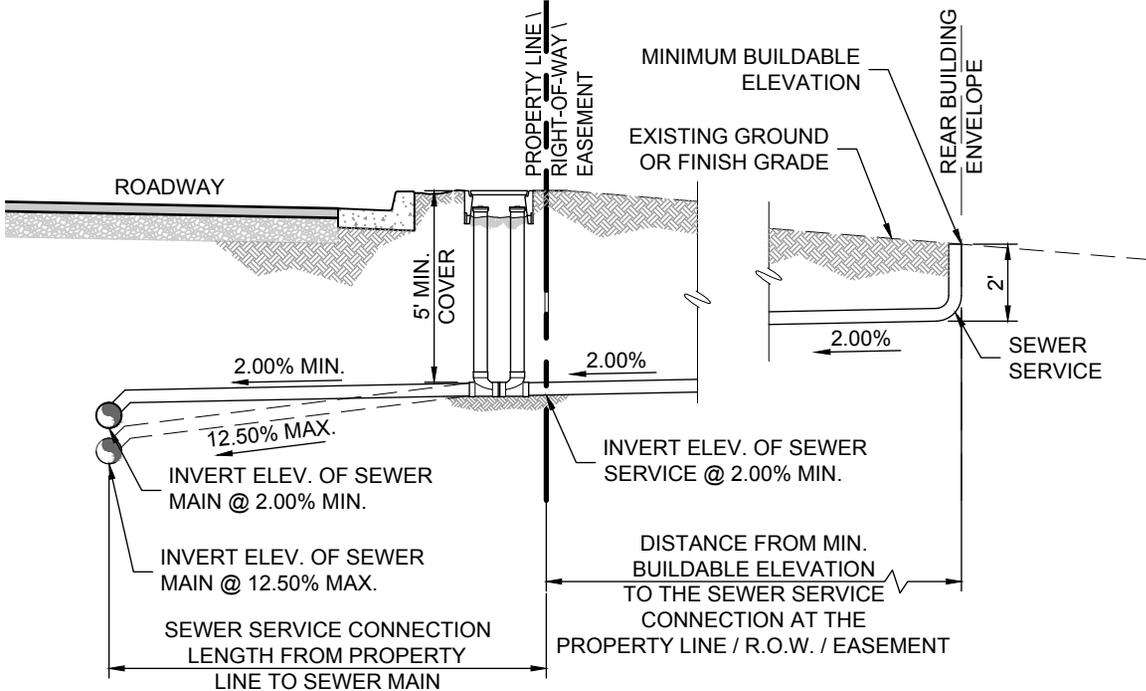
1. Regulatory Requirements
  - a. All gravity sewer shall meet the requirements of Arizona Administrative Code R18-9-E301.
  - b. All sewer/water shall meet the separation requirements in Arizona Administrative Code R18-5-502.
  - c. All gravity sewer shall conform to the Maricopa Association of Governments Uniform Standard Specifications and Details for Public Works Construction, Latest Edition, unless otherwise defined below.
2. Green Valley Water Requirements
  - a. All gravity sewer shall conform to the GVW Gravity Sewer Standard Details and Specifications, attached.
  - b. Gravity Sewer Mains
    - i. All gravity sewer mains shall be designed using the GVW Gravity Sewer Main Line Design Methodology, attached.
    - ii. All gravity sewer mains shall be designed within a public Right-of-Way unless approved by GVW.
    - iii. Minimum cover shall not be less than 3-feet.
    - iv. Maximum depth shall not exceed 10-feet deep unless approved by GVW.
    - v. All gravity sewer mains shall be designed to ensure each connected parcel can accommodate a gravity sewer service connection serving the entire building area of the parcel.
    - vi. Minimum slope shall not be less than 0.0050 ft/ft unless approved by GVW.
    - vii. All gravity sewer pipe shall be SDR-35 PVC, green in color, unless approved by GVW.
    - viii. All ductile iron gravity sewer main shall be epoxy lined, bituminous coated.
  - c. Gravity Sewer Service Connections
    - i. Gravity sewer service connections shall not enter a manhole. All connections shall enter a gravity sewer main.
    - ii. Construction Documents shall include the gravity sewer service connection invert elevation at the property line or easement line.
    - iii. All gravity sewer service connections shall have a minimum slope of 0.0200 ft/ft and a maximum slope of 0.1250 ft/ft from the gravity main to the property line or easement line.
    - iv. All gravity sewer service connections shall be constructed per MAG Std. Dtl. 440-2. No "Inserta Tee" type lateral connections are not allowed.
  - d. Manholes
    - i. All manholes shall be 4-foot diameter for connecting gravity sewer mains 12-inch or less; 5-foot diameter for gravity sewer mains greater than 12-inch.
    - ii. All manholes downstream of a force main or Low Pressure Sewer, (LPS) connection shall be polymer concrete. Distance downstream from the force main or LPS connection for polymer manholes shall be determined by GVW.
    - iii. All manholes shall have a minimum of 0.10-feet and a maximum of 6-inches of drop across the manhole. The minimum drop for a drop manhole is 2.5-feet.

# Gravity Sewer Main Line Design Methodology

**Goal:**  
Design a minimum depth gravity sewer main line that provides gravity sewer service to all buildable areas of parcels serviced by the gravity sewer main line.

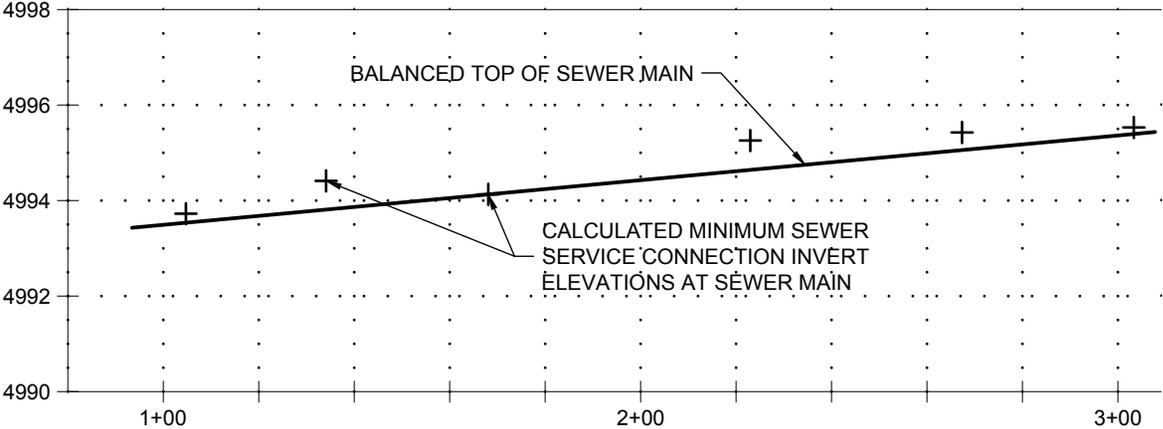
- Procedure:**
1. Locate the minimum buildable elevation on the parcel served by the sewer service connection, as follows:
    - 1.1. Existing ground elevation for buildable areas left in the natural condition.
    - 1.2. Finish grade elevation for buildable areas of graded building pads.
  2. Subtract 2-feet from the minimum buildable elevation.
  3. Determine the distance from the minimum buildable elevation to the sewer service location at the property line or easement line.
  4. Calculate the invert of the sewer service connection at the property line or easement line using a slope of 2.00%.
    - 4.1. If the calculated sewer service connection depth at the property line or easement line is less than 5-feet, use a depth of 5-feet;
    - 4.2. Otherwise, use the calculated depth of the sewer service connection at the property line or easement line.
  5. Calculate the minimum depth of the gravity sewer main line at the sewer service connection point using a sewer service connection slope of 2.0%. This is the minimum depth of the gravity sewer main at this location.
    - 5.1. All sewer service connections enter the gravity sewer main line per MAG Std Dtl 440-2.
  6. Repeat this procedure for each sewer service connection served by the gravity sewer main line.
  7. Design the gravity sewer main line using the minimum depth of the gravity sewer main line at each sewer service connection point calculated above.
    - 7.1. Check that the maximum sewer service connection slope does not exceed 12.5% for all sewer service connections. If the sewer service connection slope is greater than 12.5%, lower the sewer service connection invert at the property line to achieve the maximum slope of 12.5%.
    - 7.2. The gravity sewer main line must consider all conflicts such as water line and storm drain crossings.

**Notes:**  
If the entire buildable area of a parcel serviced by a gravity sewer service connection cannot be served by gravity while adhering to all GVW gravity sewer design criteria, then the parcel shall be designated on both the construction plans and the final plat as possibly requiring a grinder pump.



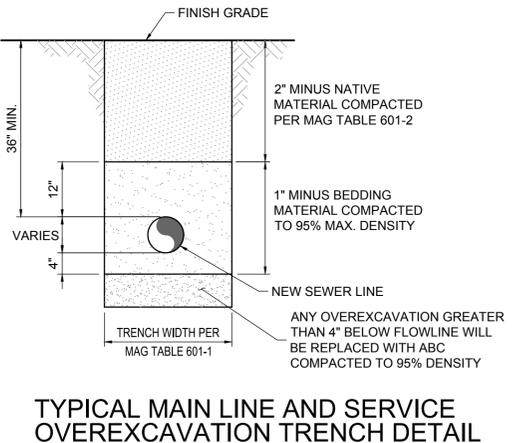
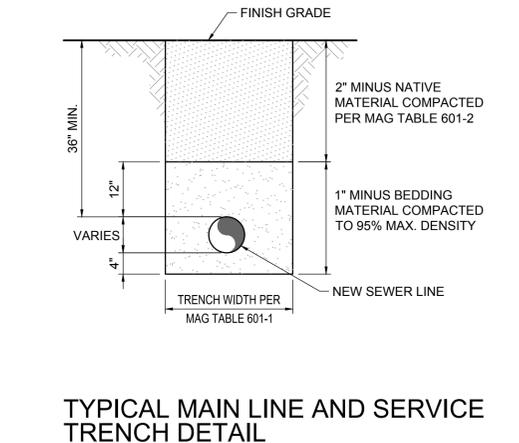
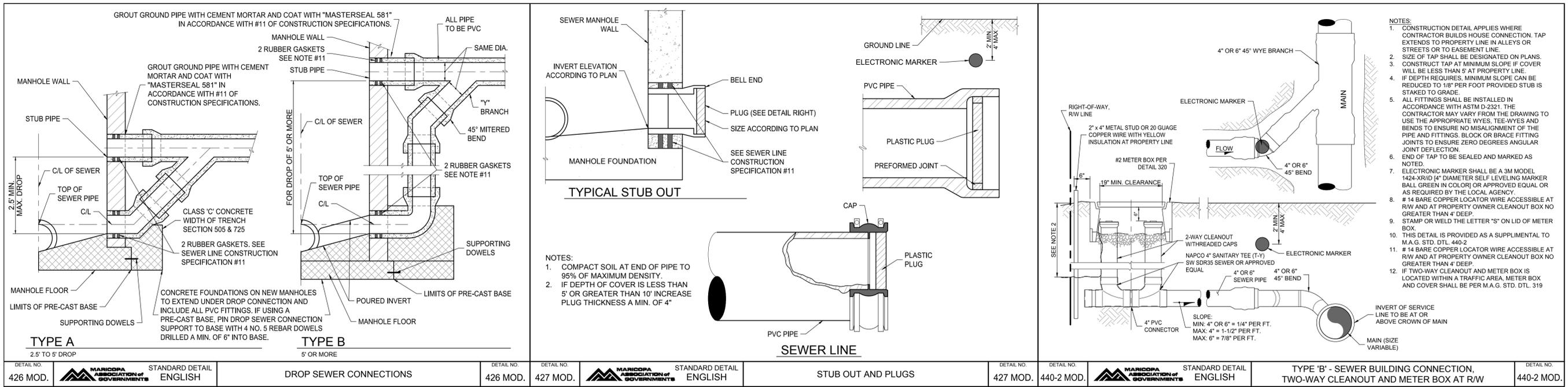
## Sewer Service Design Section

NTS



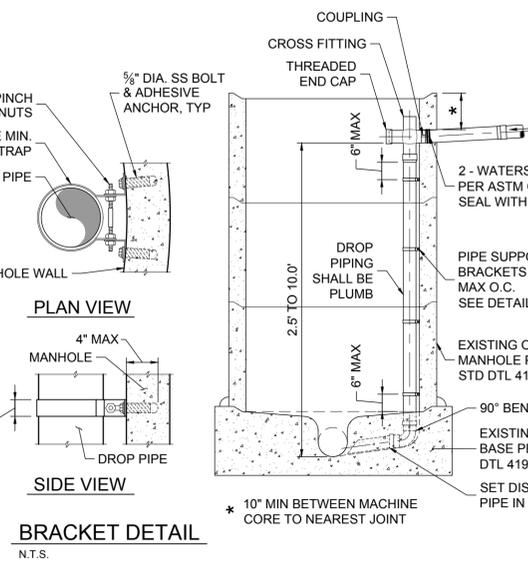
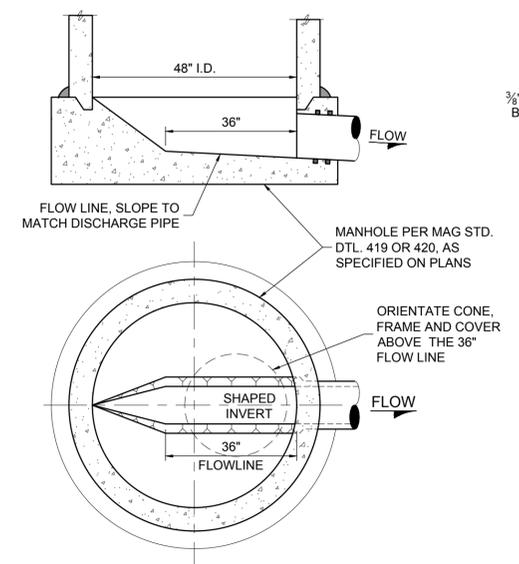
## Sewer Main Design Profile

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**SEWER LINE CONSTRUCTION SPECIFICATIONS**

- ALL IMPROVEMENTS SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, MARICOPA ASSOCIATION OF GOVERNMENTS AND THE UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION, MARICOPA ASSOCIATION OF GOVERNMENTS, LATEST EDITION, THE ARIZONA ADMINISTRATIVE CODE, TITLE 18, CHAPTER 9, ARTICLE 3, PART E. "TYPE 4 GENERAL PERMITS" (R18-9-E301), AND THE REQUIREMENTS OF GREEN VALLEY WATER (GVW).
- ALL FACILITIES, MATERIALS, AND WORKMANSHIP ARE SUBJECT TO THE INSPECTION, APPROVAL AND ACCEPTANCE OF THE DISTRICT MANAGER OF GREEN VALLEY WATER IN ORDER TO ASSURE THE INTEGRITY OF THE GREEN VALLEY WATER COLLECTION SYSTEM. ANY WORK AND MATERIALS NOT IN CONFORMANCE WITH THE SPECIFICATIONS AND DETAILS ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE. ALL WORK WILL BE WARRANTED BY THE CONTRACTOR FOR A PERIOD OF TWO (2) YEARS FROM ISSUANCE OF FINAL ACCEPTANCE.
- ANY DEVIATION FROM THE PLANS, SPECIFICATIONS OR STANDARD DETAILS MUST BE APPROVED IN WRITING BY THE ENGINEER AND THE DISTRICT MANAGER OF GREEN VALLEY WATER, PRIOR TO INSTALLATION AND ACCEPTANCE.
- WHEN WATER LINES AND SANITARY SEWER MAINS ARE LAID PARALLEL TO EACH OTHER, THE PIPING SHALL BE LAID IN ACCORDANCE WITH AAC R18-5-502.C.
- WHEN A SEWER MAIN CROSSES UNDER A WATER LINE THAT IS WITHIN 2 FEET OF THE SEWER MAIN, EXTRA PROTECTION SHALL BE PROVIDED IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODE R18-5-502.C.1.a AND MAG STANDARD DETAIL No. 404. SEWER MAIN SHALL NOT BE CONSTRUCTED ABOVE A WATER LINE.
- ALL SEWER LINE, MANHOLE AND CLEANOUT-MANHOLE CONSTRUCTION SHALL BE IN CONFORMANCE WITH MAG SPEC., SECTION 615. ALL SEWER BUILDING CONNECTIONS SHALL BE 4" PIPE UNLESS OTHERWISE SPECIFIED. ALL SEWER BUILDING CONNECTIONS SHALL BE CONSTRUCTED TO THE PROPERTY OR EASEMENT LINE IN ACCORDANCE WITH MAG STANDARD DETAIL 440-2. PVC PIPE SHALL BE INSTALLED IN CONFORMANCE WITH ASTM D2321.
- ALL SEWER TRENCH EXCAVATION, BACKFILLING, AND COMPACTION SHALL BE IN ACCORDANCE WITH MAG SPEC., SECTION 601. BACKFILL TYPE SHALL CONFORM TO TABLE 601-2 OF THE MAG SPEC AND AS APPROVED BY THE ENGINEER AND THE DISTRICT MANAGER OF GREEN VALLEY WATER. SEE TYPICAL SEWER TRENCH DETAILS, THIS SHEET. BACKFILL COMPACTION TESTING WILL BE THE RESPONSIBILITY OF CONTRACTOR.
- ALL PAVEMENT REPLACEMENT SHALL BE IN ACCORDANCE WITH MAG SPEC., SECTION 336. REPLACEMENT TYPE SHALL CONFORM TO MAG STANDARD DETAIL 200 AND THE TOWN OF PAYSON STREET PAVEMENT & SURFACE REPLACEMENT DETAILS.
- ALL SEWER MANHOLE AND CLEANOUT-MANHOLE FRAME AND COVERS SHALL BE SET AND FINAL ADJUSTMENT SHALL BE IN ACCORDANCE WITH MAG STANDARD DETAIL 422, ASSURING THAT RUNOFF WILL NOT ENTER THE MANHOLE. ALL SEWER MANHOLE FRAME AND COVERS SHALL BE "NEENAH FOUNDRY MODEL NF-15950033 AND NF-15950094", IDENTIFIED WITH THE LETTERING "SEWER", UNLESS OTHERWISE NOTED.
- ALL WATERPROOF MANHOLE FRAME AND COVERS SHALL BE "NEENAH FOUNDRY MODEL R-1476-BHB" OR APPROVED EQUIVALENT.
- ALL CONCRETE MANHOLES, AS IDENTIFIED ON THE PLANS, SHALL BE CAST CONCRETE IN ACCORDANCE WITH AAC R18-9-E301.D.3 AND MAG STANDARD DETAIL 420. CAST-IN-PLACE MANHOLE BASES SHALL BE CONSOLIDATED BY USE OF HIGH FREQUENCY INTERNAL VIBRATOR PER MAG SPEC 505.6. CONNECTIONS TO CAST-IN-PLACE MANHOLE BASES SHALL BE WITH TWO (2) RUBBER WATER STOP GASKETS PER CONNECTION POINT, PER ASTM C923. PRECAST MANHOLE BASES SHALL BE MANUFACTURED WITH PIPE CONNECTIONS PER MAG STANDARD DETAIL 420-2. THE EXTERIOR OF ALL CONCRETE MANHOLES SHALL HAVE TWO (2) COATS OF "MASTERSEAL 581" FOUNDATION COATING INCLUDING "MASTEREMACO A 660" ADDITIVE. AT LEAST ONE COAT SHALL BE APPLIED AFTER ALL MANHOLE SECTIONS ARE IN PLACE. A SUBSTITUTE FOR THE "MASTERSEAL 581"/"MASTEREMACO A 660" COMBINATION MAY BE ALLOWED IF PRE-APPROVED IN WRITING BY THE DISTRICT MANAGER OF GREEN VALLEY WATER.
- ALL MANHOLES DOWNSTREAM OF LOW PRESSURE SEWER OR SEWER FORCE MAIN DISCHARGE POINTS, AS IDENTIFIED ON THE PLANS, SHALL BE POLYMER CONCRETE PER MAG STANDARD DETAIL 419 IN ACCORDANCE WITH AAC R18-9-E301.D.3. ALL POLYMER CONCRETE MANHOLES SHALL BE INSTALLED WITH NON-CORROSIVE RING(S), FRAME AND COVER AS PRE-APPROVED BY GREEN VALLEY WATER. FRAME AND COVER SHALL HAVE AN H-20 LOAD RATING AND A HEX PADDLE LOCK TO SECURE TO FRAME. DISTANCE DOWNSTREAM OF DISCHARGE POINT SHALL BE DETERMINED BY GREEN VALLEY WATER.
- ALL SANITARY SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC), GREEN IN COLOR, IN ACCORDANCE WITH THE MAG SPEC, SECTION 745 OR DUCTILE IRON (DIP), IN ACCORDANCE WITH THE MAG SPEC, SECTION 750. DUCTILE IRON (DIP) SHALL BE LINED WITH "PROTECTOR 401", OR APPROVED EQUAL CERAMIC EPOXY LINING. A CERTIFICATE SHALL BE FURNISHED FROM THE MANUFACTURER ATTESTING THAT THE PIPE MEETS THE REQUIRED ASTM REQUIREMENTS.
- DROP SEWER CONNECTIONS (DROP MANHOLES) SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAIL 426 (MODIFIED, THIS SHEET) AND AS SPECIFIED ON THE PLANS.
- ALL CLEANOUT-MANHOLE BASES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAIL THIS SHEET.
- ALL SEWER BUILDING CONNECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH MAG STANDARD DETAIL 440-2 (MODIFIED, THIS SHEET). NO "INSERTA TEE" TYPE LATERAL CONNECTIONS ARE ALLOWED FOR SEWER BUILDING CONNECTIONS.
- ALL SEWER BUILDING CONNECTIONS SHALL BE TYPICALLY 10' OFFSET FROM THE PROPERTY CORNER UNLESS NOTED OTHERWISE.
- ALL APPURTENANCES LOCATED ON PRIVATE PROPERTY REQUIRED TO BE REMOVED FOR CONSTRUCTION SHALL BE REPLACED TO THEIR PRIOR CONDITION.
- THE CONSTRUCTION PROJECT OWNER/CONTRACTOR SHALL OBTAIN PERMITS AS REQUIRED, WITH THE EXCEPTION OF PERMITS NECESSARY FOR BLASTING.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY CONSTRUCTION STAKING TO CONSTRUCT THIS PROJECT AND THE ACCURACY THEREOF. THE ENGINEER WILL PROVIDE SURVEY CONTROL POINTS
- THE CONTRACTOR SHALL NOTIFY THE ENGINEER 48 HOURS (TWO WORKING DAYS) IN ADVANCE OF STAKING. THE CONTRACTOR SHALL NOTIFY THE GVW THAT CONSTRUCTION IS COMMENCING AT A MINIMUM OF TWO WORKING DAYS PRIOR TO CONSTRUCTION START.
- ONE SET FULL SIZE SET OF "RECORD DRAWINGS" IN A .PDF FILE FORMAT, MIN. 400 DPI, FOR THE GRAVITY SEWER IMPROVEMENTS SHALL BE SUBMITTED TO GREEN VALLEY WATER BEFORE THEIR FINAL ACCEPTANCE.
- ALL SEWER MAINS SHALL HAVE MINIMUM COVER OF 3.0 FEET OVER THE TOP OF THE PIPE.
- TRAFFIC CONTROL WILL BE ESTABLISHED FOR ALL CONSTRUCTION WITHIN PUBLIC RIGHTS-OF-WAY USING THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST REVISED EDITION, AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CLEAN THE MANHOLE INSIDE SUBSEQUENT TO ALL ADJUSTMENTS AND, IF THE MANHOLE IS NOT IN THE PAVEMENT, THE AREA AROUND THE MANHOLE SHALL BE CLEANED AND GRADED SO THAT NO STORM WATER WILL ENTER THE MANHOLE.
- ALL SEWER LINES SHALL BE SECURELY CLOSED TO PREVENT INFILTRATION DURING CONSTRUCTION. A MECHANICAL PLUG SHALL BE INSTALLED AT THE CONNECTION POINT TO THE EXISTING GREEN VALLEY WATER COLLECTION SYSTEM TO PREVENT ANY FLOW FROM ENTERING THE EXISTING COLLECTION SYSTEM UNTIL ACCEPTANCE OF THE NEW SYSTEM BY GREEN VALLEY WATER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF REMOVAL OF ANY DIRT AND DEBRIS THAT MAY ENTER THE EXISTING COLLECTION SYSTEM BEFORE ACCEPTANCE OF THE NEW COLLECTION SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TREATMENT COSTS ASSOCIATED WITH ANY FLOWS ENTERING THE EXISTING COLLECTION SYSTEM BEFORE ACCEPTANCE OF THE NEW COLLECTION SYSTEM.



STANDARD CLEANOUT-MANHOLE

INTERNAL DROP MANHOLE CONNECTION



**Gravity Sewer Standard Details and Specifications**

