

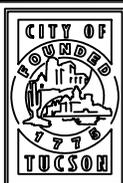
# SANITARY SEWER DETAIL INDEX

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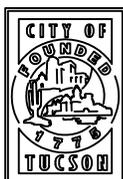
\*DENOTES DETAIL NO LONGER ACCEPTED FOR NEW CONSTRUCTION

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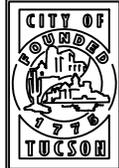
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## GUIDELINES FOR VARIANCES

THE DIRECTOR OF THE WASTEWATER MANAGEMENT DEPARTMENT AND HIS DESIGNATED REPRESENTATIVES MAY ALLOW VARIANCES TO THE DESIGN STANDARDS AND STANDARD DETAILS WHEN STRICT ADHERENCE WOULD LESS ADEQUATELY PROVIDE FOR THE DEVELOPMENT, MAINTENANCE, EFFICIENCY, AND EFFECTIVENESS OF PUBLIC SANITARY SEWERAGE FACILITIES. THE VARIANCE SHALL ENSURE THE OBJECTIVES OF THE DESIGN STANDARD OR STANDARD DETAIL TO WHICH THE VARIANCE IS GRANTED ARE SUBSTANTIALLY MET.

VARIANCES MAY BE ALLOWED WHEN:

- \* DESIGN SLOPES LESS THAN THE MINIMUM STANDARD WOULD ELIMINATE THE NEED FOR A PUMP STATION;
- \* A SUBSTITUTION FOR A CHANGE IN STANDARD MATERIAL RESULTS IN THE USE OF A MATERIAL WHICH CAN BE CLEARLY DEMONSTRATED TO BE EQUAL TO OR OF SUPERIOR QUALITY;
- \* A STRICT ADHERENCE TO A DESIGN STANDARD OR STANDARD DETAIL WOULD BE IMPRACTICAL OR IMPOSSIBLE BECAUSE OF FIELD CONDITIONS SUCH AS EXISTING UTILITY FACILITIES OR INCOMPATIBLE EXISTING SEWERAGE FACILITIES; OR
- \* AN EMERGENCY SITUATION PROHIBITS STRICT ADHERENCE TO A DESIGN STANDARD OR STANDARD DETAIL.

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# DESIGN CONSIDERATIONS FOR PUBLIC WASTEWATER PUMPING SYSTEMS

1. GENERAL COMMENTS – CONTACT THE ENGINEERING STAFF AT THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT FOR A RECENT EXAMPLE OF PLANS AND SPECIFICATIONS OF WASTEWATER PUMP STATIONS THAT WOULD BE APPROPRIATE FOR YOUR PARTICULAR PROJECT. PLANS AND SPECIFICATIONS FOR YOUR PARTICULAR PROJECT WOULD THEN NEED TO BE DEVELOPED TO REFLECT SITE SPECIFIC CONDITIONS. SOME GENERAL ITEMS THAT SHOULD BE CONSIDERED IN THE DESIGN OF ALL WASTEWATER PUMPING SYSTEMS ARE LISTED BELOW. PLEASE NOTE THAT THIS LIST IS LIMITED IN SCOPE AND THAT MORE ITEMS WILL NEED TO BE ADDRESSED DURING THE DESIGN PROCESS. REFERENCE SHOULD ALSO BE MADE TO THE DESIGN STANDARDS SECTION OF THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT’S MANUAL OF ENGINEERING STANDARDS AND PROCEDURES. MORE INFORMATION IS GIVEN IN THAT SECTION ABOUT WASTEWATER PUMPING SYSTEM REQUIREMENTS AND DESIGN CONSIDERATIONS.
2. DESIGN REPORT – ONE SHOULD BE DONE FOR ALL PUMP STATIONS. A SAMPLE REPORT WILL BE PROVIDED IF NEEDED.
3. ELECTRICAL ISSUES – ELECTRICAL PLANS AND SPECIFICATIONS SHOULD BE PREPARED FOR THE WASTEWATER PUMP STATION.
4. WET WELL SIZE – MAKE SURE THE MINIMUM PUMP RUNNING TIME IS MET AND THE PUMP CYCLE TIME IS ADEQUATE.
5. TOTAL DYNAMIC HEAD – INCLUDE STATIC HEAD FROM THE LOW WATER LEVEL, FRICTION LOSS IN PIPE AND FITTINGS, AND ELEVATION OF DISCHARGE POINT.
6. BACKUP POWER – A BACKUP GENERATOR SHOULD BE PROVIDED.
7. ODOR CONTROL – SOME METHOD TO PREVENT HYDROGEN SULFIDE GENERATION AND TO CONTROL ODOR MUST BE INCLUDED IN THE DESIGN. AERATION OR CHEMICAL INJECTION ARE TWO COMMON METHODS THAT HAVE BEEN USED IN THE PAST.
  - A. AERATION – IF THIS METHOD OF HYDROGEN SULFIDE PREVENTION IS CHOSEN, CALCULATIONS SHOULD BE INCLUDED IN THE DESIGN REPORT SHOWING THE SIZE OF COMPRESSOR NEEDED.
    - i. PROVIDE SPECIFICATIONS ON THE AERATION CABINET. MAKE SURE THE CABINET HAS SOUND ATTENUATION AND HEAT VENTING.
    - ii. A SPARE COMPRESSOR MUST BE PROVIDED FOR EACH SIZE OF COMPRESSOR.
    - iii. MAKE SURE THAT THE PROPER FLOW METERING AND VALVING SETUP IS PROVIDED.
    - iv. THE TOP OF THE AIR DIFFUSER IN THE WET WELL SHOULD BE LOCATED ABOUT TWO (2) INCHES (50 mm) BELOW THE LOW WATER LEVEL. DO NOT ALLOW THE AIR DIFFUSER TO BE PLACED ON THE FLOOR OF THE WET WELL.

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B. CHEMICAL INJECTION – IF THIS METHOD IS CHOSEN, CALCULATIONS SHOULD BE INCLUDED IN THE DESIGN REPORT SHOWING THE AMOUNT OF CHEMICALS NEEDED AND THE ASSOCIATED COST OF OPERATION AND MAINTENANCE. OTHER ISSUES TO CONSIDER ARE LISTED BELOW:

- i. HOW HAZARDOUS IS THE CHEMICAL TO WORK WITH?
- ii. WHAT IS THE CAPITAL COST OF THE EQUIPMENT?
- iii. WHAT REFERENCES HAVE YOU CHECKED OUT TO CONFIRM THAT IT HAS BEEN SUCCESSFULLY USED IN OTHER SIMILAR SITUATIONS?

8. EMERGENCY CELLULAR TELEPHONE – EQUIPMENT MUST BE ABLE TO RELAY OVERFLOW ALARMS AND FLOW VALUES FROM THE FLOW METER.

9. BUOYANCY – THE WET WELL AND VALVE CHAMBER SHOULD BE DESIGNED TO RESIST IT. THERE SHOULD BE AN EXTENSION OF THE BASE SLAB BEYOND THE WALL OF THE WET WELL OR THE VALVE CHAMBER FOR A GIVEN DISTANCE. THIS CAN VARY SOMEWHAT DEPENDING UPON THE CHAMBER DIMENSIONS.

10. DIFFERENCE IN ELEVATION BETWEEN INFLUENT LINE'S INVERT ELEVATION AND THE ELEVATION OF THE FLOOR OF THE WET WELL – THIS VALUE IS NORMALLY 5.5 FEET (1.7 m) BUT CAN BE ADJUSTED AS NEEDED TO PREVENT BACKWATER PONDING IN THE INFLUENT LINE.

11. VALVES – RESILIENT WEDGE GATE VALVES ARE GENERALLY USED.

12. PUMPS – MAKE SURE THAT AS ACCEPTABLE QUALITY PUMP IS SPECIFIED AND THAT REPAIR SERVICES ARE AVAILABLE IN TUCSON.

A. MAKE SURE A SPARE PUMP IS PROVIDED AND DELIVERED TO PIMA COUNTY WASTEWATER MANAGEMENT. THIS PUMP WILL BE USED WHEN IT IS NECESSARY TO REPLACE A PUMP THAT MUST BE REMOVED FROM THE WET WELL FOR REPAIRS.

B. AVOID SMALL IMPELLER THRULETS TO MINIMIZE CLOGGING.

13. FLOW METER – THE FLOW METER SHOULD BE A MAG METER WITH A SPECIAL INTERIOR ABRASION RESISTANT LINING THAT CAN BE SUBMERGED BELOW SEVERAL FEET OF WATER AND CONTINUE FUNCTIONING PROPERLY. MAKE SURE THAT IF AIR IS INJECTED INTO THE PRESSURE SEWER THAT IT DOES NOT TRAVEL THROUGH THE MAG METER. IT WILL CAUSE ERRONEOUS READINGS.

14. SAFETY ISSUES – IN GENERAL, MAKE SURE THAT THE DESIGN PLANS AND SPECIFICATIONS MEET CURRENT OSHA REQUIREMENTS. THIS WOULD INCLUDE SUCH THINGS AS NOTED BELOW.

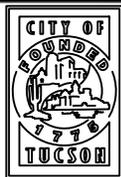
A. INSTALLATION OF SAFETY RAILING AND CHAINS AROUND HINGED DOORS.

B. ACCESSIBILITY TO THE WET WELL AND THE VALVE CHAMBER.

C. EASE OF CONFINED SPACE ENTRIES.

D. NEED OF EXPLOSION-PROOF ELECTRICAL APPURTENANCES.

E. ADEQUATE SPACE FOR TRIPOD USE AROUND WET WELL AND VALVE CHAMBER ENTRY LOCATIONS.

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15. PRESSURE SEWER –

A. DETERMINE WHICH MATERIAL SHOULD BE USED.

AVOID SAGS THAT WILL ALLOW SOLIDS TO SETTLE OUT AND GENERATE HYDROGEN SULFIDE.

B. IF YOU DO HAVE A SAG, MAKE SURE THAT THERE IS A CLOSURE VALVE ON THE DOWNSTREAM END TO KEEP THE PRESSURE SEWER FULL AND ALLOW FLUSHING TO OCCUR.

C. THE PRESSURE SEWER SHOULD HAVE STATION AND ELEVATIONS SHOWN TO MAKE SURE THAT IT GETS BUILT TO LINE AND GRADE AND DOES NOT JUST FOLLOW THE NATURAL GROUND PROFILE.

D. SHARP BENDS (90 DEGREES) SHALL BE AVOIDED UNLESS OTHERWISE APPROVED BY PIMA COUNTY WASTEWATER MANAGEMENT.

E. MAKE SURE THAT THE PRESSURE SEWER ENTERS THE DISCHARGE MANHOLE IN SUCH A MANNER THAT A SMOOTH TRANSITION OF FLOW FROM THE PRESSURE FLOW MODE TO THE GRAVITY FLOW MODE IS ACHIEVED. THIS WILL HELP TO MINIMIZE ODOR AND CORROSION PROBLEMS.

F. TRACER WIRE AND TEST STATIONS SHALL BE INSTALLED TO AID IN LOCATING THE PRESSURE SEWER BOTH HORIZONTALLY AND VERTICALLY. PRESSURE SEWER MONUMENTS SHALL BE LOCATED AT ALL POINTS WHERE THERE IS A CHANGE IN HORIZONTAL DIRECTION.

16. DUCTILE IRON PIPE (DIP)

A. ALL DUCTILE IRON PIPE, FITTINGS AND METAL COUPLINGS SHALL HAVE BOTH A POLYETHYLENE INTERIOR LINING AND POLYETHYLENE EXTERIOR WRAPPING OR APPROVED EQUALS.

B. SAND BEDDING SHOULD BE USED FOR ALL DUCTILE IRON PIPE THAT HAS THE LOOSE POLYETHYLENE WRAP.

17. VELOCITY THROUGH PRESSURE SEWER – ARIZONA ADMINISTRATIVE CODE R18-9-E301.D.4.a. CALLS FOR 3 TO 7 FPS. (0.9 to 2.1 m/sec) WE RECOMMEND THAT A MINIMUM OF 4 FPS (1.2 m/sec) BE USED.

18. RESTRAINED JOINTS – THE APPROPRIATE LENGTH OF RESTRAINED JOINT PIPE SHOULD BE PROVIDED AT ALL HORIZONTAL AND VERTICAL CHANGES IN PIPE DIRECTION TO RESIST THE RESULTING THRUST FORCES.

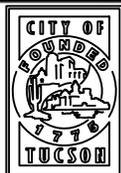
19. PRESSURE SEWER LOCATION MONUMENTS – LOCATE AT ALL POINTS WHERE THERE IS A CHANGE IN HORIZONTAL DIRECTION.

20. AIR RELEASE/VACUUM RELIEF (AR/VR) VALVES – MAKE SURE THAT A COMBINATION AIR RELEASE/VACUUM RELIEF VALVE IS PLACED AT ALL HIGH POINTS WHERE AIR WOULD ACCUMULATE.

A. THE AIR DISCHARGE AND AIR INTAKE DIAMETERS MUST BE SPECIFIED. ONLY BALL VALVES SHOULD BE USED ON THE AIR RELEASE/VACUUM RELIEF VALVES. GATE VALVES ARE NOT ACCEPTABLE.

B. LOCATE THE AR/VR VALVES ABOVE GROUND IN A VANDAL-SECURE, MAINTENANCE-ACCESSIBLE ENCLOSURE. ALLOW ADEQUATE SPACE FOR ENTRIES AND MAINTENANCE.

C. CALL FOR THE FLUSHING HOSE ACCESSORY.

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21. WATER HAMMER – CHECK FOR CONDITIONS WHICH MAY CAUSE WATER HAMMER TO OCCUR. IN PARTICULAR, MAKE SURE THE PRESSURE SEWER CAN HANDLE BOTH THE OPERATING PRESSURE AND THE PRESSURE FROM THE WATER HAMMER.
22. DISCHARGE MANHOLE – THE DISCHARGE MANHOLE SHOULD BE LINED.
  - A. USE T-LOCK LINING IF IT IS A NEW MANHOLE. USE A COATING THAT IS APPROVED BY THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT (PCWMD) IF IT IS AN EXISTING OR NEW MANHOLE. INCLUDE APPROPRIATE NOTES AS NEEDED.
  - B. INCLUDE A REFERENCE TO STANDARD DETAIL WWM 505 WHICH SHOWS HOW A PRESSURE SEWER IS CONNECTED TO A DISCHARGE MANHOLE.
23. GRIT MANHOLE – INCLUDE A GRIT MANHOLE UPSTREAM OF THE GRAVITY SEWER TO CATCH SAND AND GRAVEL IF POSSIBLE. YOU MAY NEED TO PROVIDE SOME AERATION TO THIS MANHOLE IF YOU HAVE VERY LOW FLOWS.
24. EROSION & LONG TERM DEGRADATION – CHECK FOR SCOUR, EROSION AND LONG TERM DEGRADATION IF THE PRESSURE SEWER CROSSES ANY DRAINAGE WAYS OR WASHES.
25. UTILITIES – CHECK FOR CONFLICTS WITH OTHER UTILITIES, PARTICULARLY POTABLE WATER LINES AND WELLS.

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## DESIGN & CONSTRUCTION GUIDELINES FOR PUBLIC GRAVITY OR PRESSURE SEWERS

### 1. LOCATION

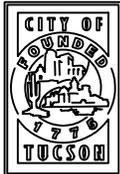
- a. ALL NEW GRAVITY AND PRESSURE SEWERS SHALL BE DESIGNED AND LOCATED SO AS TO BE POSITIONED WITHIN THE PAVED PORTIONS OF NEW ROADS AND STREETS TO THE MAXIMUM EXTENT POSSIBLE. REQUESTS TO DEVIATE FROM THIS GUIDELINE MAY BE APPROVED ON A CASE-BY-CASE BASIS, BY PIMA COUNTY WASTEWATER MANAGEMENT IF NO OTHER FEASIBLE ALTERNATIVE EXISTS. THIS GUIDELINE SHALL BE FOLLOWED EVEN IN THE CASE WHERE ADJACENT LOTS MAY BE REQUIRED TO UTILIZE PRIVATE, ON-SITE MECHANICAL WASTEWATER PUMPING SYSTEMS TO ACHIEVE PHYSICAL CONNECTION TO THE PUBLIC GRAVITY SANITARY SEWER LOCATED BENEATH A STREET SURFACE.
  
- b. THE LOCATION OF SEWERS IN THE FOLLOWING AREAS/CIRCUMSTANCES SHALL BE AVOIDED UNLESS SPECIFIC APPROVAL IS OBTAINED FROM PIMA COUNTY WASTEWATER MANAGEMENT ON CASE-BY-CASE BASIS:
  - 1) ACROSS, THROUGH, AND BETWEEN LOTS
  - 2) WITHIN OR ALONG A WASH OR WASH ENVIRONMENT
  - 3) CROSSING A WASH OUTSIDE OF A ROAD RIGHT OF WAY
  - 4) WITHIN A COMMON AREA
  - 5) WITHIN EASEMENTS AREAS UNDISTURBED BY DEVELOPMENT

### 2. ACCESSIBILITY

- a. IF APPROVAL IS GRANTED FOR A GRAVITY SEWER TO BE LOCATED OUTSIDE THE PAVED PORTION OF A ROAD, STREET OR ALLEY, A STABILIZED DRIVING SURFACE (PREFERABLY CENTERED ALONG/ATOP THE PROPOSED SEWER) SHALL BE PROVIDED. THE DRIVING SURFACE SHALL BE 16' (4.5 m) WIDE AND A PORTLAND CEMENT OR LIME STABILIZED ABC SURFACE OR APPROVED (100 MINIMUM OF 4" mm) EQUAL.

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- b. MAINTENANCE VEHICLE ACCESS TO SEWER MANHOLES AND CLEANOUTS SHALL BE UNRESTRICTED. SANITARY SEWER EASEMENTS SHALL HAVE A MINIMUM 20' (6 m) VERTICAL CLEARANCE FOR THE FULL WIDTH OF THE EASEMENT FROM VEGETATION OR STRUCTURES THAT ARE OBSTACLES TO TRAVEL. ANY BENDS IN THE EASEMENT SHALL HAVE A MINIMUM 55' (17 m) OUTSIDE RADIUS AND A MINIMUM 35' (11 m) INSIDE RADIUS. THE WIDTH OF THE EASEMENT WHERE A BEND OCCURS MUST BE AT LEAST 20' (6 m) WIDE. DEAD ENDS REQUIRE A RIGHT ANGLE TURN AROUND (SEE STANDARD DETAIL WM 210). ABRUPT CHANGES IN VERTICAL GRADE (INCLUDING VERTICAL CURB) SHALL BE AVOIDED. A RELATIVELY LEVEL 6' (1.8 m) DIAMETER AREA SHALL BE PROVIDED AROUND A MANHOLE TO ALLOW WORKING ROOM FOR SETUP OF A TRIPOD AND RELATED SAFETY EQUIPMENT WHEN MANHOLE ENTRY IS REQUIRED. MANHOLES LOCATED IN UNPAVED AREAS SHALL HAVE A PROTECTIVE CONCRETE COLLAR, MEETING THE REQUIREMENTS OF STANDARD DETAIL WM 212, PLACED AROUND THEM. A 20' (6 m) DIAMETER UNRESTRICTED (NO LANDSCAPING) AND GENERALLY LEVEL AREA SHALL BE PROVIDED AROUND A MANHOLE OR CLEANOUT TO ALLOW MANEUVERING ROOM FOR MAINTENANCE VEHICLES. ANY PAVING WITHIN THIS ACCESS AREA MUST BE SUFFICIENT TO SUPPORT COMMERCIAL VEHICLES (H2O LOADING).
- c. THE WIDTH OF SEWER EASEMENT SHALL BE THE GREATER OF EITHER 20' (6 m) OR TWICE THE DEPTH OF THE SEWER MEASURED FROM TOP OF MANHOLE TO ITS INVERT ROUNDED TO THE NEAREST FIVE FEET (1 m).
- d. NO STRUCTURES OR OTHER IMPEDIMENTS; INCLUDING GAZEBOS, WATER FOUNTAINS, SCULPTURES, ETC.; THAT WILL PREVENT OR INHIBIT VEHICULAR ACCESS SHALL BE ALLOWED ANYWHERE WITHIN THE LIMITS OF THE SEWER EASEMENT. STEEP SURFACES, GRADES OR ABRUPT CHANGES SUCH AS VERTICAL CURBS OR RETAINING WALLS SHALL NOT BE PERMITTED. SURFACE TREATMENTS COMPRISED OF SHARP ROCK THAT COULD DAMAGE TIRES, LOOSE MATERIAL THAT COULD BE THROWN UP AND DAMAGE A VEHICLE OR INJURE SOMEONE STANDING NEARBY, SLOPE CONTROL VEGETATIVE GROUND COVER THAT COULD CAUSE VEHICLE TIRES TO LOSE TRACTION, OR SOFT SAND/SOIL THAT COULD CAUSE A MAINTENANCE VEHICLE TO BECOME STUCK ARE NOT ACCEPTABLE. TREES OR LARGE CACTI THAT WOULD REQUIRE TIME TO PHYSICALLY REMOVE BEFORE A MAINTENANCE VEHICLE COULD PROCEED ARE PROHIBITED. SMALL SHRUBS AND GROUND COVER ON FLAT SURFACE AREAS THAT CAN BE DRIVEN OVER OR THROUGH ARE ACCEPTABLE PROVIDED THEY DO NOT CONTAIN SPIKES OR THORNS THAT CAN DAMAGE TIRES OR INJURE PEOPLE.
- e. VERTICAL CLEARANCE OF 20' (6 m) MINIMUM SHALL BE MAINTAINED AT ALL TIMES WITHIN THE FULL WIDTH OF THE EASEMENT. THIS INCLUDES THE VERTICAL CLEARANCE TO ANY OVERHEAD WIRES AND BUILDING ROOF OVERHANGS. TREES OR OTHER VEGETATION PLANTED ADJACENT TO THE EASEMENT MUST NOT BE ALLOWED TO ENCROACH ON THE EASEMENT. PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT (PCWMD) PERSONNEL SHALL HAVE THE AUTHORITY TO CUT BACK OR REMOVE ANY OFFENDING VEGETATION.

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- f. WALLS THAT CROSS THE SEWER EASEMENT MUST HAVE EASEMENT WIDTH GATES WITH A 20'(6 m) VERTICAL CLEARANCE AND SHALL HAVE A LOCKING SYSTEM THAT INCLUDES A PCWMD PADLOCK. THE PROPERTY OWNER SHALL MAINTAIN THE GATES SO THAT THEY ARE FULLY OPERABLE AT ALL TIMES. THE GATES AND THE EASEMENT MUST BE FULLY ACCESSIBLE TO PCWMD PERSONNEL, HEAVY SANITARY SEWER MAINTENANCE VEHICLES AND CONSTRUCTION EQUIPMENT 24 HOURS PER DAY 7 DAYS PER WEEK.
- g. PIMA COUNTY OR THEIR CONTRACTOR HAS THE RIGHT TO INSTALL ANYWHERE WITHIN THE EASEMENT AREA TEMPORARY OR PERMANENT UNDERGROUND OR ABOVE GROUND FACILITIES THAT MAY BE REQUIRED TO MONITOR, OPERATE, MAINTAIN, REPAIR OR REPLACE THE PUBLIC SANITARY SEWER SYSTEM, OR UNDER EMERGENCY CONDITIONS, PUMP OR OTHERWISE CONVEY SANITARY SEWAGE.
- h. PCWMD ASSUMES NO LIABILITY FOR DAMAGE TO OR REMOVAL OF ANY VEGETATION, ABOVE GROUND OR BELOW GROUND FACILITIES, SURFACE TREATMENTS, MATERIALS, EQUIPMENT, OR STRUCTURES PLACED WITHIN THE EASEMENT OR WITHIN 20'(6 m) ABOVE THE SURFACE OF THE EASEMENT BY ANYONE OTHER THAN PIMA COUNTY OR THEIR CONTRACTOR.
- i. THE PROPERTY OWNER SHALL BE LIABLE FOR INJURY TO PERSONNEL AND/OR DAMAGE TO MAINTENANCE VEHICLES OR CONSTRUCTION EQUIPMENT THAT RESULTS FROM CONTACT WITH ANY PROHIBITED ENCROACHMENTS ANYWHERE WITHIN THE FULL WIDTH OF THE PUBLIC SANITARY SEWER EASEMENT OR WITHIN 20'(6 m) ABOVE THE SURFACE OF THE EASEMENT, OR FROM ANY ACTIONS NECESSARY TO REMOVE SUCH ENCROACHMENTS FROM THE EASEMENT. LIABILITY FOR INJURY OR DAMAGE INCLUDES PERSONNEL AND EQUIPMENT OF PIMA COUNTY AND THEIR CONTRACTORS.
- j. PIMA COUNTY WILL ENDEAVOR TO PROVIDE ADVANCE NOTICE TO THE PROPERTY OWNER OF THE NEED TO UTILIZE/ACCESS THE EASEMENT OR THE SEWER. HOWEVER, THE COUNTY HAS NO OBLIGATION TO PROVIDE SUCH ADVANCE NOTICE AND SHALL NOT PROVIDE NOTICE UNDER EMERGENCY CONDITIONS.
- k. TEMPORARY STORAGE OF VEHICLES, EQUIPMENT, OR MATERIALS BY THE PROPERTY OWNER IS NOT ALLOWED WITHIN THE EASEMENT WITHOUT THE PRIOR WRITTEN PERMISSION OF PCWMD.

3. ABANDONMENT OF EXISTING SEWERS AND MANHOLES:

- a. EXISTING SEWER PIPE OR MANHOLES THAT ARE TO BE ABANDONED SHALL BE CLEARLY DENOTED ON THE PLANS. WHEREVER POSSIBLE, THE REACHES OF SEWER THAT ARE TO BE ABANDONED SHALL BE REMOVED COMPLETELY. IF A REACH OF SEWER IS TO BE ABANDONED IN PLACE, IT SHALL BE FILLED WITH GROUT. ALL SEWER LINES AND ALL MANHOLES THAT ARE ABANDONED IN PLACE SHALL BE MARKED WITH AN ABANDONMENT MARKER IN ACCORDANCE WITH STANDARD DETAIL WM 508. THIS ABANDONMENT MARKER SHALL ALSO BE PLACED AT ALL HORIZONTAL ANGLE POINTS ON ALL ABANDONED PRESSURE SEWER LINES.

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- c. MANHOLES THAT ARE TO BE ABANDONED SHALL BE DEMOLISHED TO AT LEAST 3'(910mm) BELOW FINISHED GRADE. THE MANHOLE FRAME AND COVER SHALL BE SALVAGED AND DELIVERED TO THE FIELD OPERATIONS DIVISION OFFICE AT 3390 N. RICHEY BLVD. CONTACT THE FIELD OPERATIONS DIVISION (326-4333) TO ARRANGE FOR AND COORDINATE THE DELIVERY OF SALVAGED ITEMS.
- d. DEBRIS THAT IS GENERATED BY THE REMOVAL OF EXISTING SEWER LINES OR MANHOLES SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR AND DISPOSED OF AT THE APPROPRIATE PIMA COUNTY SOLID WASTE FACILITY. DISTURBED AREAS SHALL BE BACKFILLED WITH SELECT MATERIAL AND COMPACTED IN ACCORDANCE WITH THE STANDARDS SET BY THE AGENCY CONTROLLING THE RIGHT-OF-WAY BUT IN ALL CASES A MINIMUM OF 95% OF THE STANDARD PROCTOR DENSITY IN ACCORDANCE WITH THE PROVISIONS OF ASTM D 698.

4. MANHOLES AND CLEANOUTS:

- a. THE FRAME AND COVER OF EVERY EXISTING PUBLIC SANITARY SEWER MANHOLE AND CLEANOUT THAT WILL REMAIN IN SERVICE SHALL BE ADJUSTED TO MATCH THE NEW FINISHED GRADE. PER STANDARD DETAIL WM 304, 305 AND 306, IT MAY BE NECESSARY TO RECONSTRUCT THE MANHOLE CONE OR RISER SECTION WHEN THE MANHOLE IS ADJUSTED TO GRADE. PCWMD ALSO MAY REQUIRE THAT THE MANHOLE FRAME AND COVER BE REPLACED IF THE AGE, CONDITION, OR TYPE OF THE EXISTING FRAME AND COVER WARRANTS SUCH REPLACEMENT.
- b. MANHOLES AND CLEANOUTS THAT ARE LOCATED IN AREAS SUBJECT TO STORMWATER RUNOFF SHALL HAVE WATERPROOF FRAMES AND COVERS (AS SHOWN IN STANDARD DETAIL WM 213.0 - 214.3). WATERPROOF FRAMES AND COVERS MAY ALSO BE INSTALLED ON MANHOLES IN PEDESTRIAN AREAS TO REDUCE THE POTENTIAL FOR ODOR COMPLAINTS IF SUCH PLACEMENT DOES NOT ADVERSELY IMPACT AIR EXCHANGE WITHIN THE SEWER. A MANHOLE VENT ASSEMBLY (AS SHOWN IN STANDARD DETAIL WM 221) MAY ALSO BE REQUIRED.
- c. IF THE MANHOLE IS IN AN UNPAVED AREA, A PROTECTIVE CONCRETE COLLAR SHALL BE PLACED AROUND THE MANHOLE AS SHOWN IN STANDARD DETAIL WM 212. A SEWER LINE MARKER SHALL ALSO BE INSTALLED PER STANDARD DETAIL WM 224 AT THE DISCRETION OF PCWMD.
- d. PER STANDARD DETAIL WM 307, THE CONTRACTOR IS REQUIRED TO COVER THE BENCH DURING THE ADJUSTMENT PROCESS IN ORDER TO PREVENT DEBRIS FROM ENTERING THE SEWAGE FLOW.
- e. CONTACT THE PCWMD MAPS AND RECORDS SECTION AT 740-6602 TO ARRANGE FOR A PERMIT TO ADJUST AN EXISTING MANHOLE. THEN, CONTACT PCWMD FIELD ENGINEERING (740-2651) TO ARRANGE FOR AN INSPECTION OR TO GET ANSWERS FOR ANY QUESTIONS CONCERNING ADJUSTMENTS TO EXISTING MANHOLES.

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5. BACKWATER VALVES LOCATED IN MANHOLES FOR ODOR CONTROL:

- a. DUE TO THE POTENTIAL FOR TURBULENCE INDUCED OFF-GASSING IN LARGE SEWERS, WHENEVER A CONNECTION IS MADE TO AN 18 INCH (450 mm) DIAMETER OR LARGER SEWER, WHERE THE NEW PIPE IS 12 INCHES (300 mm) OR LESS IN DIAMETER, A BACKWATER VALVE SHALL BE INSTALLED ON THE NEW INCOMING LINE. ALSO, THE WALLS OF THE SEWER MANHOLE INTO WHICH THE NEW CONNECTION IS MADE MAY REQUIRE APPLICATION OF CORROSION PROTECTION COATING, AND A NEW WATERPROOF MANHOLE COVER MAY NEED TO BE INSTALLED. THE COATING AND BACKWATER VALVE REQUIREMENTS MAY BE OBTAINED FROM THE PCWMD ENGINEERING DESIGN SECTION, 201 N. STONE, 8TH FLOOR, 740-6500.

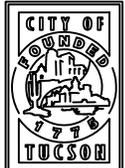
6. RECONSTRUCTION OF BRICK MANHOLES:

- a. WHEN RECONSTRUCTION OF AN EXISTING BRICK MANHOLE IS REQUIRED, REMOVE THE TAPERED SECTION OF EXISTING BRICK. IF BRICK OR MORTAR OF THE STRAIGHT (VERTICAL) WALL IS DETERIORATED, CONTINUE REMOVING WALL UNTIL SOLID MATERIAL IS REACHED. THE PCWMD INSPECTOR SHALL INSPECT THE EXISTING BRICK WALL PRIOR TO RECONSTRUCTION IN ORDER TO VERIFY THAT THE CONDITION IS SATISFACTORY. USE STANDARD PRECAST SECTIONS TO REBUILD THE MANHOLE TO GRADE. A LEVELING RING MAY NEED TO BE FORMED AND POURED BEFORE THE PRECAST SECTIONS CAN BE SET ON THE BRICK WALLS.

7. CLEARANCE BETWEEN WATER AND SEWER:

- a. Per Arizona Administrative Code Title 18, Chapter 4 (R18-4-502), new water lines must be at least 2 feet (610 mm) above existing gravity sanitary sewer lines and 6 feet (1.8 m) above pressure sanitary sewer lines, measured from outside of pipe to outside of pipe. When parallel, the horizontal separation must be at least 6 feet (1.8 m). If field conditions do not permit adherence to these standards, or the water line will be built below the sanitary sewer, the sanitary sewer must be replaced with ductile iron pipe or approved equal. Pima County/City of Tucson Standard Detail WM 108 shows the requirements. Please show the limits of the replacement or encasement in plan view.

Facilities that cross at less than 45° are considered parallel. Since the standards are outside of pipe to outside of pipe and dimensioning convention is centerline to centerline, the minimum horizontal separation must be dimensioned as 6'(1.8 m) plus 1/2 the outside diameter of each pipe.

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**8. LININGS OR COATINGS OF MANHOLES FOR CORROSION CONTROL:**

- a. All new public sanitary sewer manholes that will be installed as part of this project and all existing public sanitary sewer manholes that will be modified as part of this project that are located on public sanitary sewer lines 18”(450 mm) or larger in diameter or that are located on smaller tributary lines within 200’ (61 m) of an 18” (450 mm) or larger line shall have corrosion resistant linings or coatings. Contact the Design Section Manager (740-6500) for lining or coating specifications.

**9. Construction near manholes:**

Do not pile construction materials within 10’ (3.1 m) of a sanitary sewer manhole. The contractor must contact PCWMD’s Field Operations Division (Richey Yard, 326-4333) at least 48 hours in advance to request permission to temporarily block or restrict access to an active public sanitary sewer manhole. The contractor shall indicate the nature of the planned activity, and the type and length of time that access will be blocked or restricted.

**10. Reduction of cover over an existing sanitary sewer:**

- a. If the ground surface elevation over an existing public sanitary sewer is lowered enough to reduce the cover over the sewer pipe to less than 4’ (1.22 m) the involved reach of sewer, or portion thereof, it must be replaced with ductile iron pipe or approved equal. The lowest elevation attained during construction will govern, not the finished grade. This standard applies to reconstruction of streets, regrading of easements, excavations required for the installation of such things as box culverts, or wherever heavy construction or compaction equipment will be used directly over the sanitary sewer.

**11. Damage to existing facilities during construction:**

- a. Any damage to a PCWMD facility, including dropping debris down a manhole, must be reported immediately to either Field Engineering (740-2651) or Field Operations (326-4333). In the event that the damage occurs during non-business hours, contact the Pima County Sheriff’s Communications Center at 295-4595 or 791-4911 and request that a PCWMD representative be dispatched to the site.

**12. Ductile iron pipe, fittings and couplings requirements:**

- a. All ductile iron pipe, fittings and metal couplings which are not supported by piles shall be wrapped in 8 mil (200 μm) polyethylene sheeting as per ANSI/AWWA C105/A21.5.

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- b. The contractor shall supply a certification from the pipe manufacturer (or coating applicator if certain conditions are met) that states that the pipe and the lining meet the current Standards and Specifications of the Pima County Wastewater Management Department. The lining material shall be a hybrid novolac epoxy such as SP2000W, polyethylene, a combination of polyethylene and fusion bonded epoxy or another approved lining. The certification shall state specifically the following, with the name of the approved lining material inserted into the blank spaces:
- 1) All ductile iron pipe and fittings have an (name of lining material) interior lining of 40 mils (1.0  $\mu\text{m}$ ) (35 mils (890  $\mu\text{m}$ ) minimum) in the barrel area and 10 mils (250  $\mu\text{m}$ ) minimum on the exterior of the spigot end.
  - 2) Each piece of pipe and each fitting has been checked for holidays utilizing a testing voltage of 7500 volts with a dry conductive probe in the barrel area and a testing voltage of 67 1/2 volts with a wet sponge in both the bell area and the exterior of the spigot end and there are none.
  - 3) The (name of lining material) lining extends from the bottom of the gasket socket in the bell to a point on the exterior of the spigot end of the pipe where the next pipe gasket would overlap the lining.
  - 4) All (name of lining material) used meets the current Specifications set by Pima County Wastewater Management for this material.
  - 5) A maximum lining thickness of 15 mils(380  $\mu\text{m}$ ) has been applied to both the gasket seat groove in the bell area and the exterior of the spigot end.
- c. If the contractor makes a field cut of (name of lining material) lined pipe, he shall comply with the recommendations of the coating manufacturer in applying an (name of lining material) coating to the pipe end and in allowing proper drying time before pipe assembly. In all cases, as a minimum, a 10 mil (250  $\mu\text{m}$ ) coating of (name of lining material) shall be applied to the pipe end and shall overlap the original (name of lining material) lining by four inches (100 mm) and extend around the end of the pipe and along the outside of the pipe a minimum of ten inches (250 mm) and shall also be allowed to dry before pipe assembly. In addition, the overlapped surface of the existing (name of lining material) lining shall be roughed up to produce a 3 to 5 mil (75-130  $\mu\text{m}$ ) profile over the entire surface. The end result of this process is to secure proper adhesion for the new (name of lining material) coating. The (name of lining material) used shall meet the current specifications of Pima County Wastewater Management.

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- d. The following information as a minimum will be shown on the exterior of each piece of ductile iron pipe:
- 1) Name of lining applicator
  - 2) Name of lining
  - 3) Thickness of lining
  - 4) Date of lining application
  - 5) Class of ductile iron pipe
  - 6) Name of ductile iron pipe manufacturer
  - 7) Date of ductile iron pipe manufacture
  - 8) Lot # or Serial #
- e. All ductile iron pipe that is supplied shall not have any exterior coating unless called for on the construction plans, the construction specifications or as called for in the notes listed above (such as on the exterior 10 inches (250 mm) of the spigot end of the pipe).

13. HCS requirements:

- a. Since House Connection Sewers (HCS's) are not part of the public sanitary sewer system, they are not required to be Blue Staked. Any HCS encountered during construction shall be protected, repaired, or rerouted, as the situation dictates, at no expense to Pima County Wastewater Management or the property owner.
- b. Existing HCS's that will be reconnected into a 12" (300 mm) or larger pipe must be reconnected at a new or existing manhole per PC/COT SD WM 301. A backflow preventer will be required if the existing line is 18" (450 mm) or larger in diameter.

14. Drop manhole requirements:

- a. External drop inlets are not allowed due to maintenance concerns. Provide a steep segment of DIP with a special abrasion resistant hybrid novolac epoxy lining and the associated extra manhole. In certain circumstances such as an extremely deep manhole surrounded by numerous utilities, we may allow the use of an internal drop within a 5' (1.52 m) diameter or larger manhole. Contact the PCWM Design Section at 740-6500 for more information in regard to either of these options.

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15. Irrigation components location relative to manholes:

- a. Landscape irrigation system components that might be damaged if a heavy vehicle were to drive over them should not be placed in close proximity to a sanitary sewer manhole, nor within the area that the vehicle will traverse in order to access the manhole.

16. See PCWM detail on Sanitary Sewer Landscaping Guidelines for landscaping type and location restrictions.

17. Manhole and cleanout numbers:

- a. Maps are available from the Maps and Records Section that show the general location of the existing sanitary sewer facilities and a unique identification number. PCWMD has assigned this unique identification number to each existing public sanitary sewer manhole and cleanout, and has created an electronic attribute database for each pipe segment. It is required that the manhole and cleanout numbers be added to the plans for future cross-reference to the sanitary sewer database and the County's electronic basemaps. The existing manhole and cleanout numbers are shown on our sewer basemaps. More detailed information regarding these sewer base maps may be obtained from our Maps and Records Section, 5th floor, Public Works Building, 201 N. Stone (740-6602). In addition, the actual location of the sewers often varies from that stated on the plans which means that field verification will be required.

18. Manhole entry or access permit:

- a. If the contractor or consultant must enter or access a manhole, a no-cost Manhole Entry Permit must be obtained from PCWMD Maps & Records (5th Floor, 201 N. Stone) prior to making the entry or removing the manhole cover.

19. Construction permit requirements:

- a. A Project Construction Permit must be obtained from PCWMD at least 72 hours prior to commencing work that impacts an active public sanitary sewer. Application for a Project Construction Permit may be made at the Wastewater Maps and Records Counter, 5th Floor, 201 N. Stone. All applicable Wastewater inspection fees must be paid prior to issuance of the permit. Three sets of final approved plans must be submitted to PCWMD prior to issuance of the permit. Although most permits can be issued on the day of application, please allow two working days to process and issue the permit. A permit cannot be issued until the plans have been reviewed and approved, in writing, by the Department Director or his designated representative.

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20. Pole requirements:

Poles and pole footings shall not be located closer than 2 feet (610 mm) to the outside of a sanitary sewer pipe. If any sanitary sewer lines in a given area are located in close proximity to a proposed pole location, please provide a detail showing how you propose to mitigate any conflict with this standard.

21. Private sewers:

- a. The Uniform Plumbing Code authorizes the use of an abutting lot to construct a building sewer [House Connection Sewer (HCS)] provided that a legal easement has been established to the satisfaction of the municipality that administers the code. The Connection Fee Ordinance requires that Pima County Wastewater Management review and approve the location and method of connection to the public sanitary sewer system. The proposed method and location of connection could include the use of a private sanitary sewage collection system that serves more than one parcel. Please submit evidence that there is a properly approved and recorded easement. Also, PCWMD recommends, but does not require, that all parties that share use of the private sanitary sewage collection system enter into and record a joint use and maintenance agreement.

22. See the PCWM detail on Wastewater Flow Management Plan Guidelines for requirements on rerouting wastewater flows.

23. Damaged manhole or cleanout frames and covers:

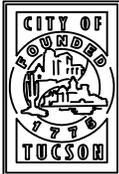
- a. The contractor shall notify PCWMD Field Engineering (740-2651) of any damaged or mismatched manhole or cleanout frames and covers. New frames and covers shall be installed and who pays for the replacements will vary depending upon the situation.

24. Safety:

- a. Job site safety is the sole and exclusive responsibility of the general contractor. The general contractor shall exercise complete control over who has access to the job site to assure job site safety. The general contractor's responsibility covers anyone who may have access to the site, including the general contractor's own work force, all subcontractors, vendors and suppliers, support personnel, government officials, and the general public.

25. Speed Bumps:

- a. Do not place speed bumps within 10 feet (3.0 m) of a sanitary sewer manhole or cleanout.

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26. Storm and sanitary sewer separation:

- a. Provide at least 2' (610 mm) of vertical separation between storm drainage facilities and public sanitary sewers. If it is not possible to meet this standard, the sanitary sewer either must be replaced with ductile iron pipe or approved equal. For drainage pipes that parallel the sanitary sewer, stay outside the normal trench areas as shown in PC/COT Standard Details WM 104 & 105. If the drainage pipe is placed below and parallel to the sanitary sewer, maintain at least 2' (610 mm) of horizontal separation. All dimensions are from outside of pipe to outside of pipe measured at the joint. Facilities should cross at no less than 45° whenever possible.

27. See PCWM detail on Sanitary Sewer Landscaping Guidelines for information on traffic circles.

28. City of Tucson water projects within county right-of-way:

- a. Under the provisions of the 1979 License Agreement and the 1982 Supplement, the County is obligated to pay 100% of the public sanitary sewer adjustment or relocation costs required by the above referenced project. Because of this, we may object to the design of the project. There may be alternatives that either will reduce or eliminate the need to adjust or relocate existing public sanitary sewer. Please provide evidence that alternatives were considered and a justification for electing the alternative of relocating the existing public sanitary sewer. If adjustment or relocation of public sanitary sewer cannot be avoided, PCWMD reserves the right to make the needed adjustments as authorized by Paragraph II.3 of the 1982 Supplement. Upon completion of the project design, please provide PCWMD with an itemized cost breakdown of the required adjustment or relocation work. PCWMD will review the cost breakdown and notify the City of its decision regarding who will perform the work.
  
- b. Permits will not be issued until these payment obligations are acknowledged.

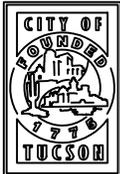
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29. City of Tucson non-water project in City of Tucson right-of-way:

- a. Under the provisions of the 1979 License Agreement and the 1982 Supplement, the County is obligated to pay 50% of the sewer adjustment or relocation costs, other than surface adjustments, required by the above referenced project. Because of this, we may object to the design of the project. There may be alternatives that could either reduce or eliminate the need to adjust or relocate existing public sanitary sewer. Please provide evidence that alternatives were considered and a justification for selecting the alternative of relocating the existing public sanitary sewer. If adjustment or relocation of public sanitary sewer cannot be avoided, PCWMD reserves the right to make the needed adjustments as authorized by Paragraph 11.3 of the 1982 Supplement. Upon completion of the project design, please provide PCWMD with an itemized cost breakdown of the required adjustment or relocation work. PCWMD will review the cost breakdown and notify the City of its decision regarding who will perform the work. Pavement replacement, and manhole and cleanout adjustments or reconstruction necessitated by changes in surface conditions are to be broken out separately since they are to be paid for 100 % by the City (Paragraph 11.4 of the 1982 Supplement).
- b. Permits will not be issued until these payment obligations are acknowledged.

30. As-built drawings will be required in accordance with Pima County Ordinance 2001-20 (or later versions) and current Arizona Department of Environmental Quality or Arizona Administrative Code rules.

31. Sewer line field verification. When a new manhole is being constructed over an existing sewer line, verification of the horizontal and vertical location is required by both the design consultant and the contractor before the manhole is built. Potholing or other PCWD approved method that actually exposes the pipe is required.

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## SANITARY SEWER LANDSCAPING GUIDELINES

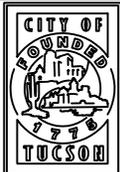
Both visual and physical vehicular access to public sanitary sewer manhole covers shall be a top priority. All planting and irrigation design shall take into consideration both viable visual and physical access from the closest travel lane to the manhole cover to provide for maintenance purposes. The landscape area between the manhole and the street shall be left open, providing a clear vehicle maintenance access lane width of not less than 16 feet (4.9 m). This lane shall not contain shrubs, trees, boulders, river rock or swales. Trees trunks must be at least 16 feet (4.9 m) from a manhole, and sufficiently distant so that the ultimate canopy will not overhang the access lane or overhang an area within 10 feet (3.0 m) of the manhole cover. The manhole elevation must be a minimum of 2 inches (50 mm) above the finished grade and shall under no circumstances be buried under landscaping or surface materials (decomposed granite, etc.).

In most cases, a wide (2' (600 mm)+/-) concrete collar will be present around the manhole frame and cover. If a concrete collar is not present, it will be added as part of the landscaping project.

All public sanitary sewer lines will be shown on all project plans, including landscaping plans. The intent of the planting plan shall be to keep all parts of trees a minimum of 10 feet (3.0 m) from the outside surfaces of the involved sewer lines. Where limited right-of-way or other setbacks are prohibitive, the following rules shall apply:

1. The depth of the sanitary sewer line shall be noted on the drawings at each manhole or cleanout. In areas where the sanitary sewer line is greater than 8 feet (2.4 m) deep, the Landscape Architect may select certain non-deep rooted trees to be placed within the 10-foot (3.0 m) to 16-foot (4.9 m) setback area, as shown on Detail WWM 111. However, prior written approval from Pima County Wastewater Management (PCWWMD) is required.
2. In areas where the sewer line is less than 8 feet (2.4 m) deep, no tree or deep-rooted shrub shall be placed within the 10-foot (3.0 m) to 16-foot (4.9 m) setback limits. In certain situations, the Landscape Architect may be able to use root barriers or other approved methods to locate deep-rooted trees within the 10-foot (3.0 m) to 16-foot (4.9 m) setback but only with prior written approval from the PCWWMD.
3. Contact PCWWMD for a list of the latest approved native shrubs and trees and their associated setbacks from a sanitary sewer.

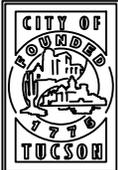
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Traffic circles are not recommended near or surrounding manholes. If a traffic circle is to be built around a manhole, the following requirements must be adhered to:

1. All posts, fencing, and other manmade physical impediments shall be easily and quickly removable by one person without the need for specialized or heavy equipment.
2. Curbing shall be mountable curb.
3. An area between the manhole and the street shall be left open, providing a straight drive-in vehicle maintenance access lane with a width of not less than 12 feet (3.6 m), with 16 feet (4.9 m) preferred. This access lane shall extend to the center of the manhole cover.
4. Deep rooted trees or other aggressive root vegetation shall be avoided. It will be necessary to provide complete (sides and bottom) root barriers for any plants that have the potential to develop root growth of a breadth and depth that will reach any portion of the sanitary sewer system. Landscaping should be limited to flowers, grasses, shrubs, and other small plants that can either be driven over or removed easily and quickly in the event that the sanitary sewer must be accessed with sanitary sewer maintenance vehicles, personnel and associated equipment or dug up and repaired.
5. No obstruction or vegetation shall be placed within a 3-foot (900 mm) radius of the center of the manhole cover opposite the access lane.
6. The area within a 3-foot (900 mm) radius of the center of the manhole shall be level asphalt, concrete, or brick pavement that can withstand heavy trucks. Loose material such as rock, gravel, or landscape pavers shall not be used in the access area. The alignment of the access strip(s) shall be chosen such that a large maintenance vehicle can be set up over the manhole without blocking the intersection. PCWMD shall be consulted on the alignment of the access strip(s) before finalizing the traffic circle design.
7. Vegetation shall be positioned such that its mature size shall not encroach on the access strip(s) or the area within a 3-foot (900 mm) radius of the center of the manhole cover.
8. Drainage shall be directed away from the manhole cover.

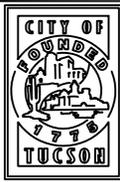
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A registered landscape architect shall stamp and sign a certification declaring that the project landscaping plan complies with the above standards and that all trees and plants included in the project will not develop root systems that will reach sewer structures within the project limits, nor will any vegetation, at planting or at maturity, interfere with viable visual and vehicular access to manholes. This certification shall appear on the landscaping plans cover sheet or the project plans cover sheet.

The Municipality having jurisdiction over the involved street/roadway shall be responsible for maintaining all plants and trees placed by the project to comply with the setback and access requirements at all times.

Pima County Wastewater Management reserves the right to take whatever action (cutting, trimming, removal, etc.) is deemed necessary to achieve viable visual and vehicular access to sewer structures. Repair and/or replacement of the disturbed landscaping, whether in medians or in traffic circles, shall be the responsibility of the Municipality having jurisdiction for the involved street/roadway.

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## WASTEWATER FLOW MANAGEMENT PLAN GUIDELINES

### 1. Wastewater Flow Management Specification:

The Contractor shall provide for the uninterrupted flow of wastewater around the section or sections of pipe designated to be affected by the construction work. For all projects, the Contractor shall prepare and submit to PCWMD three copies of his wastewater flow management plan, showing the treatment of each affected reach of sewer for approval prior to the notice to proceed.

Wastewater flow management plan submittals shall be made, a minimum of four weeks prior to construction, unless approved otherwise, to each of the following:

Design Engineering Manager  
Pima County Wastewater Management Department  
100 N. Stone Avenue, 4th Floor  
Tucson, Arizona 85701

Field Engineering Manager  
Pima County Wastewater Management Department  
1313 S. Mission Road  
Tucson, Arizona 85713

Operations Manager  
Pima County Wastewater Management Department  
Richey Operations Yard  
3390 N. Richey Boulevard  
Tucson, Arizona 85716

Wastewater flow management operations shall not be performed by the Contractor until receipt of written approval from PCWMD Field Engineering. (520-740-2651), PCWMD Field Operations (520-326-4333) and the affected treatment facility (i.e. Roger Road WWTF (520-888-4801) or Ina Road WPCF (520-744-4236)). Once approved, the contractor shall notify each of the above at least 48 hours prior to commencement of any flow management plan.

The Contractor shall, at his expense, obtain all permits necessary for the installation and operation of the wastewater flow management equipment. The Contractor must receive approval from PCWMD of his plan submittal for wastewater flow management operations prior to commencing construction work.

For wastewater flow management plans, gravity type designs are typically preferred over pumped type designs. However, the most appropriate type of wastewater flow management should be used for the project.

The flow management equipment shall be quiet running and shall be equipped with noise suppression apparatus, including, but not limited to: sound boards and engine mufflers. Contractor shall be required to meet the noise abatement requirements of the controlling municipality (usually City of Tucson).

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For gravity type wastewater flow management plans the following specifications apply:

- show influent & discharge points with elevations & stationing on the design plans
- survey, blue stake, and show the plan and profile on the design plans
- design sewer pipe plugs for expeditious removal during startup testing
- submit calculations to verify that the gravity flow management system will be able to handle the peak wastewater flows that are approved by PCWMD

For pumped type wastewater flow management plans the following specifications apply:

- show suction & discharge points with elevations & stationing on the design plans
- provide pump performance curves
- discharge manifolds are acceptable
- intake manifolds are not acceptable
- use separate intakes for each pump with debris control
- structural calculations are required for all aluminum pipe designs
- suction lines shall be steel reinforced pipe or better
- provide adequate intake line spacing (center to center) to avoid vortexing.
- provide high level alarm notification to pagers or cell phones
- provide redundant air release valves
- submit calculations to verify suction lift of pumps has not been exceeded
- provide multiple fuel tanks with 24 hours of fuel supply
- protect discharge piping from vandalism and vehicular damage
- butt-fused HDPE is the preferred material for the discharge piping
- submit calculations to verify that the pumping system will be able to handle the peak wastewater flows that are approved by PCWMD
- provide containment under each pump, valve, and manifold

The Contractor shall be responsible for insuring that there is no unauthorized discharge or spill of raw sewage as a result of the flow management operation. In the event of a sewage spill the Contractor shall notify the PCWMD Operations Division (520-326-4333), after 5:00pm, weekends, holidays (520-741-4911). In the event of any sewage spill the Contractor will be responsible for the prompt cleanup and disinfecting of the spill to the satisfaction of the PCWMD Operations Manager. In cases where the contractor is not in compliance with mitigation efforts, any assistance provided by PCWMD will be billed to the contractor. The Contractor shall compensate PCWMD for the cost of any fines levied as a result of a spill or unauthorized discharge. Prior to start of construction, the contractor must also prepare a sanitary sewer overflow (SSO) spill prevention plan, include it within his wastewater flow management plan submittal, and obtain plan acceptance from Pima County. The contractor shall provide an on-site disinfectant, meeting EPA and PCWMD specifications for SSO mitigation.

For information regarding measured sewage and storm flows in the subject sewer line, the contractor should contact the PCWMD Planning Services Manager, (520-740-6500). The Contractor is responsible for verifying this information and then providing a sufficient number of pumps to handle the normal peak flows with additional reserve capacity to handle wet weather flows and pump malfunctions.

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The Contractor shall provide backup pumps equal in number to 50% of the number of pumps being used and of the same discharge capacity. Any fractional number of pumps will be rounded up to the next higher whole number. Flow management pumps are to be manned by qualified and certified pump personnel 24 hours per day, no unattended operation will be permitted. The Contractor shall be responsible for the periodic inspection of the flow management pipelines and shall provide a written log documenting the time of each inspection.

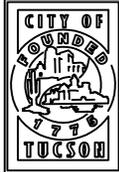
"Lay-flat" hoses may not be authorized at all locations. Where flow management pipelines cross existing paved residential roads, a ramp over the pipes will be constructed or other arrangements made to insure that local access is maintained to homes and businesses. A minimum of 12 inches of cover will be provided over the top of the flow management pipelines located in areas where vehicular traffic must cross over them. This requirement may be reduced if approved in writing by the Engineer, after the Contractor submits an acceptable cover design. The pipelines at the crossing shall be designed for an H-20 truck loading and have a slope that will permit large tractor trailer and fire apparatus to cross over the ramp safely.

2. Specification for Service Connections and Residential Notices:

The contractor shall notify the residents within the area of the proposed work using a form of "Official Notification." The notification shall be written in the two languages of English and Spanish and distributed. The Contractor shall make all arrangements for one or more neighborhood meetings at least 10 calendar days prior to commencement of work on the project. The contractor's superintendent and PCWMD staff shall attend the meeting(s).

Before beginning work that will affect service connections, the Contractor shall be responsible for definitely determining the locations of all active service connections, and then further identify any business, commercial, high flow, or any other service connections in which flow cannot be interrupted. Records of most service connection locations are available to the Contractor in PCWMD's Maps and Records Section on the 5th Floor of the Public Works Building, 201 N. Stone Avenue. If the information is not available in the Maps and Records Section, the Contractor shall determine the locations by visiting the site, CCTV, dye testing, consulting with the resident/occupant, or other approved methods. The Contractor shall submit a proposed plan for maintaining uninterrupted use of these service connections for the Engineer's approval at least five (5) working days prior to commencing work.

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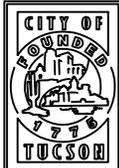
Prior to commencing work, the Contractor shall notify all residents/businesses whose service connections will be interrupted at least 72 hours in advance of the service interruption. This notification shall be in person, whenever possible, and shall include a pamphlet describing the project, the method of construction, and the approximate date and length of time that the interruption of service will occur. The Contractor's proposed method of notification, as well as the proposed written notification to be used, shall be submitted to PCWMD for review and approval prior to distribution to the public. The Contractor shall confirm the notification again verbally, whenever possible, at least 24 hours before the interruption actually happens. The 24-hour notifications shall include an "Official Notification" approved by the Engineer. The Contractor shall maintain a notification log, which will include the date and time of the notification for all the involved properties, the contact person's name, or if no contact was made, that the information was left at the door. This notification log shall be submitted to PCWMD prior to construction.

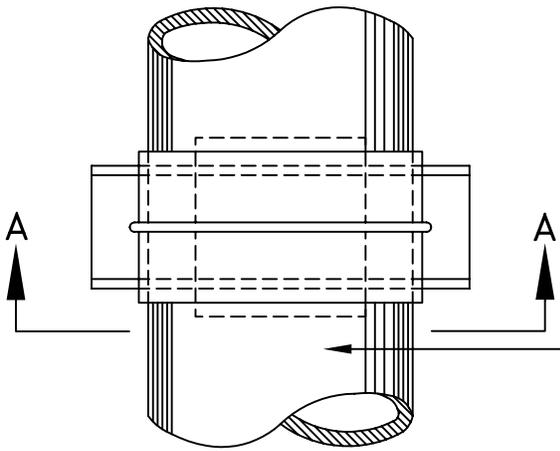
The contractor must accommodate the special needs, if any, for continuance of sewer service of the residents/occupants. Also, in general, if sewer service cannot be effectively/fully restored within 24 hours after interruption, then the physical flow management pumping of the house connection must be provided.

The Contractor shall provide portable temporary restroom facilities at the beginning and for the duration of the service interruption. The number of facilities shall be not less than 1 portable restroom per 2 residential units and 1 portable restroom per business. The portable temporary restroom facilities shall be structurally stable and shall be kept in a state of cleanliness and shall include hand washing stations as required. In the case where a handicap facility would be necessary, PCWMD will negotiate with the Contractor to determine a solution.

Prior to commencement of work on the project, the Contractor and PCWMD shall schedule a neighborhood meeting with the Contractor's Superintendent and PCWMD staff in attendance. The purpose of the meeting is to discuss the parameters of the project, and how it will affect the neighborhood residents/businesses. Identification of special requirements for handicapped persons will be addressed.

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ISSUED:		STANDARD DETAIL		DETAIL NO.
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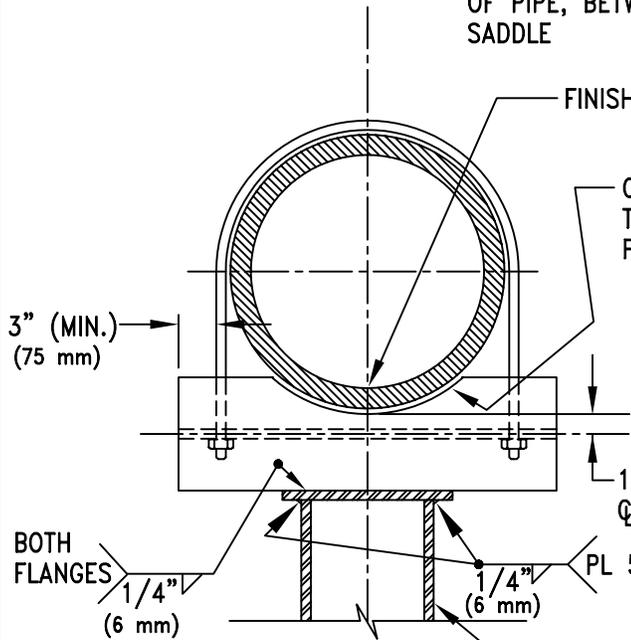
NOTE: SPECIAL CORROSION PROTECTION MEASURES SHALL BE AS SPECIFIED ON THE PLANS

DUCTILE IRON PIPE (D.I.P.) REFER TO PLANS FOR DIAMETER.

PLAN VIEW

7/8" (22 mm) Ø THREADED ROD W/(2) CUT WASHERS AND W/(2) HEX NUTS

1/2" (13 mm) THICK NEOPRENE CONTINUOUS, AROUND PERIMETER OF PIPE, BETWEEN PIPE AND SADDLE



SECTION A-A

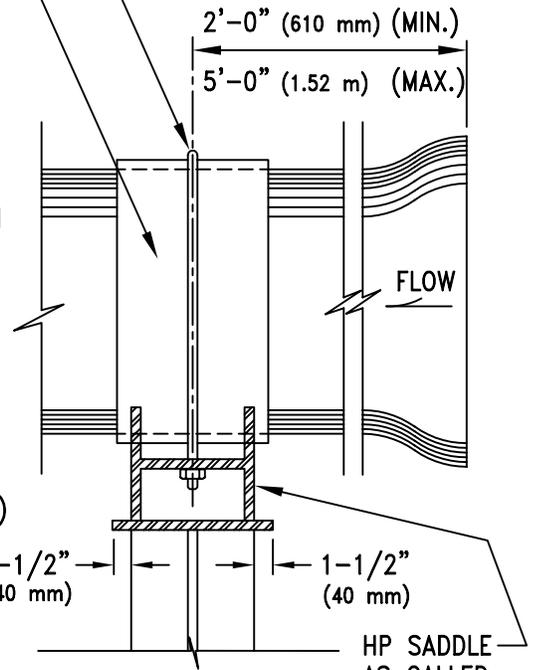
FINISH INVERT ELEVATION

CUT HP TO CONFORM TO OUTSIDE PERIMETER OF PIPE

1-3/4" (45 mm) (MIN.) CL HP TO PIPE O.D.

BOTH FLANGES 1/4" (6 mm)

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) BEARING SHAPE (HP) PILE AS SPECIFIED ON THE PLANS

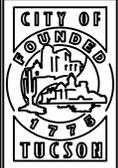


SIDE VIEW

HP SADDLE AS CALLED FOR ON PLAN

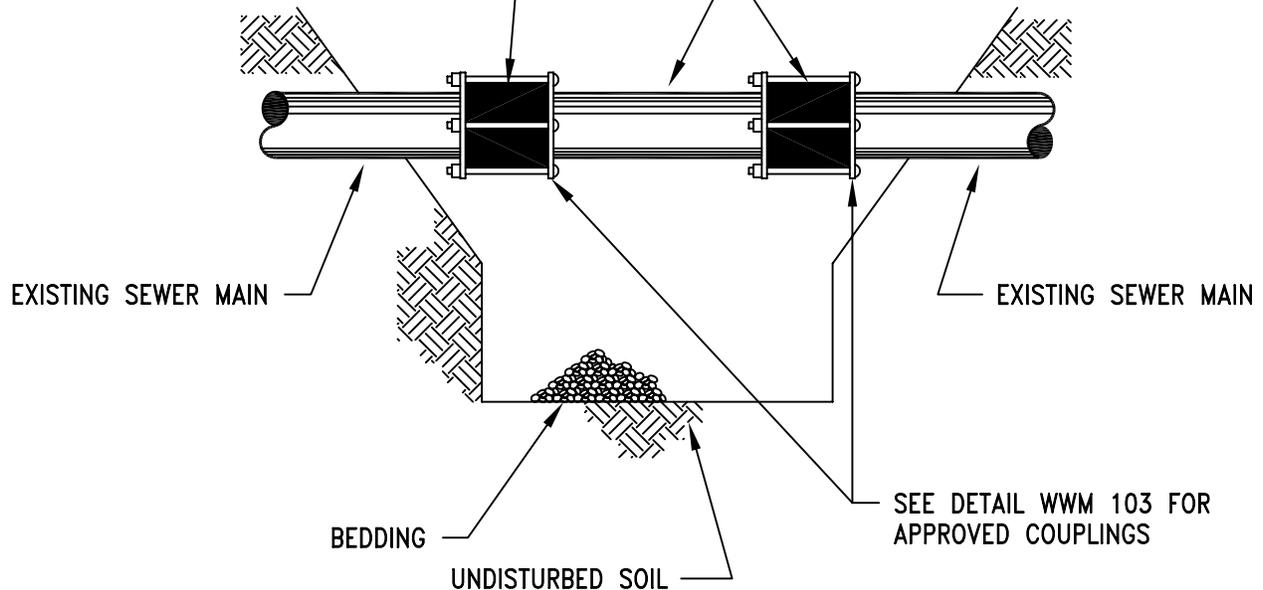
NOTES:

1. ALL STEEL PLATES AND SADDLES TO BE ASTM A 36 (A 36M)
2. ALL WELDING ELECTRODES SHALL CONFORM TO ASTM 233-62T AND AWS A5.1 GRADE E-70XX.
3. ALL BOLTS AND NUTS TO BE ASTM A 307 (A 307M)

ISSUED:		STANDARD DETAIL PILE SUPPORTED SANITARY SEWER		DETAIL NO.
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ENDS OF NEW AND EXISTING  
PIPES SHALL BE CUT SQUARELY  
WITH A MAXIMUM OF 1/2"  
(13 mm) GAP.

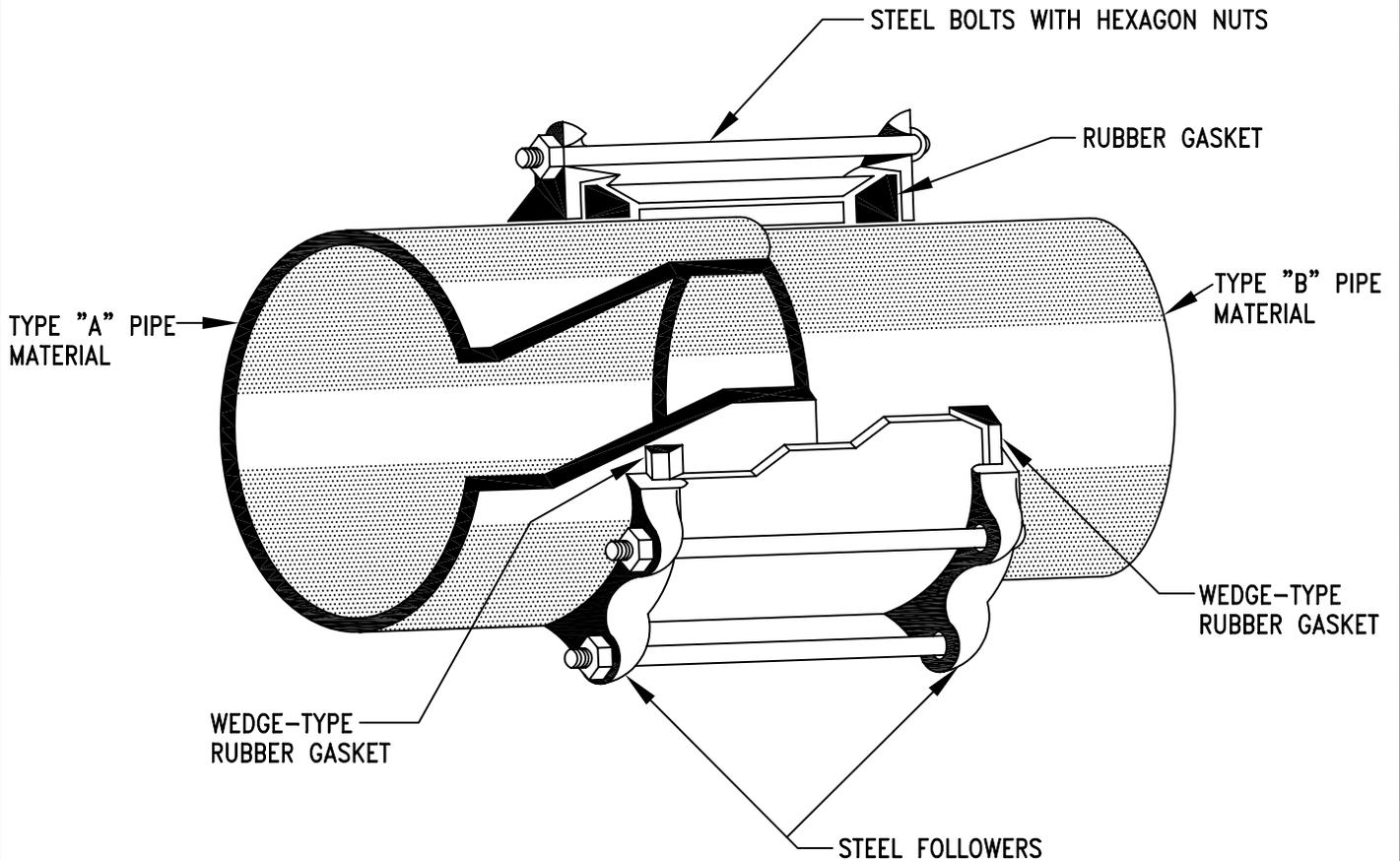
REMOVE DAMAGED PIPE AND  
REPLACE WITH NEW PIPE  
ACCEPTABLE TO P.C.W.M.D.



NOTES:

1. IF, WHEN THE DAMAGED PORTION OF THE EXISTING MAIN IS REMOVED, SATURATED SOIL IS FOUND, THE SATURATED SOIL SHALL BE EXCAVATED, REMOVED FROM THE SITE AND REPLACED WITH IMPORTED BEDDING MATERIAL MEETING CURRENT PIMA COUNTY WASTEWATER MANAGEMENT STANDARDS.
2. ALL SEWER REPAIRS SHALL BE INSPECTED BY PCWMD OR AUTHORIZED REPRESENTATIVE PRIOR TO BACKFILL.
3. COMPACTION OF BACKFILL SHALL BE IN ACCORDANCE WITH SECTION 508 OF THE PIMA COUNTY/CITY OF TUCSON STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS.

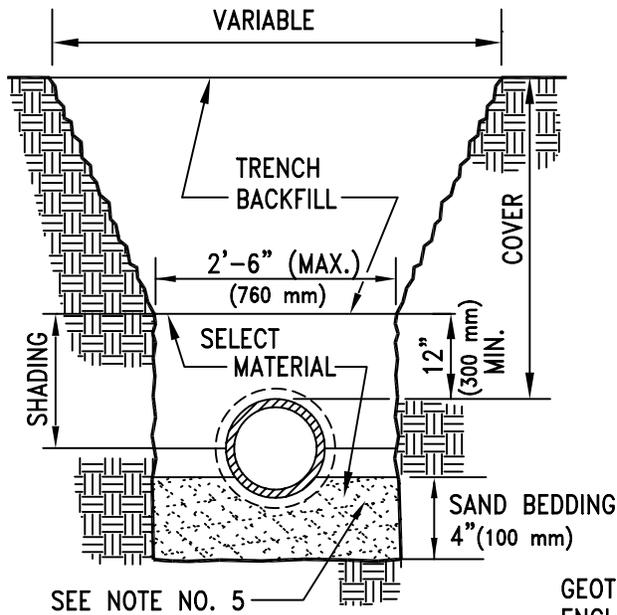
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SEWER MAIN REPAIR		WWM 102
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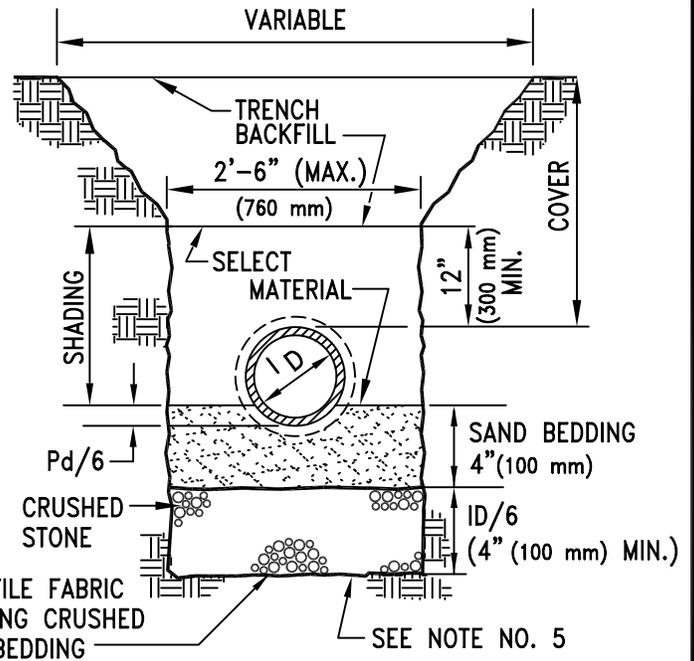
**NOTE:**

1. PIPES MADE FROM UNLIKE MATERIALS SHALL BE COUPLED TOGETHER USING AN APPROPRIATELY SIZED COATED, STEEL-BARRELED, COMPRESSION TYPE COUPLING AS MANUFACTURED BY SMITH-BLAIR COUPLING, OR AN APPROVED EQUAL TRANSITION COUPLING SUITABLE FOR WASTEWATER APPLICATIONS.
2. MISSION TYPE COUPLINGS MAY BE APPROVED FOR 6" (150 mm) DIAMETER OR 8" (200 mm) DIAMETER PIPE BY PCWMD UNDER SPECIAL CONDITIONS.
3. WHERE THERE IS A 1" (25 mm) DIFFERENTIAL IN INTERNAL DIAMETERS OF THE 2 DIFFERENT PIPE TYPES A SPECIAL CONNECTION APPROVED BY PCWMD SHALL BE USED TO ELIMINATE THE DIFFERENTIAL AT THE INVERT.
4. SEE NOTE #11 OF DETAIL WWM 106 FOR SPECIAL COATING AND WRAP REQUIREMENTS.

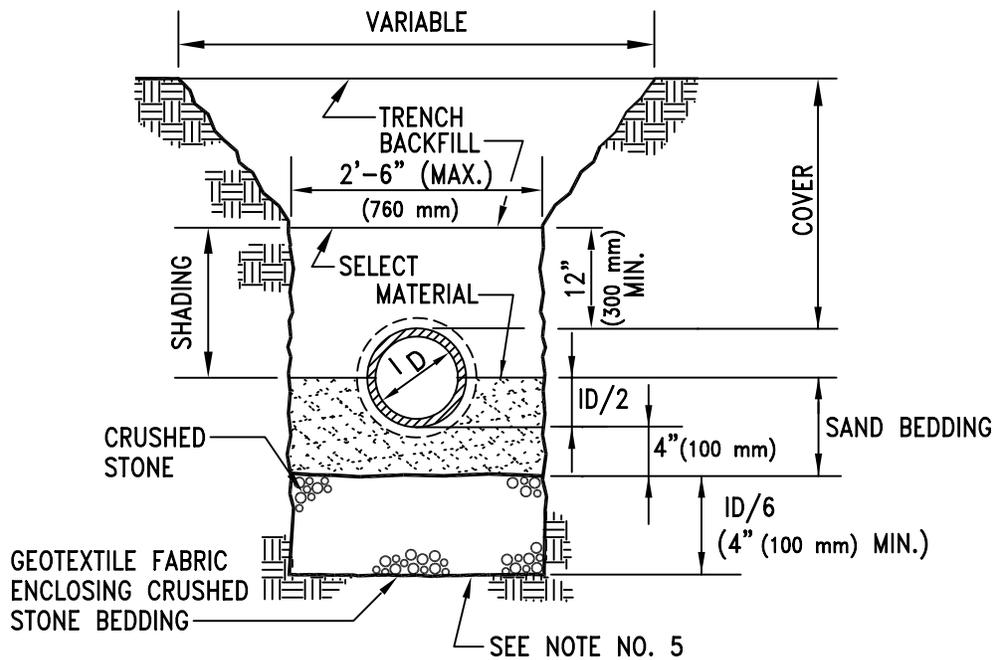
ISSUED:		STANDARD DETAIL COUPLING FOR UNLIKE PIPE MATERIALS		DETAIL NO.
8/92				WWM 103
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TYPE 1 BEDDING



TYPE 2 BEDDING



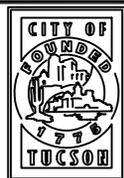
TYPE 3 BEDDING

ISSUED:

8/92

REVISED:

7/02



STANDARD DETAIL  
RIGID PIPE BEDDING  
FOR  
SANITARY SEWERS



DETAIL NO.

WWM 104

SHEET 1 OF 2

PIPE COVER LIMITATION TABLE (MAXIMUM TRENCH WIDTH 30" (760 mm) AT TOP OF PIPE)					
PIPE SPECIFICATION			MIN.-MAX. COVER		
SIZE (ID)	MATERIAL	TYPE AND MIN. CLASS	TYPE 1	TYPE 2	TYPE 3
8" (200 mm)	V. C.	EXTRA STR.	4'-10' (1.2 m-3.0 m)	4'-26' (1.2 m-7.9 m)	4'-30' (1.2 m-9.1 m)
10" (250 mm)	V. C.	EXTRA STR.	4'-11' (1.2 m-3.4 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
12" (300 mm)	V. C.	EXTRA STR.	4'-14' (1.2 m-4.3 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
15" (375 mm)	V. C.	EXTRA STR.	4'-20' (1.2 m-6.1 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
8"-16" (200 mm-400 mm)	D. I.	SEE NOTE #3	2'-17' (610 mm-5.2 m)	2'-24' (610 mm-7.3 m)	2'-30' (610 mm-9.1 m)

SIEVE ANALYSIS CHART					
CRUSHED STONE A.S.T.M. D-448, GR.67		SAND		SELECT MATERIAL	
NOM. SIZE	% PASSING	NOM. SIZE	% PASSING	NOM. SIZE	% PASSING
1" (25 mm)	100	1" (25 mm)	100	3" (75 mm)	100
3/4" (19 mm)	90-100	#4 (4.8 mm)	60-100	3/4" (19 mm)	60-100
3/8" (10 mm)	20-55	#200 (75 μm)	0-5-10	#8 (2.4 mm)	35-80
#4 (4.8 mm)	0-10	MAX. P.I.=5		#200 (75 μm)	0-25
#8 (2.4 mm)	0-5	MAX. L.L.=30		P.I. + MINUS #200 (75 μm)	< 25
MINIMUM RESISTIVITY 2000 ohm-cm					
ALL SIEVE ANALYSES SHALL BE CERTIFIED AND SUBMITTED TO PCWMD PRIOR TO STARTING CONSTRUCTION.					

- The resistivity shall be laboratory tested by ASHTO T 288 or ASTM G187-05 test method.
- Use of lime is not permitted in bedding material.
- Use of Recycled Asphalt Product (RAP) is not permitted in bedding material.

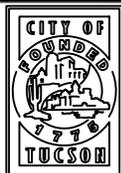
**NOTES:**

1. TRENCH BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 508-2.07 OF THE PIMA COUNTY/CITY OF TUCSON STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS. COMPACTION OF THE BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 508-3.04(A) UNLESS OTHERWISE NOTED ON THE PLANS OR IN THE SPECIAL PROVISIONS.
2. SHADING SHALL BE CAREFULLY PLACED. MINIMUM DENSITY TO BE 95% OF THE DRY DENSITY DETERMINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL.
3. ALL DUCTILE IRON PIPE AND ALL PIPE 18" (450 mm) IN DIAMETER AND LARGER WILL REQUIRE SPECIAL APPROVAL OF THE DESIGN AND INSTALLATION BY PCWMD.
4. PCWMD RESERVES THE RIGHT TO ADJUST, ON AN INDIVIDUAL CASE BASIS, THE PIPE BEDDING REQUIREMENTS TO MEET UNEXPECTED FIELD/SOIL CONDITIONS.
5. UNDISTURBED EARTH OR SELECT MATERIAL SHALL BE COMPACTED TO 95% OF THE MAXIMUM DENSITY DETERMINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL.
6. CRUSHED STONE BEDDING SHALL NOT BE USED WITH DUCTILE IRON PIPE UNLESS APPROVED IN WRITING BY PCWMD.
7. NATIVE MATERIAL MEETING THE GRADATION OF SELECT MATERIAL MAY BE USED IN LIEU OF SELECT MATERIAL.

ISSUED:		STANDARD DETAIL RIGID PIPE BEDDING FOR SANITARY SEWERS		DETAIL NO.
8/92				WWM 104
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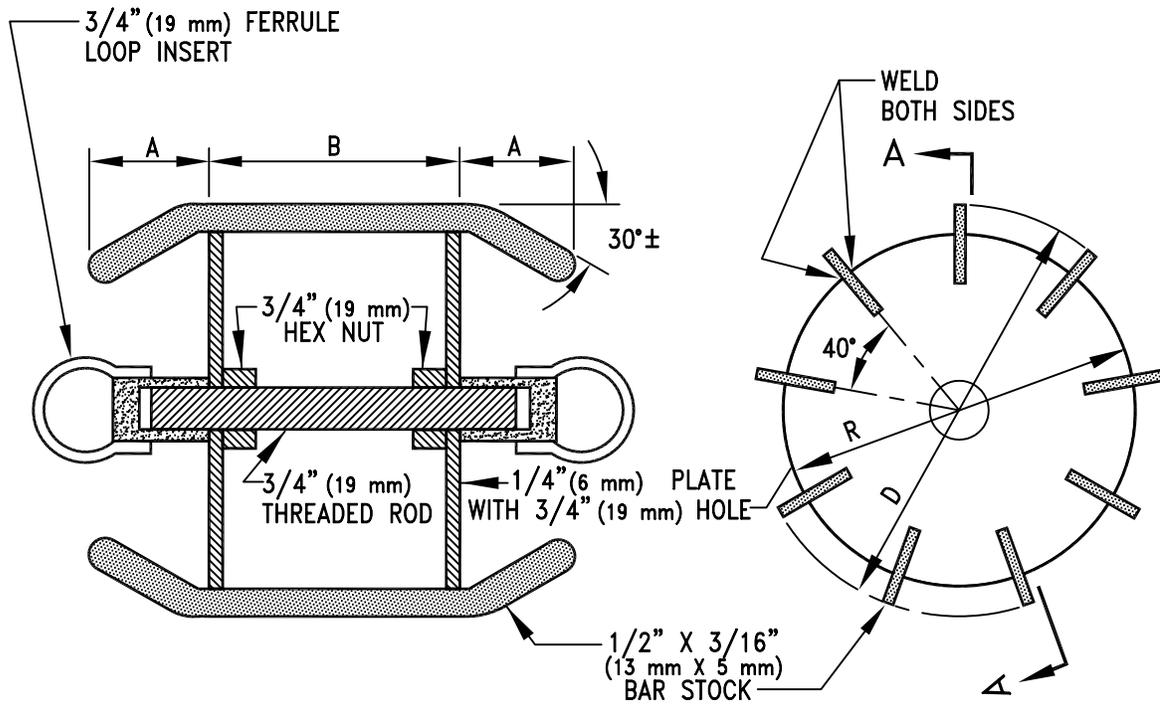


1. ALL DESIGN STANDARDS, MATERIALS AND WORKMANSHIP FOR PUBLIC SANITARY SEWERS ARE TO BE IN ACCORDANCE WITH THE LATEST EDITION OF THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT'S (PCWMD) MANUAL OF ENGINEERING STANDARDS AND PROCEDURES, AND THE PIMA COUNTY / CITY OF TUCSON STANDARD DETAILS AND SPECIFICATIONS FOR PUBLIC IMPROVEMENTS, SAID MANUALS ARE ON FILE AT PIMA COUNTY WASTEWATER MANAGEMENT OFFICES AT 201 N. STONE AVENUE, 8TH FLOOR.
2. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.
3. THE CONTRACTOR SHALL VERIFY LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. CALL "BLUE STAKE" 1-800-782-5348, A MINIMUM OF TWO (2) FULL WORKING DAYS PRIOR TO EXCAVATING.
4. ALL CHANGES THAT MIGHT AFFECT THE SEWERAGE SYSTEM (BOTH CONVEYANCE AS WELL AS TREATMENT) SHALL BE APPROVED BY THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT PRIOR TO THEIR CONSTRUCTION.
5. THE CONTRACTOR SHALL FIELD VERIFY EXISTING SEWER ELEVATIONS AND ALIGNMENTS PRIOR TO CONSTRUCTION AND IMPLEMENTATION. VERIFICATION MAY REQUIRE POT-HOLING.
6. ALL ROUGH GRADING SHALL BE COMPLETE PRIOR TO THE INSTALLATION OF SEWERS, INCLUDING FILL, TO A MINIMUM OF 4 FEET (1.2 m) OVER THE TOP OF SEWER PIPE, AND COMPACTION AS INDICATED ON THE PLANS OR AS OTHERWISE DIRECTED BY PCWMD.
7. WHERE CONNECTIONS TO EXISTING MANHOLES ARE TO BE MADE, THE CONTRACTOR SHALL CONSTRUCT NEW INVERTS IN THE EXISTING BENCH TO SMOOTHLY DIRECT THE FLOW IN THE PROPER DIRECTION.
8. THE CONTRACTOR SHALL FURNISH, OPERATE AND MAINTAIN ALL EQUIPMENT NECESSARY TO PROVIDE CONTINUOUS 24 HR./DAY SEWER SERVICE TO ALL PARTIES TRIBUTARY TO A LIVE SEWER TO WHICH A CONNECTION IS TO BE MADE. NOTIFY THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT'S COLLECTION SYSTEM MAINTENANCE SECTION AT (326-4333) 48 HOURS PRIOR TO STARTING ANY CONSTRUCTION THAT COULD EITHER ADVERSELY IMPACT THE FLOW WITHIN A LIVE SEWER, OR INVOLVE CONNECTION TO A SEWER FIFTEEN (15) INCHES (375 mm) IN DIAMETER OR LARGER.
9. SEWER CONSTRUCTION SHALL START AT THE LOWEST DOWNSTREAM POINT AND PROGRESS UPSTREAM, REGARDLESS OF THE STATIONING SHOWN ON THE PLANS.
10. THE CONTRACTOR SHALL MAKE FULL PAYMENT OF THE INVOLVED INSPECTION FEES AND OBTAIN A WASTEWATER MANAGEMENT SEWER CONSTRUCTION PERMIT FROM THE PIMA COUNTY DEVELOPMENT SERVICES DEPARTMENT (PLANNING, 740-6586) A MINIMUM OF THREE FULL WORKING DAYS PRIOR TO STARTING ANY SEWER CONSTRUCTION. THREE COPIES OF THE CONSTRUCTION PLANS AND SPECIFICATIONS ARE REQUIRED TO BE SUBMITTED WITH THE SEWER CONSTRUCTION PERMIT APPLICATION.
11. DUCTILE IRON PIPE 6" (150 mm) AND GREATER IN DIAMETER, FITTINGS AND METAL COUPLINGS SHALL HAVE BOTH POLYETHYLENE OR HYBRID NOVOLAC EPOXY INTERIOR LINING AND A POLYETHYLENE EXTERIOR WRAPPING OR APPROVED EQUALS. PIPES MADE FROM UNLIKE MATERIALS SHALL BE COUPLED TOGETHER IN ACCORDANCE WITH STANDARD DETAIL WWM 103.

ISSUED:		STANDARD DETAIL GENERAL NOTES SEWER CONSTRUCTION		DETAIL NO.
8/92				WWM 106
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12. THE HORIZONTAL DISTANCE BETWEEN A PUBLIC WATER PIPE AND A SEWER MAIN SHALL NOT BE LESS THAN SIX (6) FEET (1.8 m). VERTICAL CLEARANCE BETWEEN WATER AND SEWER LINES SHALL BE A MINIMUM OF 24 INCHES (610 mm). (IF THESE CRITERIA CANNOT BE MET, DESIGN CHANGES SHALL BE REQUIRED.) REFER TO STANDARD DETAIL WWM 108.
13. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADJUST ALL SANITARY SEWER MANHOLE STRUCTURES TO FINISHED GRADE. ALL RING AND COVER ADJUSTMENTS ARE TO BE IN ACCORDANCE WITH PIMA COUNTY/CITY OF TUCSON STANDARD DETAILS FOR PUBLIC IMPROVEMENTS WWM 304, WWM 305 OR WWM 306 (AS APPLICABLE) AND WWM 307. WHILE ADJUSTING THE MANHOLE TO FINISHED GRADE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT RINGS AND COVERS ARE CLEANED OF ANY AND ALL ATTACHED MATERIALS (ASPHALT, CONCRETE, ETC.) AND ENSURE THAT ANY VENT HOLES ARE OPEN AND CLEAR OF OBSTRUCTIONS. IF THE FRAME AND COVER ARE DAMAGED AND CANNOT BE COMPLETELY CLEANED, THEN A NEW FRAME AND COVER IS TO BE PUT INTO PLACE, AND COSTS ASSOCIATED WITH THESE ACTIONS ARE THE RESPONSIBILITY OF THE CONTRACTOR. REFER TO DETAILS WWM 213.0-214.3 FOR REQUIREMENTS FOR RINGS AND COVERS.
14. IMMEDIATELY REPORT ANY RELEASE OF SEWAGE, AND/OR ANY DAMAGE TO, OR THE DROPPING OF DEBRIS INTO, THE PUBLIC SANITARY SEWAGE CONVEYANCE SYSTEM TO EITHER PCWMD FIELD ENGINEERING (740-2651) OR PCWMD FIELD OPERATIONS (326-4333). ON WEEKENDS, HOLIDAYS, OR BETWEEN 5:00 PM AND 8:00 AM, IMMEDIATELY CALL PIMA COUNTY SHERIFF'S COMMUNICATION CENTER AT 295-685 OR CALL 791-4011 AND REQUEST A PCWMD REPRESENTATIVE TO BE DISPATCHED TO THE SITE. TAKE IMMEDIATE ACTION TO PREVENT OR CONTAIN THE SANITARY SEWAGE OVERFLOW (SSO) FROM THE SEWER SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS TO REPAIR THE SYSTEM, FOR ALL EXPENSES TO MITIGATE THE RELEASE AND TO DISINFECT THE RELEASE AREAS, AND FOR ANY REGULATORY PENALTIES LEVIED ON PCWMD BECAUSE THE SSO ENTERED A NATURAL OR CONSTRUCTED STORM WATER DRAINAGE SYSTEM. THE CONTRACTOR SHALL REPAIR ALL DAMAGE AS DIRECTED AND APPROVED BY PCWMD.
15. REFER TO DETAIL WWM A-5 FOR FLOW MANAGEMENT PLAN REQUIREMENTS.
16. REFER TO STANDARD SPECIFICATION SUBSECTION 508-3.05 (E) FOR ALIGNMENT VERIFICATION REQUIREMENTS INCLUDING THE SPACING REQUIREMENTS FOR GRADE STAKES.
17. THE CHECKING OF THE CONTRACTOR'S WORK BY AGENCY AND/OR PCWMD STAFF SHALL IN NO WAY RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR CONFORMANCE WITH THE PLANS AND SPECIFICATIONS. IF THE ENGINEER OR PCWMD INSPECTOR FAIL TO POINT OUT A DEFECT, DEFICIENCY OR ERROR IN THE WORK FROM LACK OF DISCOVERY OR FOR ANY REASON, IT SHALL IN NO WAY PREVENT LATER REJECTION OR CORRECTIONS TO THE UNSATISFACTORY WORK WHEN DISCOVERED. THE CONTRACTOR SHALL HAVE NO CLAIM FOR LOSSES SUFFERED DUE TO ANY NECESSARY REMOVALS OR REPAIRS RESULTING FROM THE UNSATISFACTORY WORK.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		GENERAL NOTES		WWM 106
REVISED:		SEWER		
7/02		CONSTRUCTION		SHEET 2 OF 2



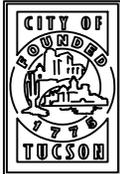
SECTION A-A

END VIEW

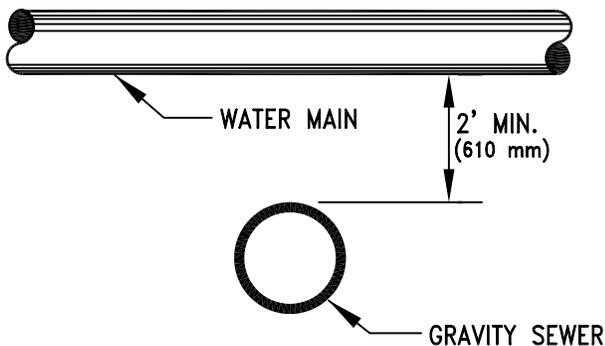
5% DEFLECTION				
PIPE SIZE	A	B	D	R
8" (200 mm)	2" (50 mm)	2.4"-8" (62 mm-200 mm)	7.28" (184.2 mm)	6.28" (159.5 mm)
10" (250 mm)	2" (50 mm)	3"-10" (75 mm-250 mm)	9.08" (230.6 mm)	8.08" (205.2 mm)
12" (300 mm)	2" (50 mm)	3.5"-12" (89 mm-300 mm)	10.79" (274.07 mm)	9.79" (248.7 mm)
15" (375 mm)	2" (50 mm)	4.3"-15" (110 mm-300 mm)	13.20" (335.3 mm)	12.20" (309.9 mm)
18" (460 mm) AND OVER	SUBMIT SHOP DRAWING			

NOTES:

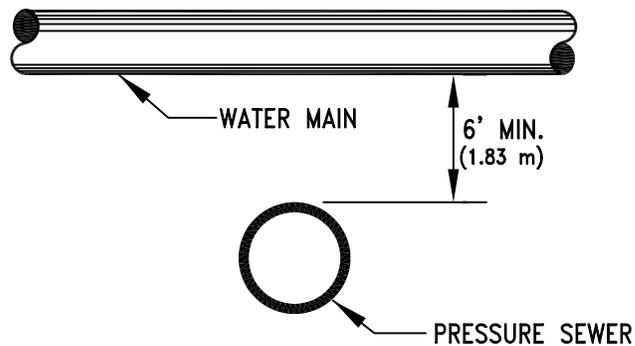
1. AFTER WELDING IS COMPLETED, TRUE THE OUTSIDE DIAMETER DIMENSION FOR THE FULL LENGTH OF "B" TO  $\pm 0.010"$  (0.3 mm) BY TOOL AND LATHE OR GRINDING.
2. FINISHED PART TO BE SANDBLASTED AND RUST-PROOFED WITH PAINT.
3. THE MINIMUM NUMBER OF RIBS IS SUBJECT TO PCWMD REVIEW AND APPROVAL OF SHOP DRAWINGS.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		DEFLECTION		WWM 107
REVISED:		TESTING MANDREL		SHEET 1 OF 1
7/02				

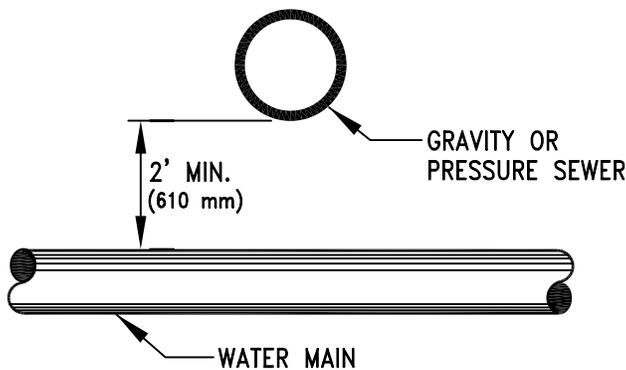
# VERTICAL SEPARATION



GRAVITY SEWER CROSSING  
(SEWER UNDER WATER MAIN)



PRESSURE SEWER CROSSING  
(SEWER UNDER WATER MAIN)



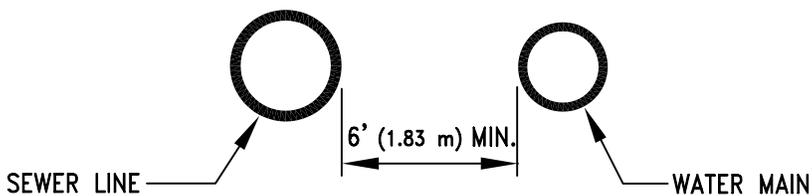
GRAVITY OR PRESSURE SEWER CROSSING  
(SEWER ABOVE WATER MAIN)

**NOTES:**

1. WHERE A WATER MAIN CROSSES ABOVE A GRAVITY SEWER WITH 2' (610 mm) OR GREATER VERTICAL CLEARANCE (OUTSIDE SURFACE TO OUTSIDE SURFACE), NO EXTRA PROTECTION IS REQUIRED. WHERE A WATER MAIN CROSSES ABOVE A PRESSURE SEWER WITH 6' (1.8 m) OR GREATER VERTICAL CLEARANCE, NO EXTRA PROTECTION IS REQUIRED.
2. WHERE A WATER MAIN MUST CROSS ABOVE A GRAVITY SEWER WITH LESS THAN 2' (610 mm) OF CLEARANCE OR ABOVE A PRESSURE SEWER WITH LESS THAN 6' (1.83 m) OF CLEARANCE, CONSTRUCT OR REPLACE THE SEWER LINE WITH DUCTILE IRON PIPE (D.I.P.) OR APPROVED EQUAL. THE D.I.P. SHALL HAVE A "PUSH-ON" JOINT OR APPROVED EQUAL IF THE SEWER JOINTS ARE LOCATED 6' (1.8 m) OR MORE BEYOND THE OUTSIDE SURFACE OF THE WATER MAIN. IF THE JOINT IS LOCATED LESS THAN 6' (1.8 m) FROM THE OUTSIDE SURFACE OF THE WATER MAIN, THEN A RESTRAINED JOINT OR APPROVED EQUAL SHALL BE USED. REFER TO SHEET 3 OF 3. IN NO CASE SHALL THE WATER MAIN BE LESS THAN 1' (305 mm) ABOVE A GRAVITY SEWER OR 2' (610 mm) ABOVE A PRESSURE SEWER.
3. WHERE A WATER MAIN CROSSES BELOW EITHER A GRAVITY SEWER OR A PRESSURE SEWER, CONSTRUCT OR REPLACE THE SEWER LINE WITH D.I.P. OR APPROVED EQUAL FOLLOWING THE GUIDELINES GIVEN IN NOTE NO. 2. IN NO CASE SHALL THE WATER MAIN BE LESS THAN 2 FEET (610 mm) BELOW EITHER A GRAVITY OR PRESSURE SEWER LINE.

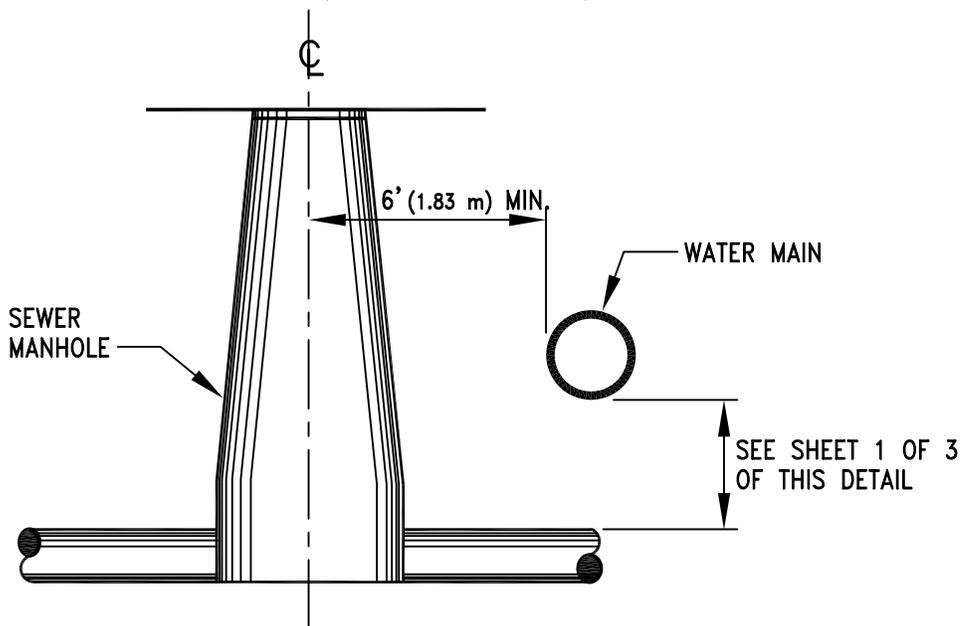
ISSUED:		STANDARD DETAIL		DETAIL NO.
11/94		SEWER / WATER		WWM 108
REVISED:		CROSSING DETAILS		SHEET 1 OF 3
7/02				

# HORIZONTAL SEPARATION



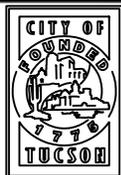
## SEWER / WATER SEPARATION

(PARALLEL ALIGNMENTS)

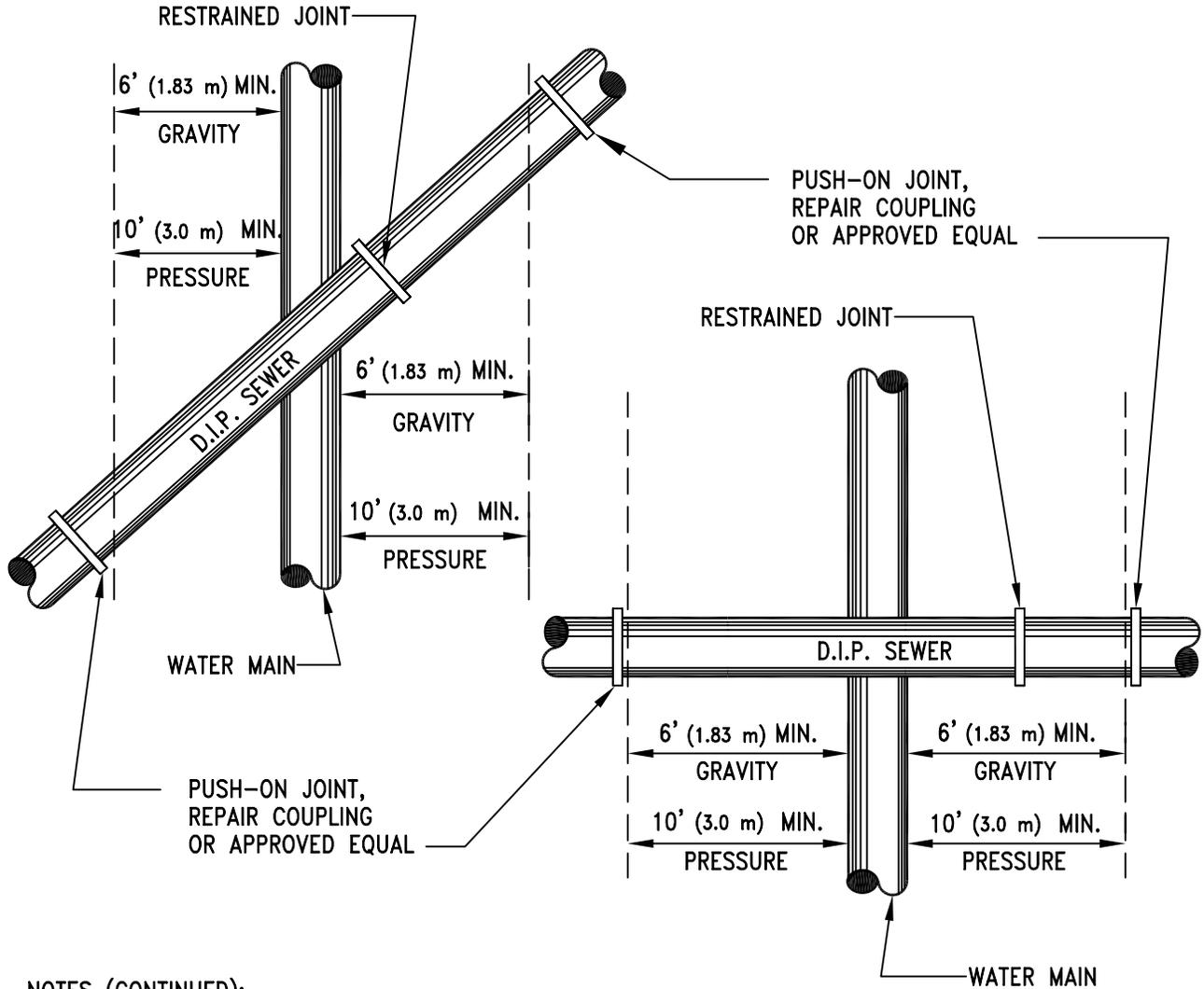


### NOTES (CONTINUED):

4. THE MINIMUM HORIZONTAL CLEARANCE WITHOUT EXTRA PROTECTION BETWEEN A WATER MAIN AND A PRESSURE OR GRAVITY SEWER LINE SHALL BE 6' (1.83 m) OUTSIDE SURFACE TO OUTSIDE SURFACE.
5. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN A WATER MAIN AND A SEWER MANHOLE SHALL BE 6' (1.83 m) FROM THE OUTSIDE SURFACE OF THE WATER MAIN TO THE CENTERLINE OF THE MANHOLE.
6. WHERE A 6' (1.83 m) HORIZONTAL CLEARANCE CANNOT BE MAINTAINED WITH A GRAVITY SEWER, CONSTRUCT OR REPLACE THE SEWER LINE WITH D.I.P. OR APPROVED EQUAL FOLLOWING THE GUIDELINES GIVEN IN NOTE NO. 2. IN NO CASE SHALL A GRAVITY SEWER LINE BE LOCATED LESS THAN 2' (610 mm) HORIZONTALLY FROM A WATER MAIN.
7. IN NO CASE SHALL A PRESSURE SEWER LINE BE LOCATED LESS THAN 6' (1.83 m) HORIZONTALLY FROM A WATER MAIN.
8. THE AMERICAN NATIONAL STANDARD FOR THE THICKNESS DESIGN OF DUCTILE IRON PIPE (ANSI/AWWA C150/A21.50) SHALL BE USED TO DETERMINE THE REQUIRED CLASS OF D.I.P. EXCEPT THAT FOR D.I.P. WITH A DIAMETER OF 3" (75 mm) THRU 24" (600 mm), A MINIMUM OF CLASS 350 (2.4 MPa) IS REQUIRED AND FOR D.I.P. WITH A DIAMETER GREATER THAN 24" (600 mm), A MINIMUM OF CLASS 200 (1.4 MPa) IS REQUIRED.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SEWER / WATER		WWM 108
REVISED:		CROSSING DETAILS		SHEET 2 OF 3
7/02				

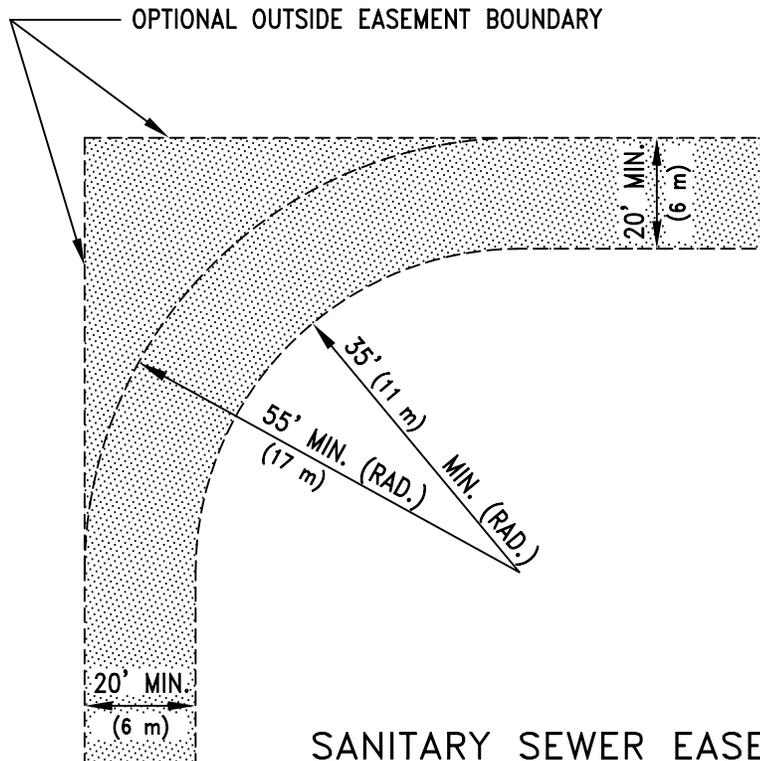
# PLAN VIEWS



**NOTES (CONTINUED):**

9. WHERE THE SEWER LINE IS A GRAVITY SEWER, THE D.I.P. INSTALLATION OR REPLACEMENT SHALL EXTEND A MINIMUM OF 6' (1.83 m) BEYOND EACH SIDE OF THE WATER MAIN, MEASURED HORIZONTALLY FROM AND PERPENDICULAR TO THE WATER MAIN.
10. WHERE THE SEWER LINE IS A PRESSURE SEWER, THE D.I.P. INSTALLATION OR REPLACEMENT SHALL EXTEND A MINIMUM OF 10' (3.0 m) BEYOND EACH SIDE OF THE WATER MAIN, MEASURED HORIZONTALLY FROM AND PERPENDICULAR TO THE WATER MAIN.
11. WHEN UNUSUAL CONDITIONS SUCH AS, BUT NOT LIMITED TO, HIGHWAY OR BRIDGE CROSSINGS PREVENT THE WATER AND SEWER LINE SEPARATIONS REQUIRED BY THIS DETAIL FROM BEING MET, THE PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT WILL REVIEW AND MAY APPROVE (SUBJECT TO ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY APPROVAL), REQUESTS FOR AUTHORIZATION TO USE ALTERNATE CONSTRUCTION TECHNIQUES, MATERIALS AND JOINTS ON A CASE-BY-CASE BASIS.
12. ALL DUCTILE IRON PIPE SHALL BE INTERNALLY LINED TO MEET THE MOST RECENT PIMA COUNTY WASTEWATER DEPARTMENT SPECIFICATIONS.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SEWER / WATER		WWM 108
REVISED:		CROSSING DETAILS		SHEET 3 OF 3
7/02				



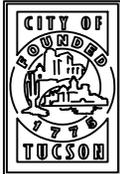
**SANITARY SEWER EASEMENT**  
NOT TO SCALE

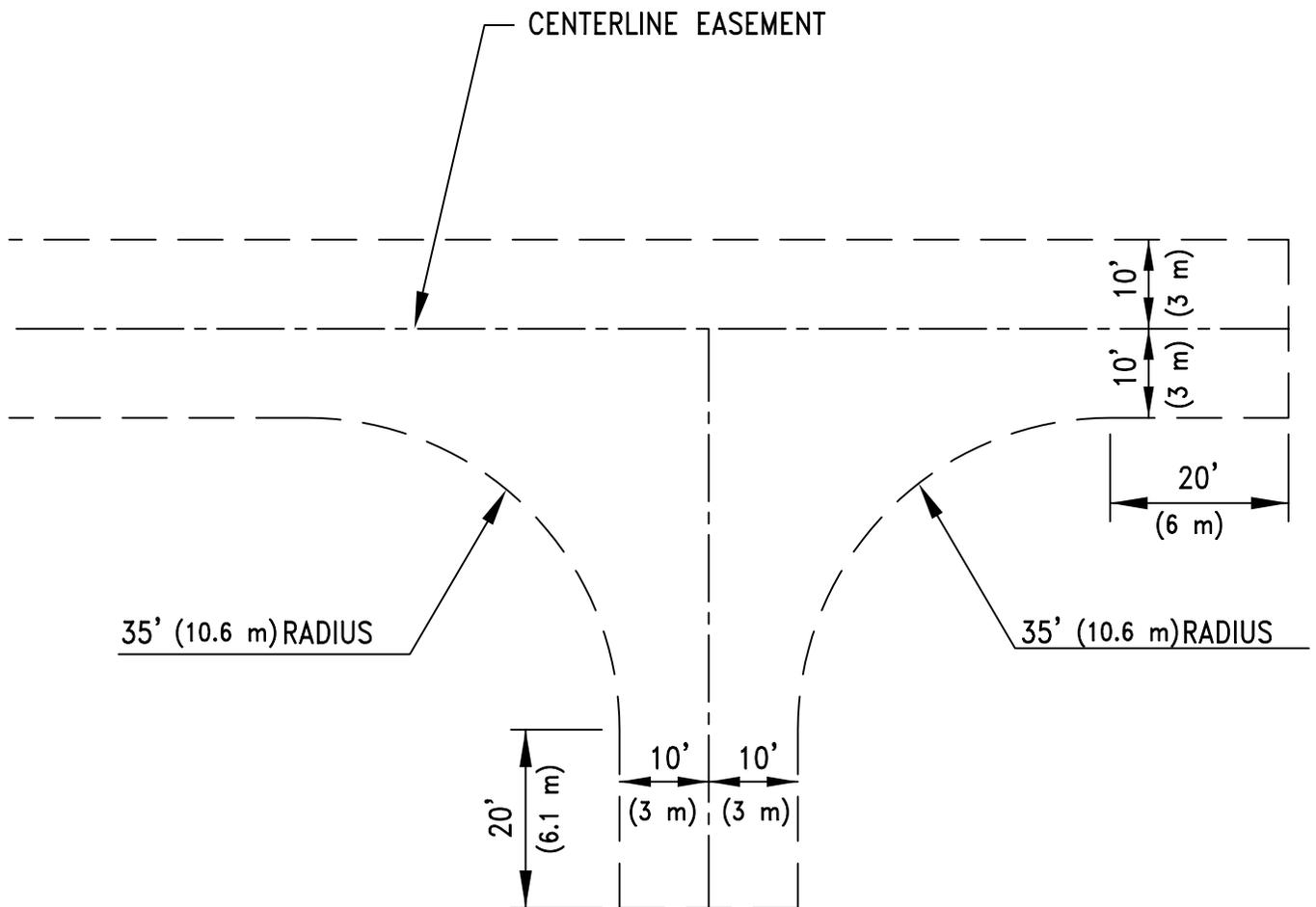
**LEGEND:**

 PORTION OF ACCESS EASEMENT WHICH MUST BE LEFT FREE OF SIGNIFICANT VEGETATION OR ANY STRUCTURES

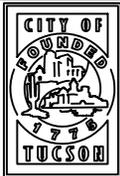
**NOTES:**

1. MINIMUM VERTICAL CLEARANCE = 20 FEET (6 m).
2. MINIMUM HORIZONTAL CLEARANCE = 20 FEET (6 m).
3. MINIMUM OUTSIDE TURNING RADIUS = 55 FEET (17 m).
4. MINIMUM INSIDE TURNING RADIUS = 35 FEET (11 m).
5. MINIMUM RELATIVELY LEVEL SURFACE AT MANHOLE = 5 FOOT (1.5 m) RADIUS.
6. MAXIMUM DRIVING AREA GRADE = 17 PERCENT.
7. MINIMUM EASEMENT WIDTH = THE SUM OF THE OUTSIDE DIAMETER OF THE PIPE PLUS THE GREATER OF EITHER 20 FEET (6 m) OR TWICE THE DEPTH OF THE SEWER LINE, ROUNDED TO THE NEAREST 5 FEET (1 m).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SANITARY SEWER EASEMENT		WWM 109
REVISED:				SHEET 1 OF 1
7/02				



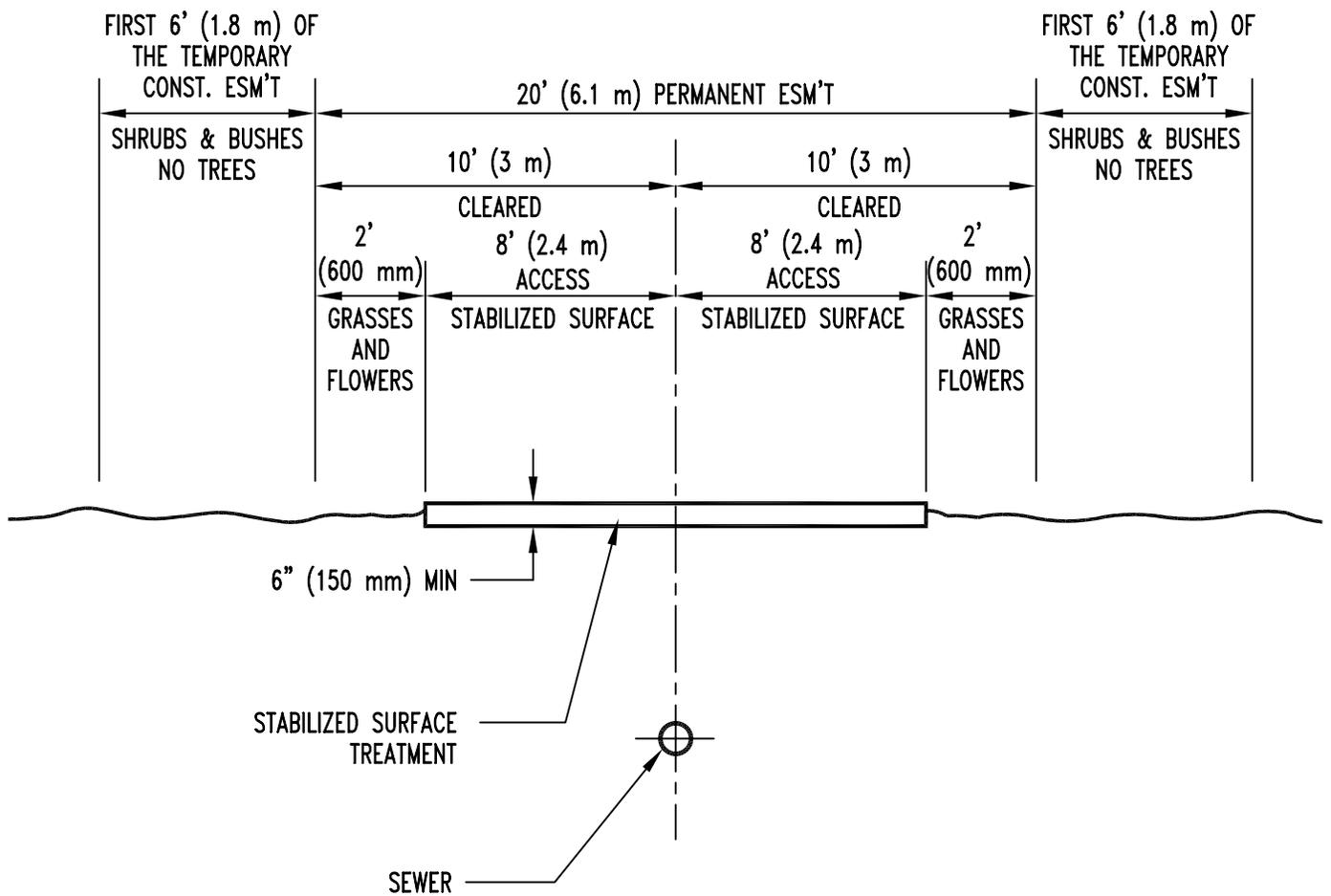
ISSUED:
1/02
REVISED:
7/02



STANDARD DETAIL  
 RIGHT ANGLE  
 TURN AROUND



DETAIL NO.
WWM 110
SHEET 1 OF 1



ISSUED:
7/02
REVISED:
9/02



STANDARD DETAIL  
TYPICAL SEWER  
EASEMENT SECTION



DETAIL NO.
WWM 111
SHEET 1 OF 2

NOTES:

1. PUBLIC SEWER EASEMENTS SHALL BE A MINIMUM 20 FEET (6.1 m) IN WIDTH. PUBLIC SEWER EASEMENTS SHALL BE PROVIDED WITH A MINIMUM 16 FOOT (4.8 m) WIDE STABILIZED SURFACE. THE STABILIZED SURFACE SHALL BE CENTERED OVER THE SEWER.

2. BASED ON THE COMPOSITION OF THE SITE SOILS, THE STABILIZED SURFACE TREATMENT SHALL BE SELECTED FROM ONE OF THE FOLLOWING OPTIONS:

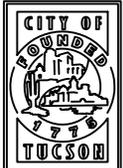
- A. HYDRATED LIME SLURRY
- B. HYDRATED LIME SLURRY AND FLY ASH
- C. PORTLAND CEMENT

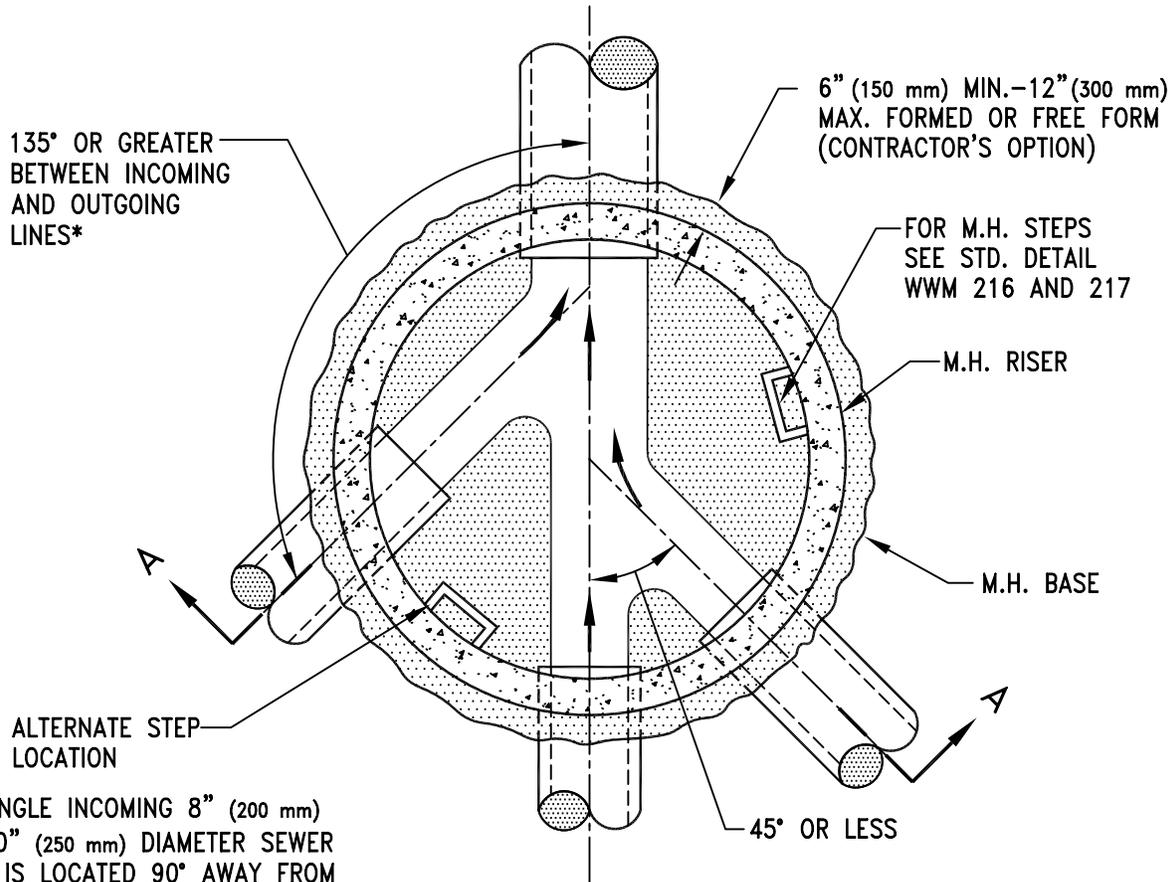
THE CONTRACTOR SHALL PROVIDE A MIX DESIGN INDICATING THE MIX PROPORTIONS FOR THE STABILIZED SURFACE TREATMENT MATERIAL(S) FOR APPROVAL BY THE ENGINEER. SOIL INCORPORATED INTO THE 6" (150 mm) THICK STABILIZED SURFACE SHALL NOT CONTAIN MATERIAL RETAINED ON A 3" (75 mm) SIEVE NOR CONTAIN ANY DELETERIOUS MATERIAL. A CLEAR CURING COMPOUND, APPROVED BY THE ENGINEER, SHALL BE APPLIED TO THE SURFACE OF THE STABILIZED AREA AFTER IT HAS BEEN COMPACTED TO A DENSITY OF NOT LESS THAN 95% OF THE MAXIMUM DENSITY AS DETERMINED IN ACCORDANCE WITH THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL OR AS DIRECTED AND APPROVED BY THE ENGINEER.

3. THE AREA EXTENDING 2 FEET (600 mm) ON EITHER SIDE OF THE STABILIZING SURFACE MAY BE REVEGETATED WITH NATIVE GRASSES AND FLOWERS.

4. TEMPORARY CONSTRUCTION EASEMENTS EXTENDING BEYOND THE WIDTH OF THE PERMANENT SEWER EASEMENT SHALL BE REVEGETATED AS SPECIFIED ON THE PLANS. HOWEVER, THE REVEGETATION OF THE TEMPORARY EASEMENT SHALL BE RESTRICTED TO NATIVE SHRUBS, GRASSES, BUSHES AND/OR FLOWERS FOR THE FIRST 6 FEET (1.8 m) OF THE TEMPORARY CONSTRUCTION EASEMENT WIDTH. ALL SHRUBS, BUSHES AND UNDERSTORY PLANTS SHALL BE COMPATIBLE WITH THE SURROUNDING NATIVE VEGETATION. IF TREES ARE TO BE PLANTED IN AREAS BEYOND THE INITIAL 6 FEET (1.8 m) OF THE CONSTRUCTION EASEMENT, THE TREE TYPE SHALL BE APPROVED, IN WRITING, BY THE ENGINEER PRIOR TO DELIVERY TO THE SITE.

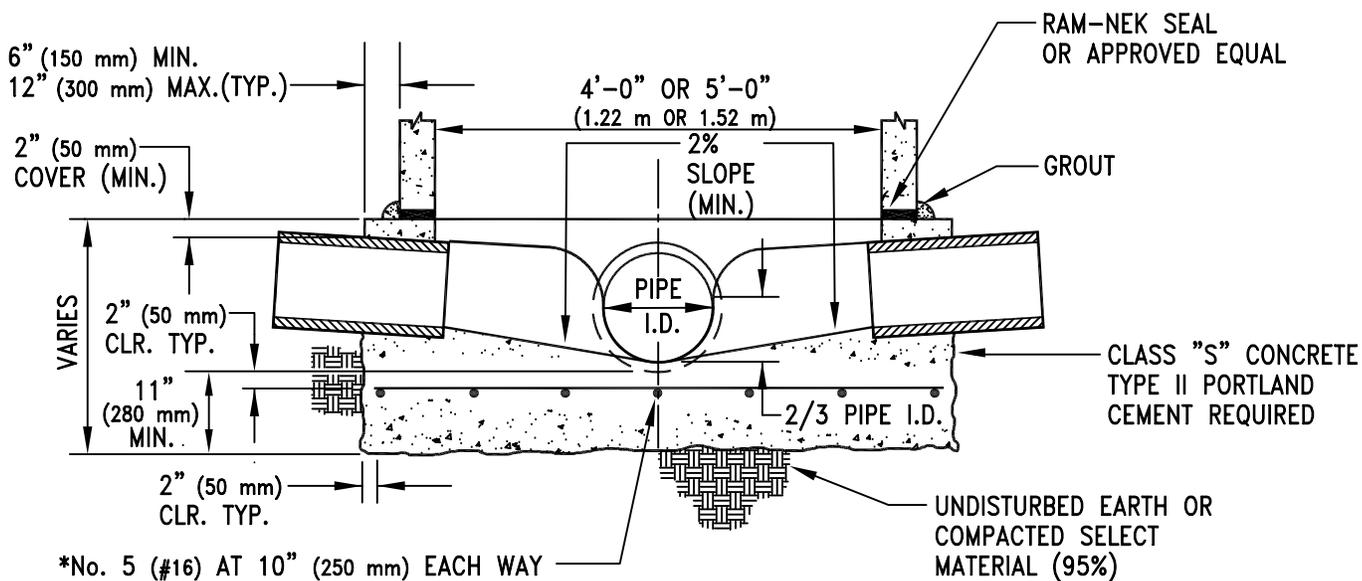
5. IF THE SEWER EASEMENT IS LOCATED WITHIN A ENVIRONMENTALLY SENSITIVE AREA, THE SPECIAL PROVISIONS AND DETAILS THAT ADDRESS CONSTRUCTION IN THE ENVIRONMENTALLY SENSITIVE AREA SHALL SUPERCEDE THIS DETAIL.

ISSUED:		STANDARD DETAIL		DETAIL NO.
7/02		TYPICAL SEWER EASEMENT SECTION		WWM 111
REVISED:		SHEET 2 OF 2		
9/02				



**PLAN VIEW**

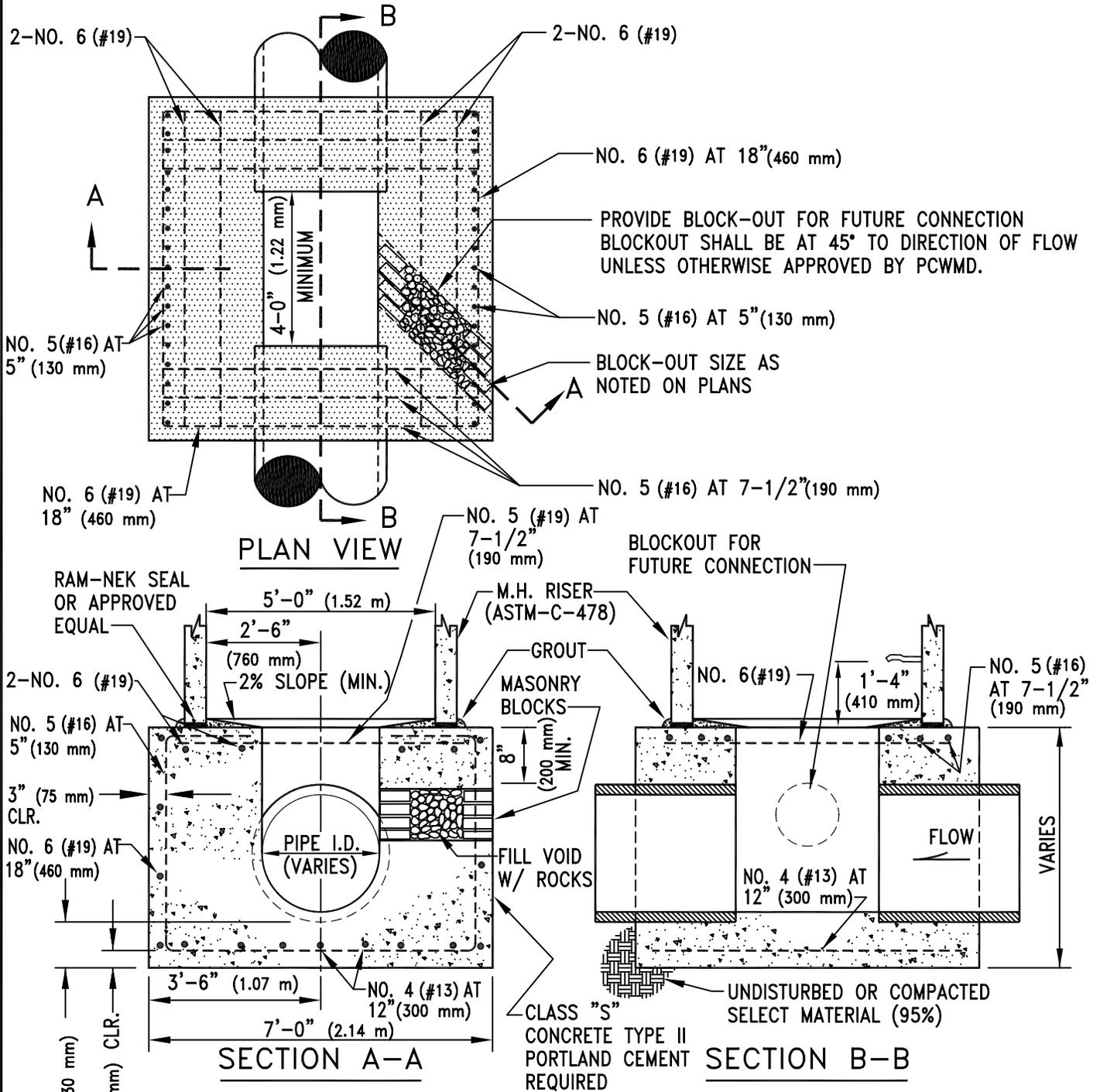
\*A SINGLE INCOMING 8" (200 mm) OR 10" (250 mm) DIAMETER SEWER THAT IS LOCATED 90° AWAY FROM ANOTHER SINGLE INCOMING 8" (200 mm) DIAMETER OR LARGER SEWER IS ACCEPTABLE.



**SECTION A-A**

\* NOTE:  
REINFORCING STEEL IS OPTIONAL FOR MANHOLES LESS THAN 20' (6.1 m) DEEP FROM INVERT TO TOP OF COVER.

ISSUED:		STANDARD DETAIL MANHOLE BASE 21" (525 mm) DIA. AND SMALLER		DETAIL NO.
8/92				WWM 201
REVISED:				SHEET 1 OF 1
7/02				

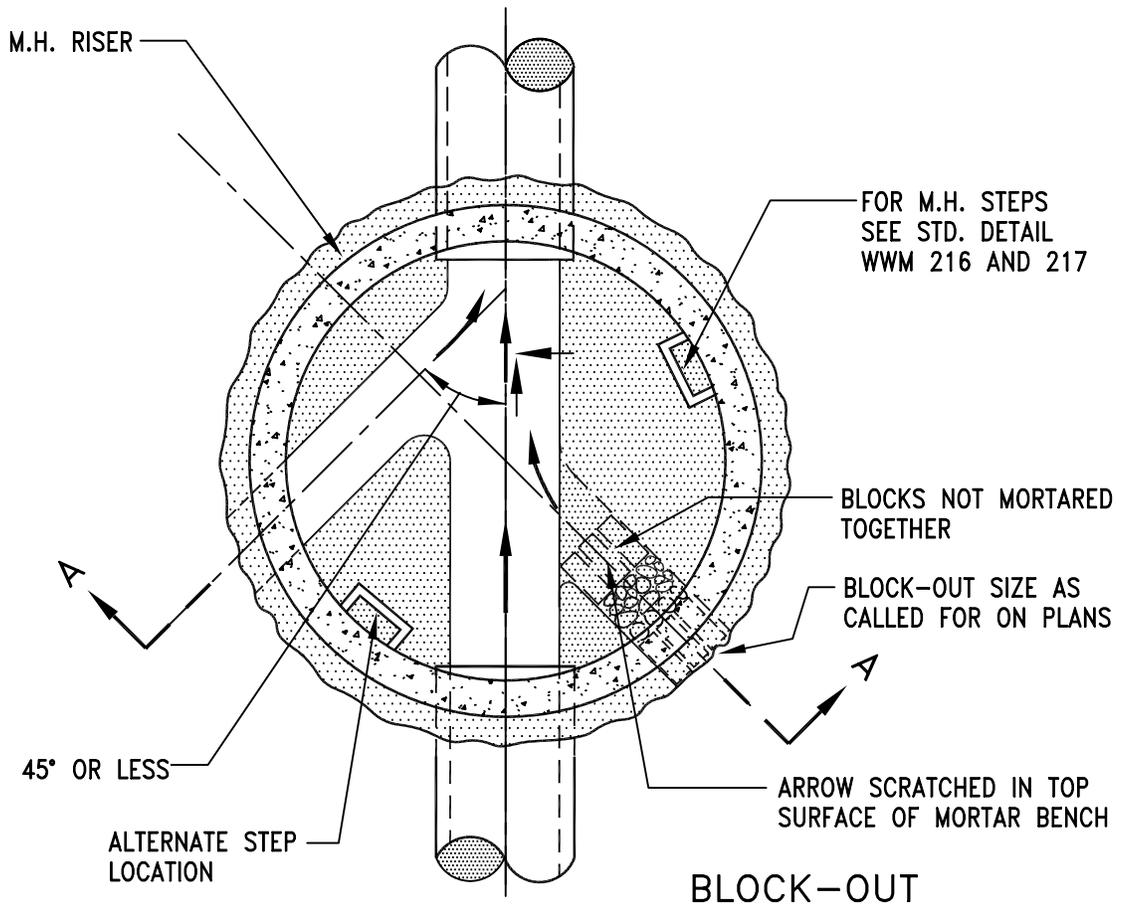


**NOTES:**

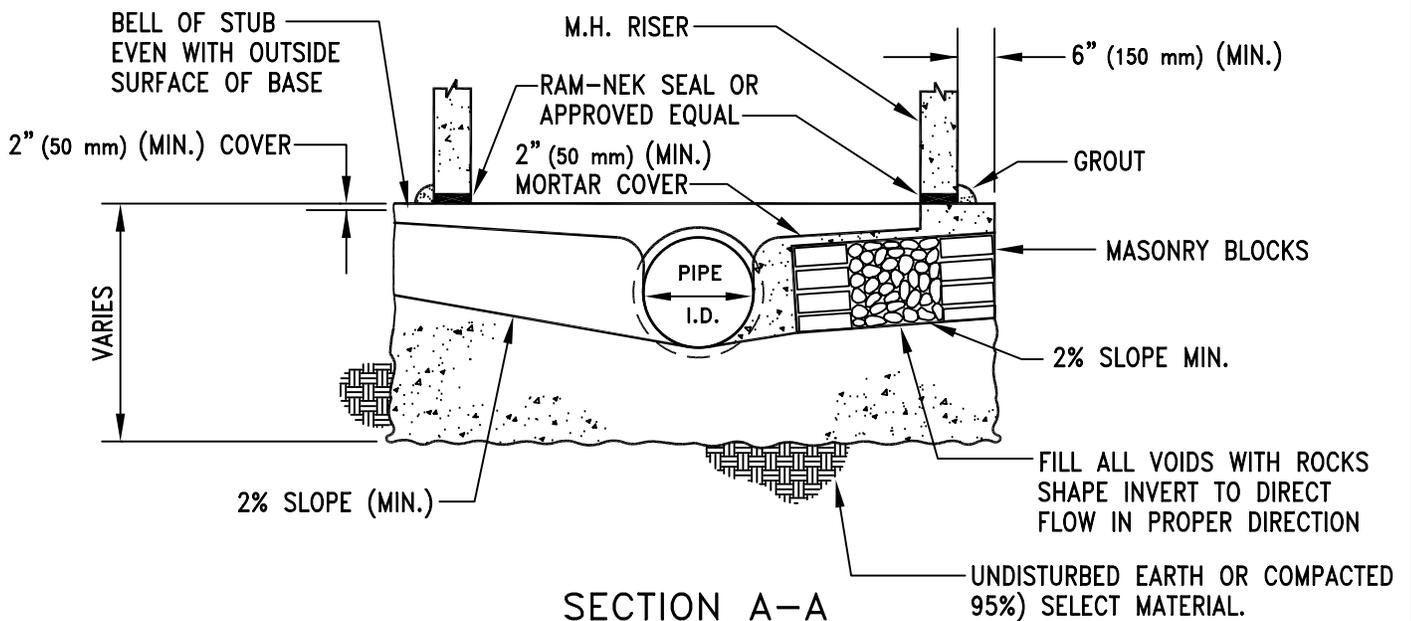
1. SPECIAL DETAILS SHALL BE REQUIRED IN THE FOLLOWING CASES:
  - A. IF P.V.C.-LINED PIPE IS USED.
  - B. AT DEFLECTION MANHOLES.
  - C. IF THE SEWER MAIN IS LARGER THAN 48" (1200 mm) DIAMETER.

2. SPECIAL DETAILS REQUIRE APPROVAL BY PCWMD.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE BASE		WWM 202
REVISED:		24" (600 mm) to 48" (1200 mm) DIAMETER		SHEET 1 OF 1
7/02				

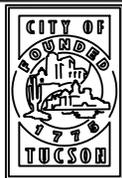


PLAN VIEW



SECTION A-A

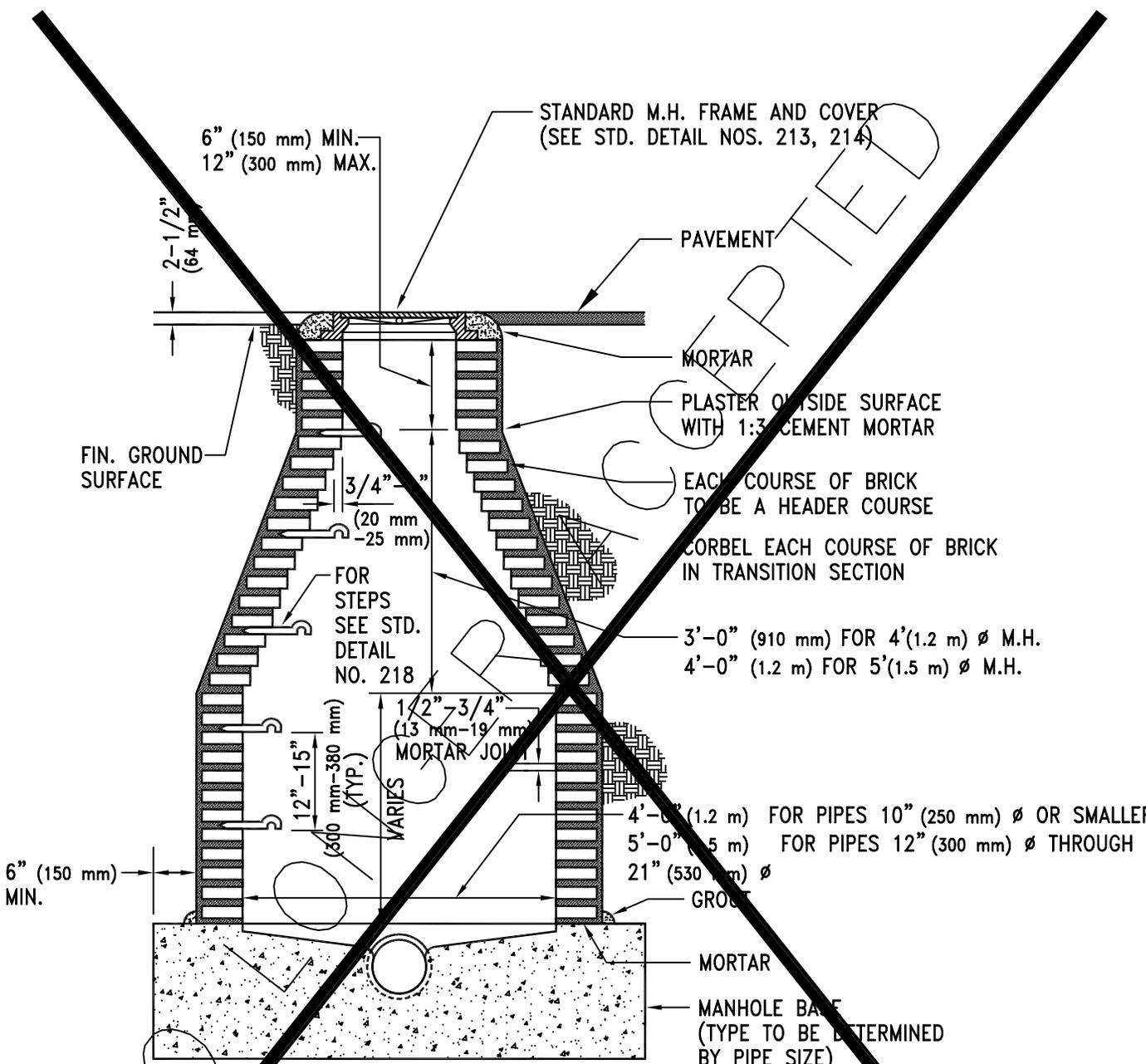
ISSUED:
8/92
REVISED:
7/02



STANDARD DETAIL  
 MANHOLE STUB-OUT  
 AND BLOCK-OUT



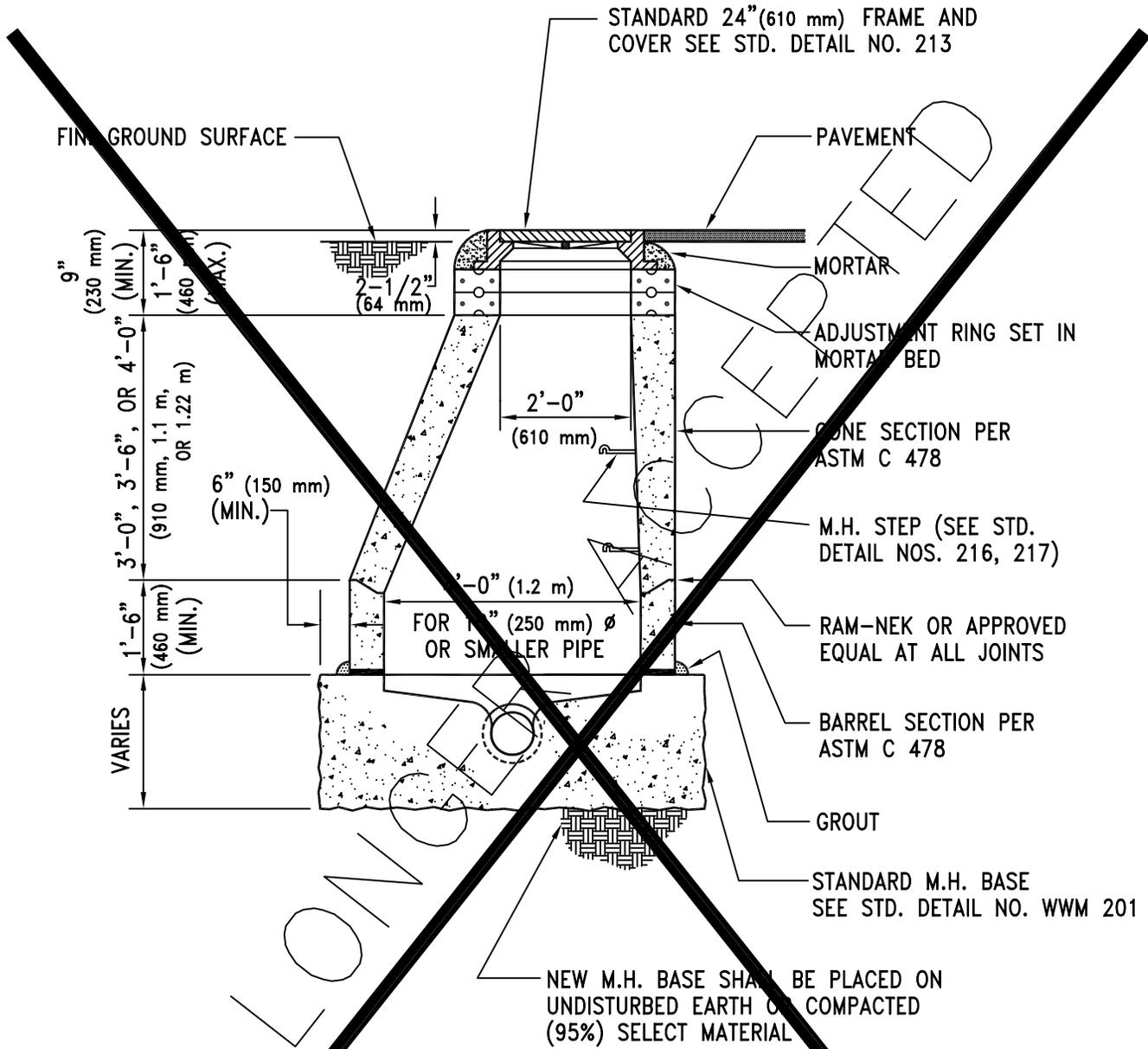
DETAIL NO.
WWM 203
SHEET 1 OF 1



NOTES:

1. COMMON HARD-BURNED BRICK PER ASTM C 32 TO BE LAID IN 1:3 CEMENT MORTAR. SOLID BRICK CONFORMING TO GRADE MM OR MS MUST BE USED
2. STRIKE OFF MORTARED JOINTS INSIDE.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		STANDARD BRICK		WWM
DELETED		MANHOLE		204
7/02				SHEET 1 OF 1



**NOTES:**

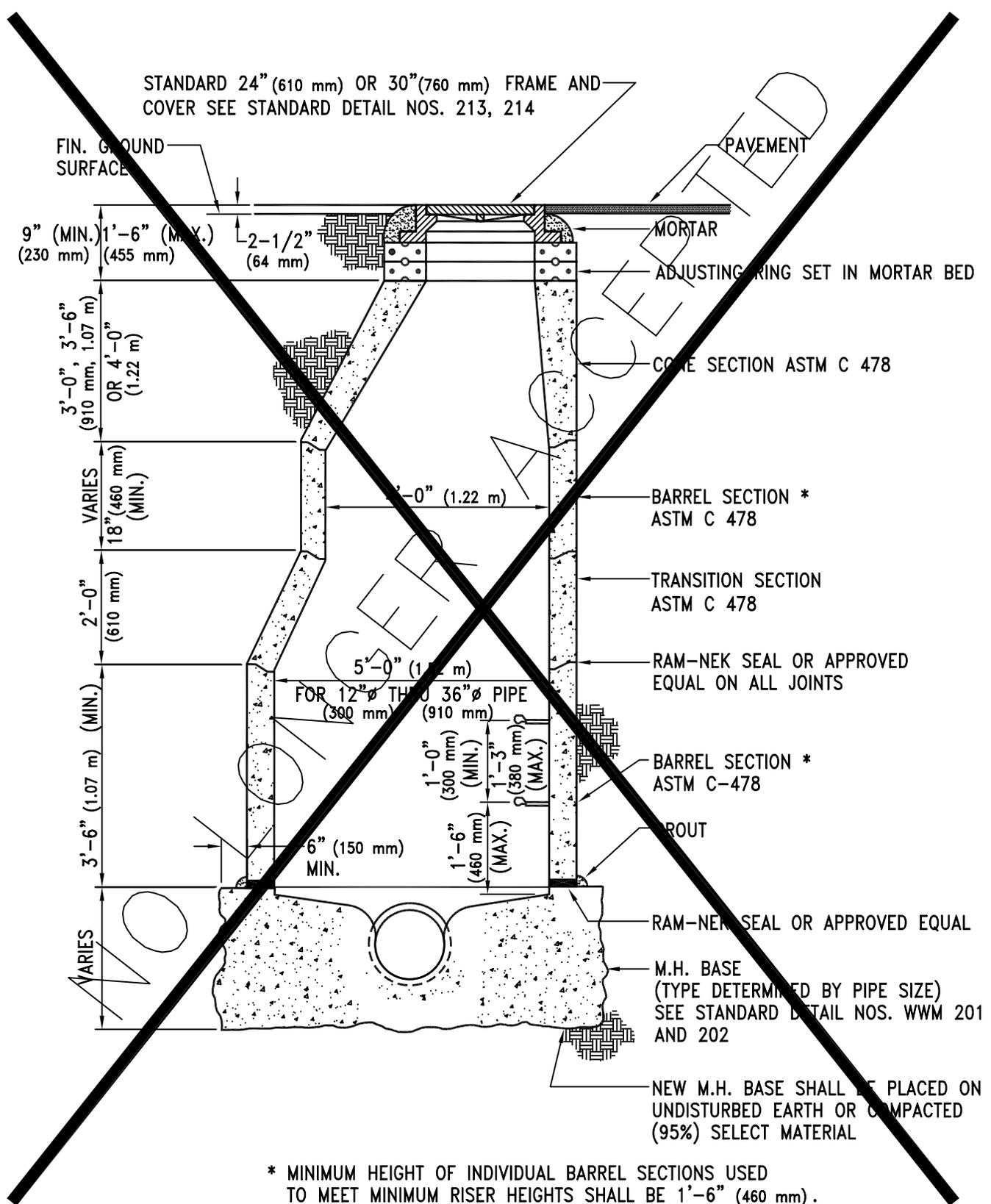
THE MINIMUM THICKNESS OF ANY BARREL OR ADJUSTMENT RING SECTION SHALL BE 1/2 THE INSIDE DIAMETER.

THE MINIMUM WALL THICKNESS OF ANY CONE SECTION SHALL BE 1/2 THE LARGEST INSIDE DIAMETER. THE WALL THICKNESS SHALL NOT BE LESS THAN 5% OR 3/16 INCH (5 MILLIMETERS), WHICHEVER IS GREATER OF THE WALL THICKNESS NOTED ON THE PLANS.

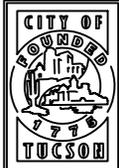
VARIATIONS IN THE INSTALLED LENGTH OF TWO OPPOSITE SIDES OF THE MANHOLE BARREL OR CONE SECTION SHALL NOT EXCEED 5/8 INCH (16 MILLIMETERS).

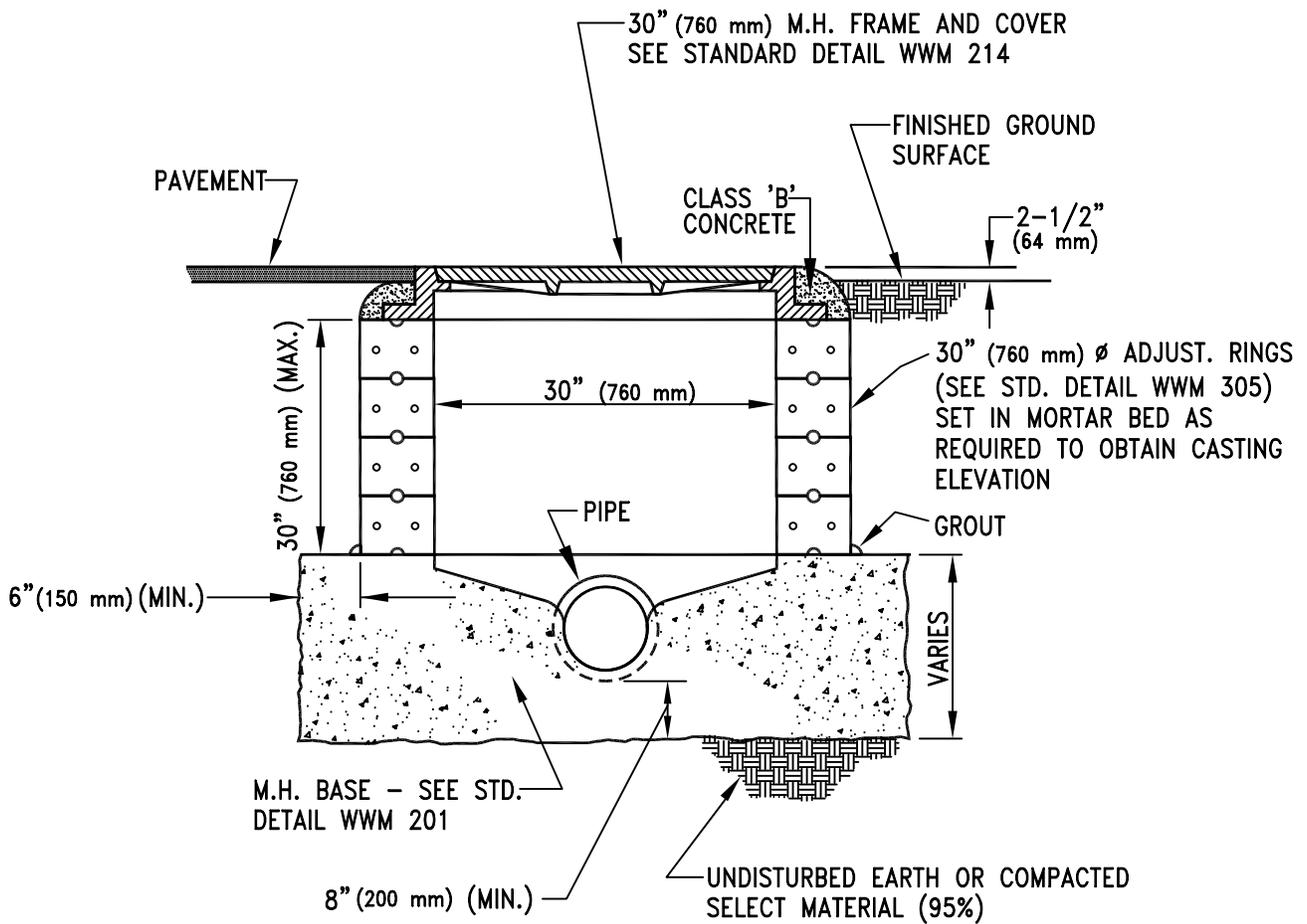
A DEFICIENCY IN THE LENGTH OF A BARREL OR CONE SECTION SHALL NOT BE MORE THAN 1/4 INCH PER FOOT (20 mm per meter) OF THE LENGTH OF THE SECTION WITH A MAXIMUM DEFICIENCY IN THE TOTAL LENGTH OF THE SECTION BEING 1/2 INCH (13 MILLIMETERS).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		PRECAST CONCRETE		WWM
DELETED		MANHOLE (4' DIA)		205
7/02				SHEET 1 OF 1



THE NOTES THAT COMPRISE STD. DET. WWM 205 ARE ALSO APPLICABLE TO THIS DETAIL.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		PRECAST CONCRETE		WWM
DELETED		MANHOLE (5' DIA)		206
7/02				SHEET 1 OF 1

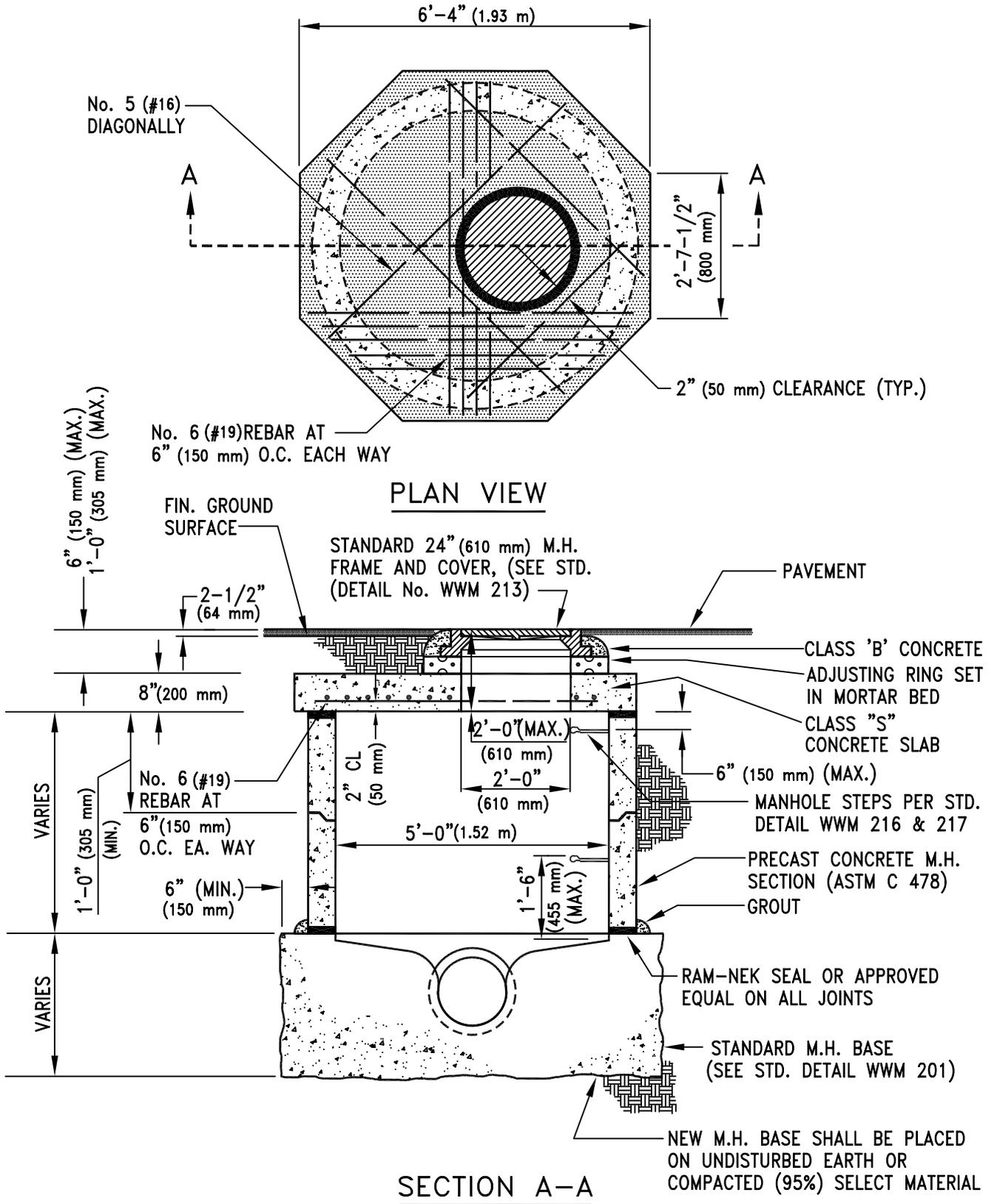


**NOTE:**

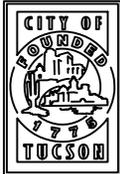
1. USE OF THIS TYPE OF MANHOLE IS SUBJECT TO SPECIAL APPROVAL FROM PCWMD

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SHALLOW MANHOLE		WWM 207
REVISED:				SHEET 1 OF 1
7/02				





ISSUED:	
8/92	
REVISED:	
7/02	



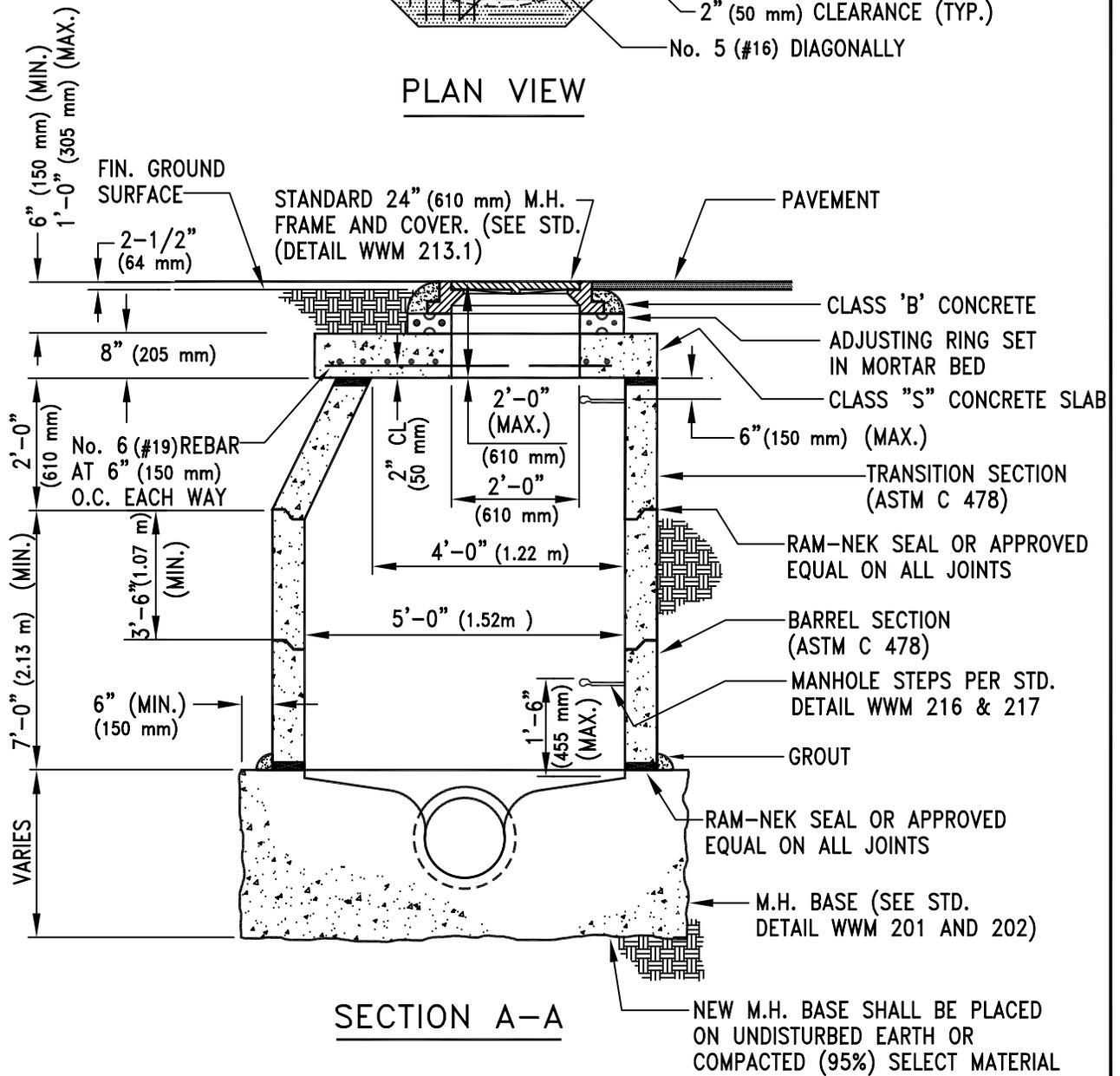
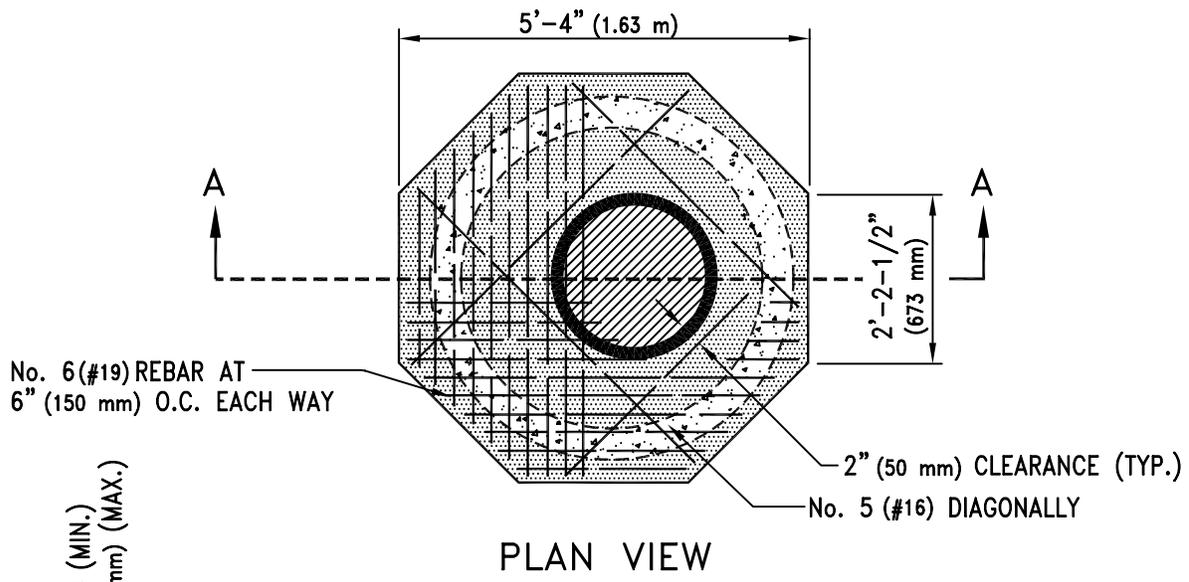
STANDARD DETAIL

FLAT TOP

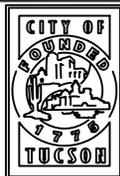
MANHOLE - TYPE "A"



DETAIL NO.	
WWM 209	
SHEET 1 OF 1	



ISSUED:	
8/92	
REVISED:	
7/02	

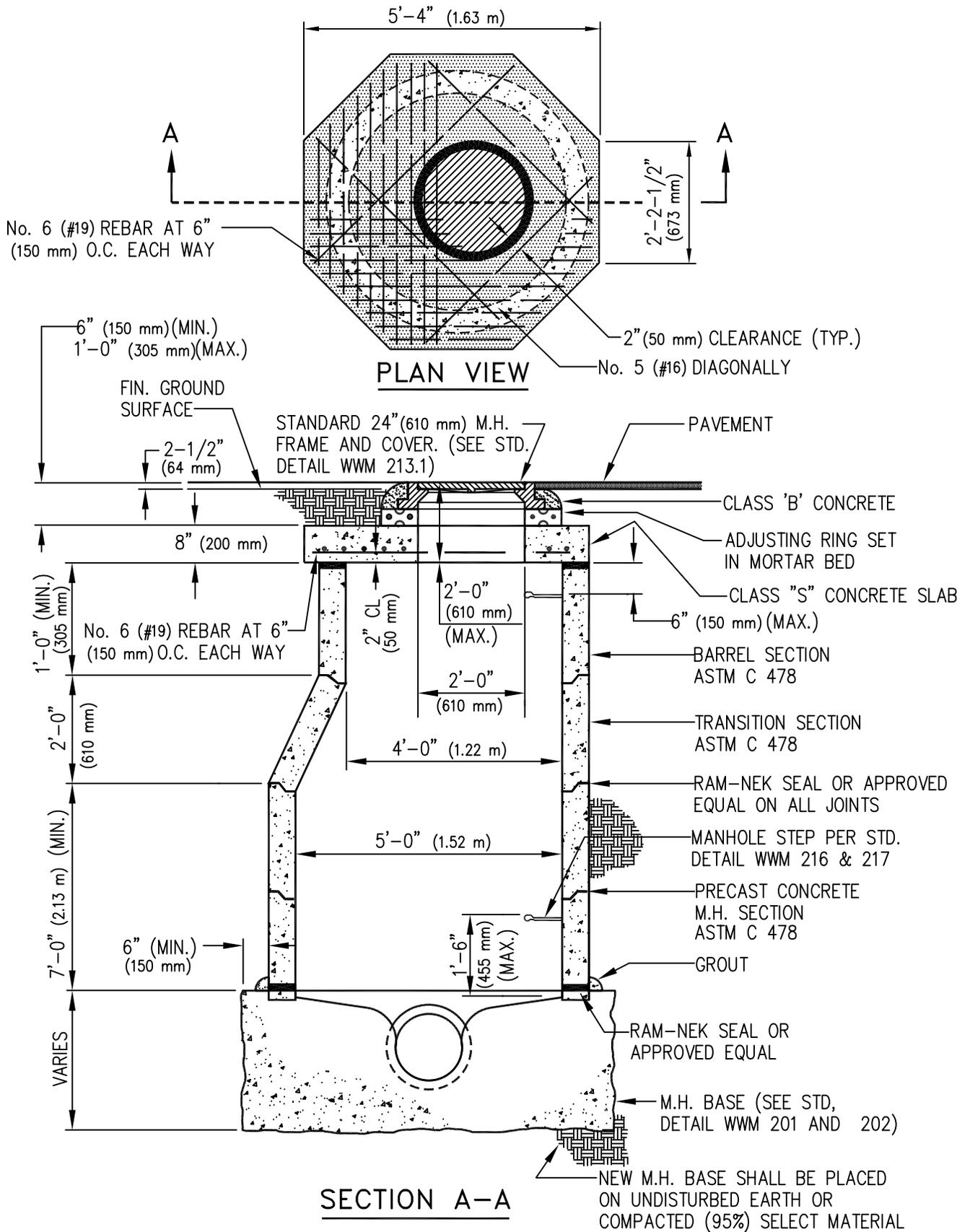


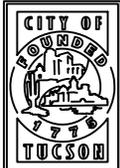
STANDARD DETAIL

FLAT TOP  
MANHOLE - TYPE "B"



DETAIL NO.	
WMM 210	
SHEET 1 OF 1	



ISSUED:	
8/92	
REVISED:	
7/02	

STANDARD DETAIL

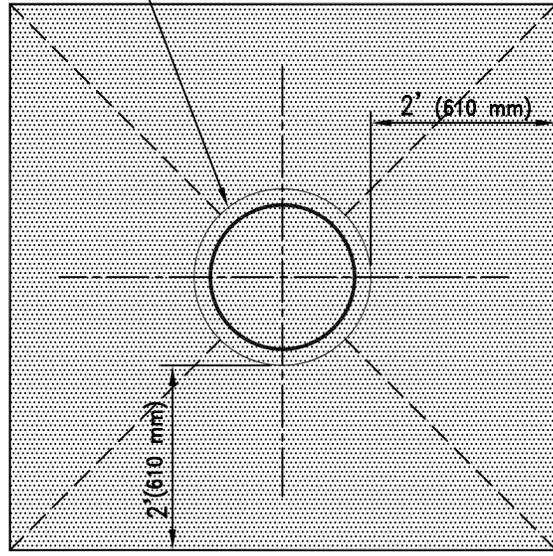
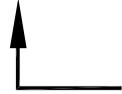
FLAT TOP  
MANHOLE - TYPE "C"



DETAIL NO.
WWM 211
SHEET 1 OF 1

MANHOLE

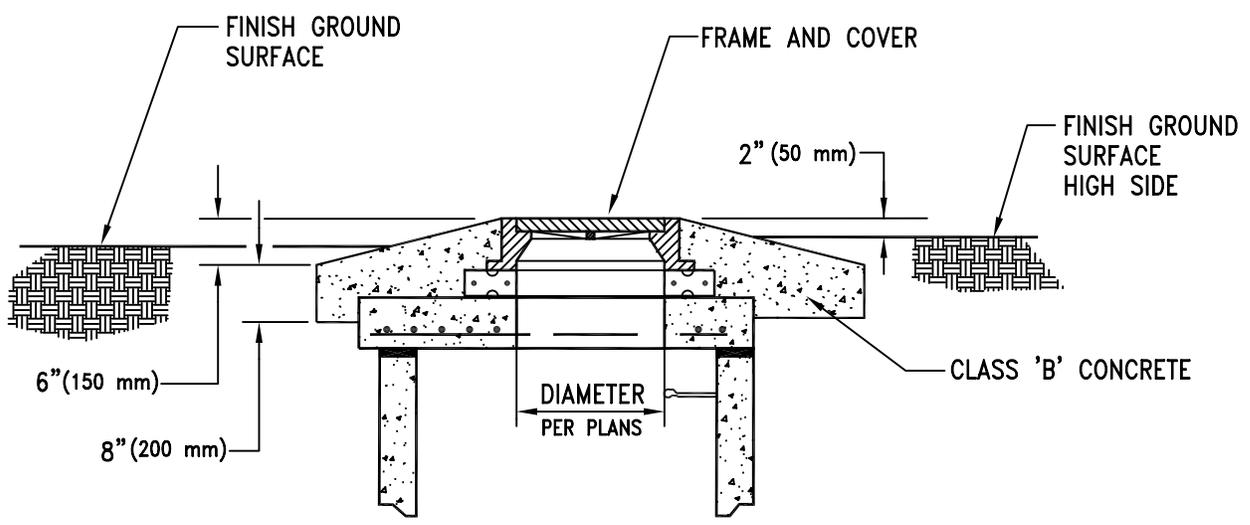
A



A



PLAN



SECTION A-A

ISSUED:
9/93
REVISED:
7/02



STANDARD DETAIL  
UNPAVED AREA  
CONCRETE COLLAR



DETAIL NO.
WWM 212
SHEET 1 OF 1

## GENERAL

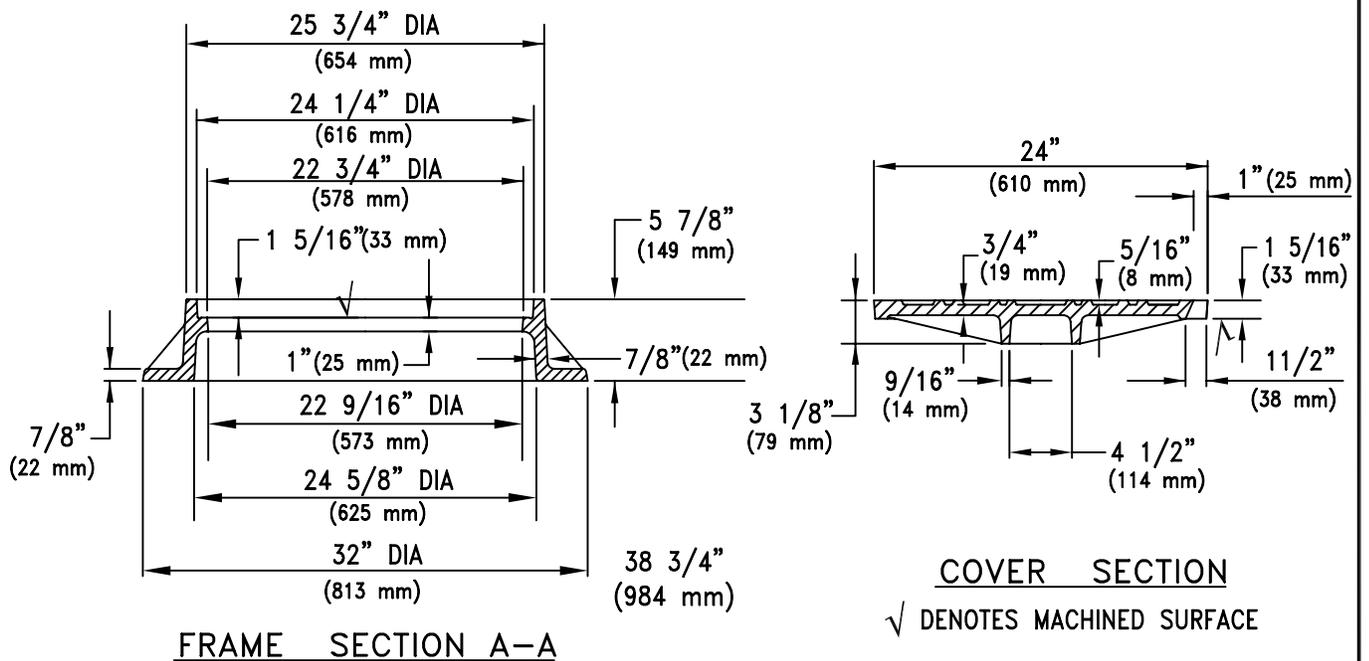
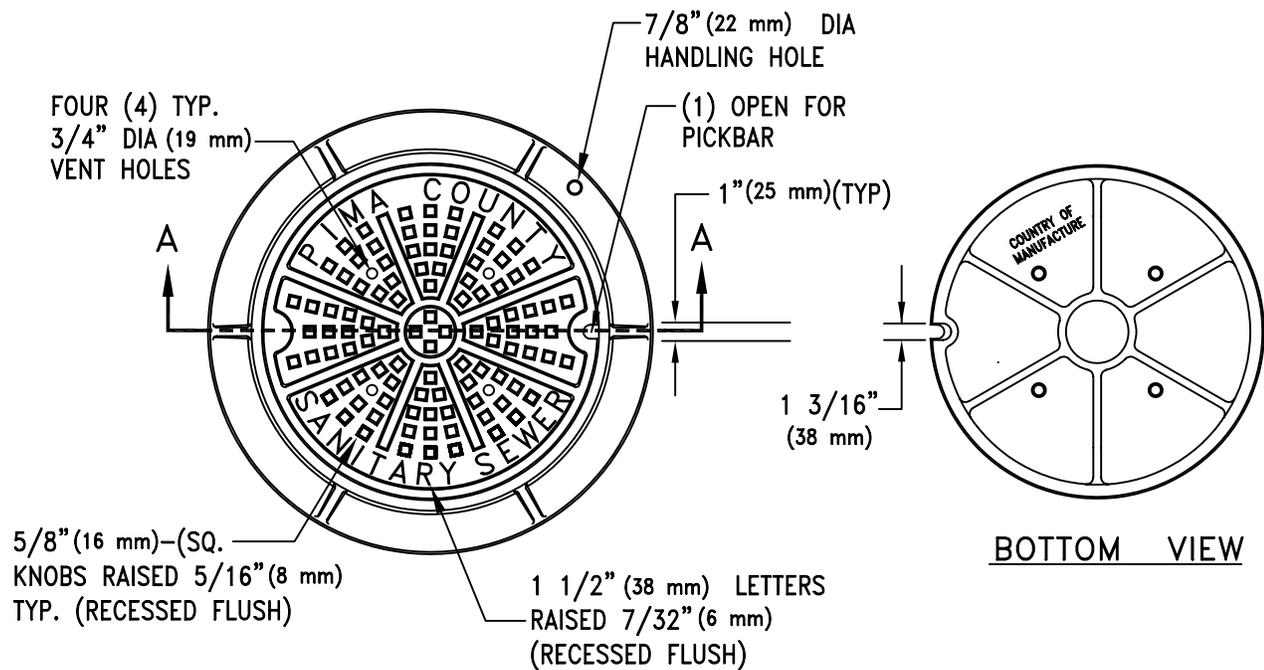
### MANHOLE NOTES:

1. THE MINIMUM WALL THICKNESS OF ANY MANHOLE SECTION SHALL BE 1/12 THE INSIDE DIAMETER OF THE BARREL OR THE LARGEST CONE DIAMETER. THE WALL THICKNESS SHALL NOT VARY FROM THE DESIGN WALL THICKNESS BY MORE THAN FIVE PERCENT OR 3/16 INCH (5 millimeters), WHICHEVER IS GREATER. THE VARIATIONS IN LAYING LENGTHS OF TWO OPPOSITE SIDES OF MANHOLE SECTIONS SHALL NOT BE MORE THAN 5/8 INCH (16 millimeters). THE UNDERRUN IN LENGTH OF A SECTION OF MANHOLE BASE, RISER, OR CONICAL TOP SHALL NOT BE MORE THAN 1/4 INCH (20 millimeters) PER FOOT OF LENGTH WITH A MAXIMUM OF 1/2 INCH (13 millimeters) IN ANY ONE SECTION.

### MANHOLE FRAME/COVER NOTES:

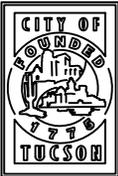
1. ANY VARIATION FROM THE REQUIREMENTS INDICATED BY THE APPLICABLE STANDARD DETAIL SHALL REQUIRE THE SUBMITTAL OF SHOP DRAWINGS FOR REVIEW AND APPROVAL BY PCWMD.
2. FRAMES AND COVERS SHALL BE MADE FROM FERROUS MATERIALS USING AT LEAST 75% POST CONSUMER WASTE. THE BASIC DESIGN, INITIAL SAMPLE CASTINGS AND FIRST ARTICLE INSPECTION (ALSO KNOWN AS FIRST PROOF LOAD TESTS) MUST BE PR-APPROVED BY PIMA COUNTY WASTEWATER MANAGEMENT BEFORE DELIVERY TO SUPPLIERS OR CONTRACTORS. ALL LETTERING ON THE FRAMES AND COVERS MUST MATCH THAT SHOWN ON THE STANDARD DETAILS UNLESS SPECIAL PERMISSION, IN WRITING, IS OBTAINED FROM PIMA COUNTY WASTEWATER MANAGEMENT.
3. PUBLIC SANITARY SEWER COVERS SHALL BE LETTERED "PIMA COUNTY SANITARY SEWER"
4. LETTERING FOR COVERS SHALL BE STANDARD RAISED BLOCK TYPE, AND SHALL BE 1 1/2" (38 mm) TO 2 1/2" (64 mm) HIGH. THE TOTAL WIDTH OF INDIVIDUAL LETTERS ARE TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACES BEFORE AND AFTER WORDS.
5. THE TOP SURFACE OF THE COVER SHALL SIT FLUSH WITH THE TOP SURFACE OF THE FRAME. A UNIFORM 1/8 INCH (3 mm) CLEARANCE SHALL EXIST BETWEEN THE EDGE OF THE COVER AND THE FRAME. ALL HORIZONTAL BEARING SURFACES SHALL BE MACHINE FINISHED.
6. THE DESIGN AND CONSTRUCTION OF PRIVATE SEWAGE CONVEYANCE SYSTEM MAY UTILIZE (OR MAKE REFERENCE TO) CERTAIN PIMA COUNTY WASTEWATER MANAGEMENT SPECIFICATIONS AND DETAILS; HOWEVER PRIVATE SYSTEMS MANHOLE COVERS SHALL NOT BE IMPRINTED WITH THE WORDS "PIMA COUNTY SANITARY SEWER". INSTEAD, THE SEWER MANHOLE COVERS LOCATED ON MANHOLES IN SANITARY SEWER SYSTEMS TO BE OWNED AND OPERATED BY ANYONE OTHER THAN PIMA COUNTY, SHALL HAVE CAST INTO THEM THE WORDS "PRIVATE SANITARY SEWER", OR OTHER APPROPRIATE DESIGNATION.
7. UNLESS OTHERWISE APPROVED BY PCWMD, THE WEIGHT OF THE FRAME AND COVER SHALL BE NO MORE THAN 2% LESS THAN THE APPROXIMATE WEIGHT SPECIFIED IN THE APPLICABLE STANDARD DETAIL FOR EACH COMPONENT.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE AND		WWM 213.0
REVISED:		MANHOLE FRAME/COVER		SHEET 1 OF 1
7/02				

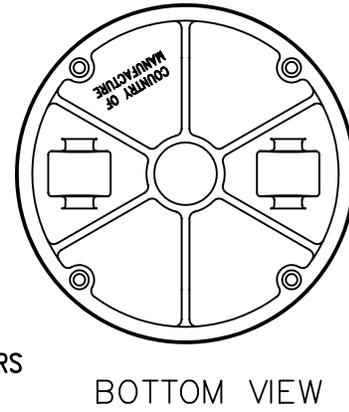
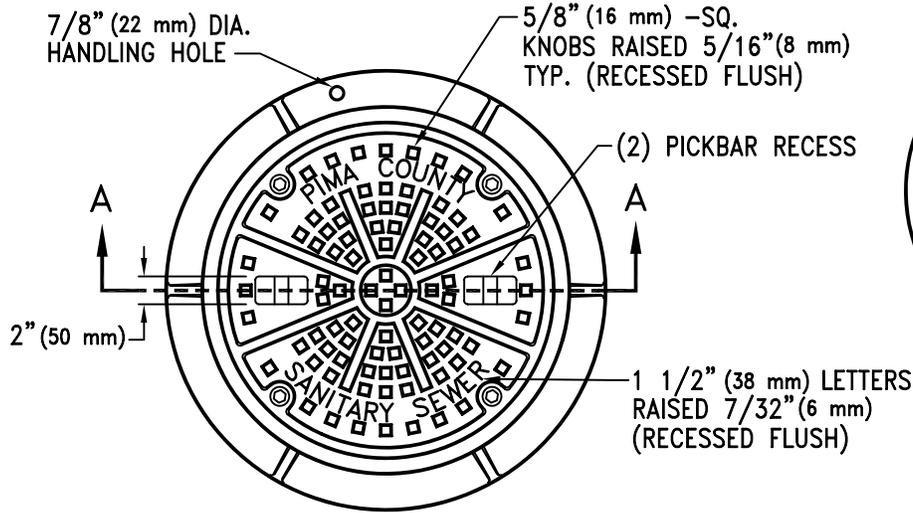


NOTES:

1. REFER TO GENERAL NOTES, STD. DETAIL WWM 213.0
2. FRAME WEIGHT 180 LBS. (82 kg) (APPROX.)
3. COVER WEIGHT 130 LBS. (59 kg) (APPROX.)

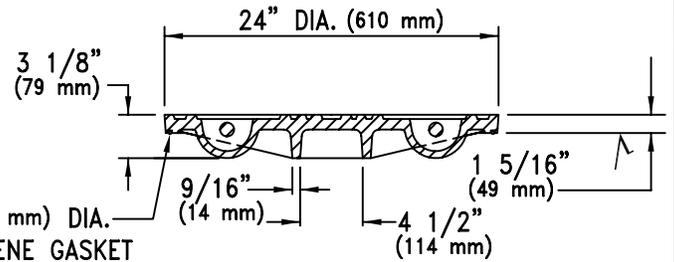
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		24" (610 mm) DIA. MANHOLE		WWM 213.1
REVISED:		FRAME AND COVER		SHEET 1 OF 1
7/02				



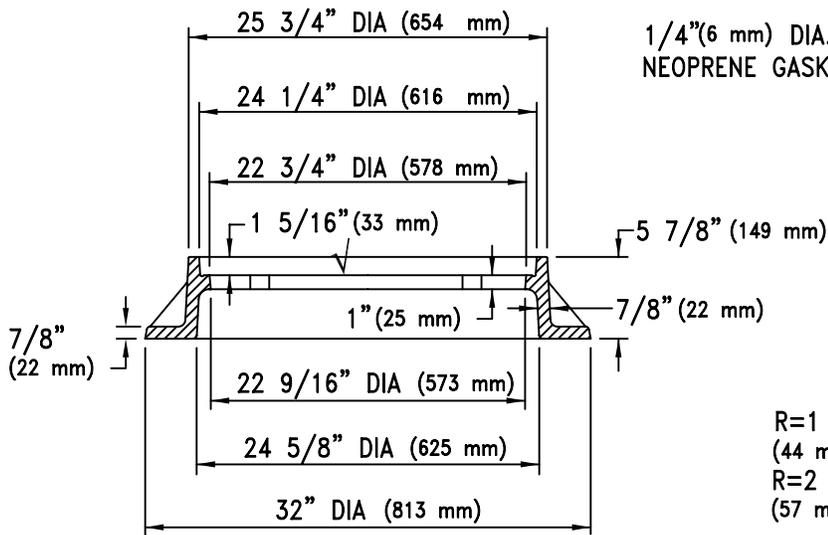


FRAME AND COVER - PLAN VIEW

BOTTOM VIEW

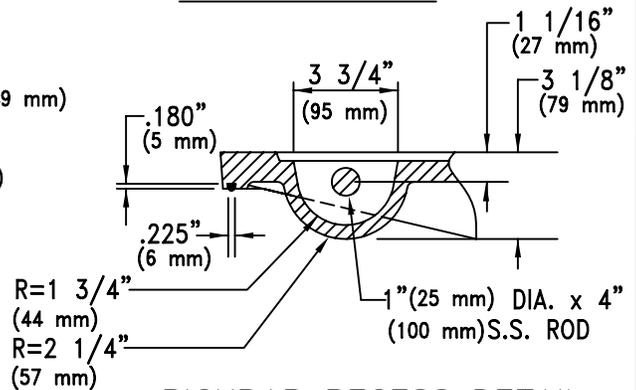


COVER SECTION



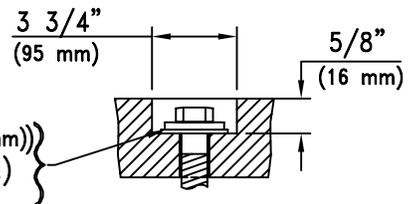
FRAME SECTION A-A

√ DENOTES MACHINED SURFACE



PICKBAR RECESS DETAIL

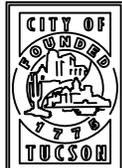
- STAINLESS STEEL HEX. BOLT (1/2" (13 mm) - 13 x 1 3/4" (5 x 44 mm))
- STAINLESS STEEL WASHER (1/2" (13 mm) I.D. x 1 1/4" (32 mm) O.D.)
- RUBBER WASHER (1/2" (13 mm) FLAT)

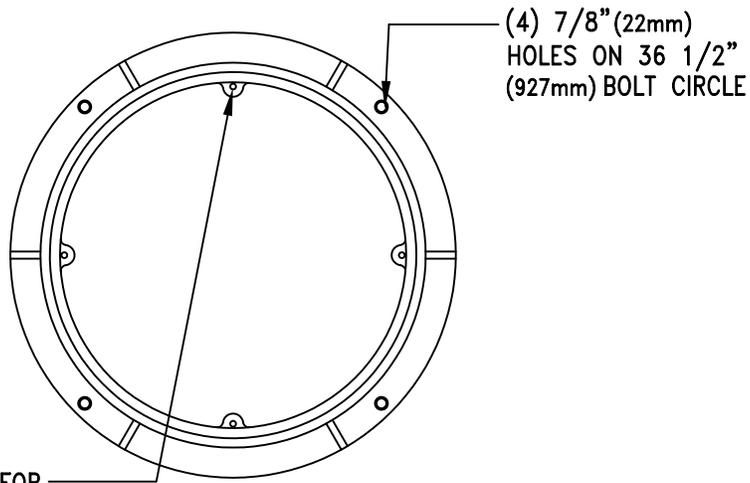


BOLTHOLE DETAIL

NOTES:

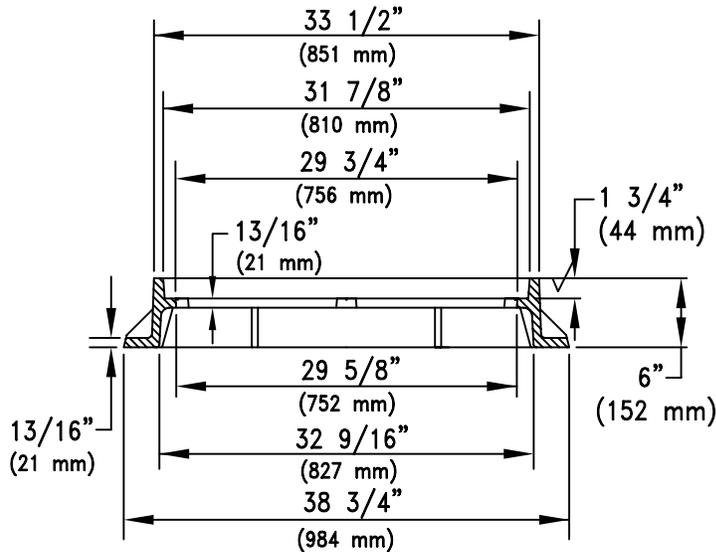
1. REFER TO GENERAL NOTES, STD. DETAIL WWM 213.0.
2. THE COVER SHALL HAVE PICKBAR RECESSES. VENT HOLES SHALL NOT BE PROVIDED.
3. FRAME WEIGHT 180 LBS.(82 Kg) (APPROX.).
4. COVER WEIGHT 130 LBS (59 Kg) (APPROX.).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		24" (610 mm) BOLTED		WWM 213.3
REVISED:		WATERPROOF MANHOLE		
7/02		FRAME AND COVER		SHEET 1 OF 1



DRILL & TAP FOR  
1/2"-13 BOLTS ON  
DRILL DIMPLES  
PROVIDED. TYP.  
(4) PLACES.

FRAME - PLAN VIEW



FRAME SECTION

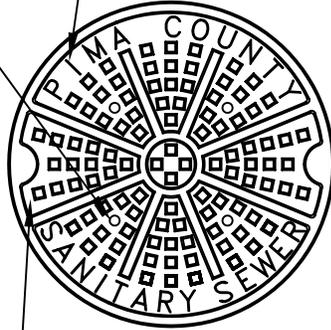
NOTES:

1. REFER TO GENERAL NOTES, STD. DET. WWM 213.0.
2. DETAIL FOR MANHOLES OF MAINS OF 27" (675 mm) DIAMETER OR LARGER.
3. THE COVER SHALL HAVE RECESSES FOR PICK BAR. VENT HOLES SHALL NOT BE PROVIDED.
4. FRAME WEIGHT 200 LBS. (91 kg.) (APPROX.).
5. COVER WEIGHT 217 LBS. (98 kg.) (APPROX.).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		30" (760 mm) DIA. MANHOLE		WWM 214.0
REVISED:		FRAME		SHEET 1 OF 2
7/02				

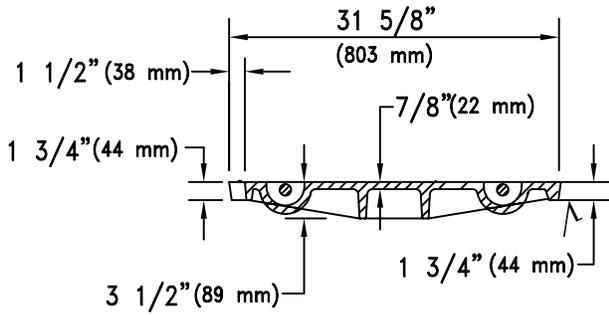
1 1/2" (38 mm) LETTERS  
RAISED 7/32" (6 mm)  
(RECESSED FLUSH)

3/4" DIA (19 mm)  
VENT HOLES  
TYP (4) PLACES.



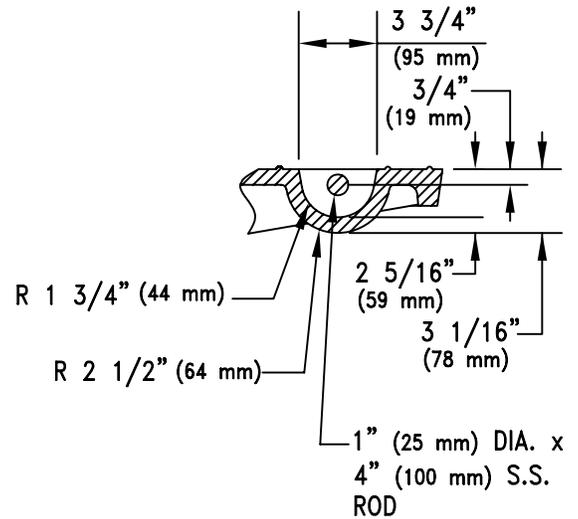
5/8" (16 mm) - (SQ.  
KNOBS RAISED 5/16"  
TYP. (RECESSED FLUSH)

TOP VIEW

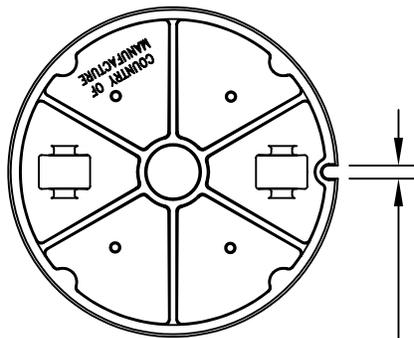


COVER SECTION

✓ DENOTES MACHINED SURFACE



PICKBAR RECESS DETAIL



1 1/4" (32 mm)

BOTTOM VIEW

ISSUED:

8/92

REVISED:

7/02



STANDARD DETAIL

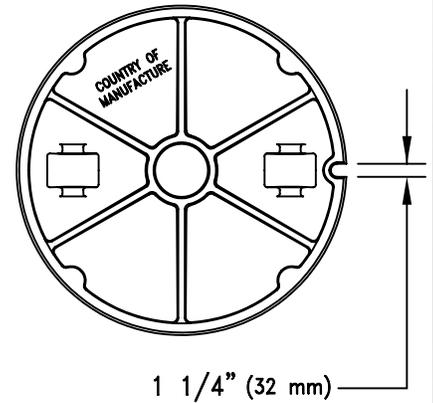
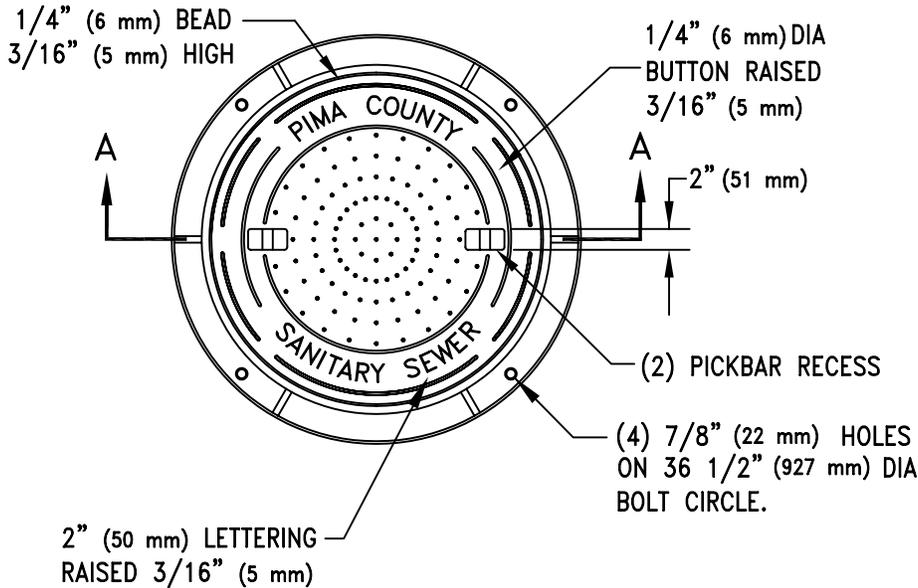
30" (760 mm) DIA. MANHOLE  
COVER



DETAIL NO.

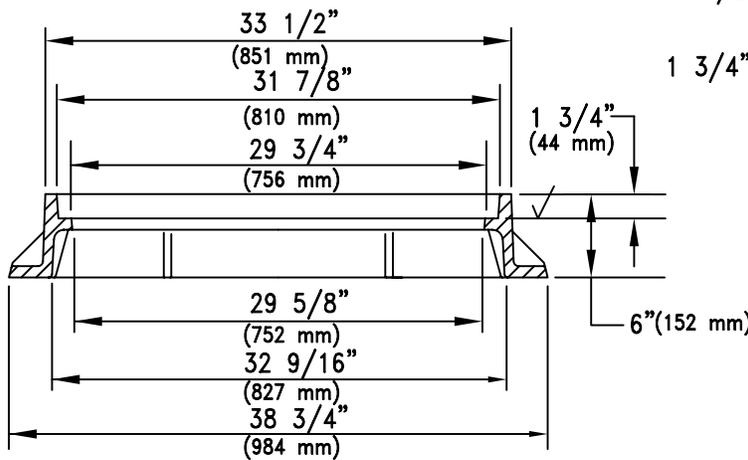
WWW 214.0

SHEET 2 OF 2



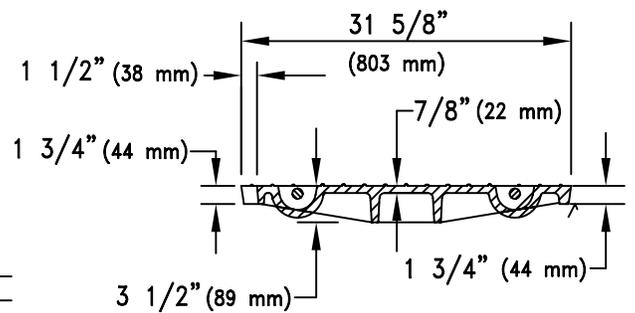
BOTTOM VIEW

FRAME AND COVER – PLAN VIEW

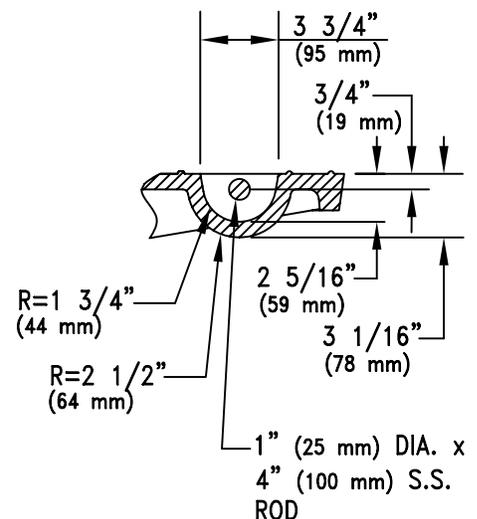


FRAME SECTION A-A

√ DENOTES MACHINED SURFACE



COVER SECTION

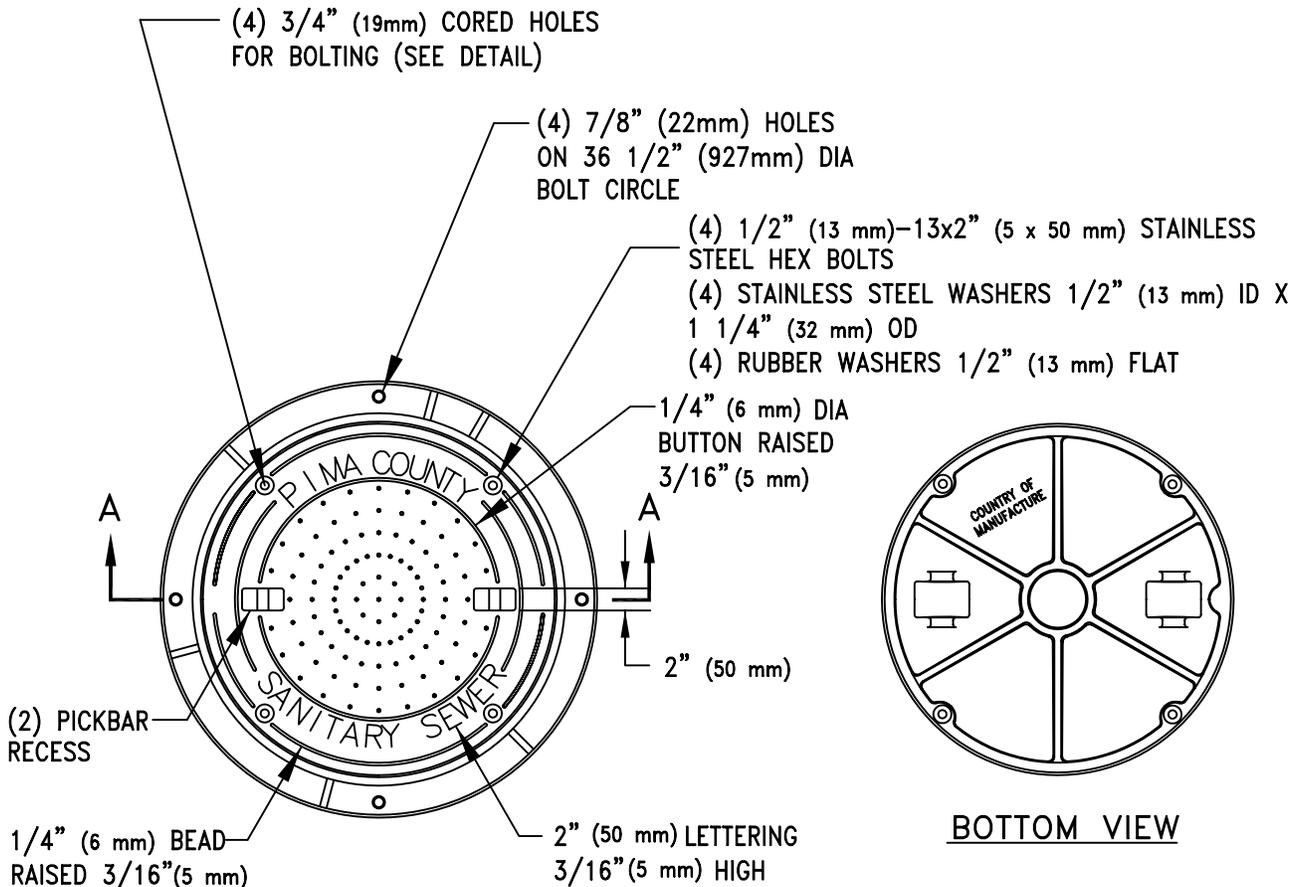


PICKBAR RECESS DETAIL

NOTES:

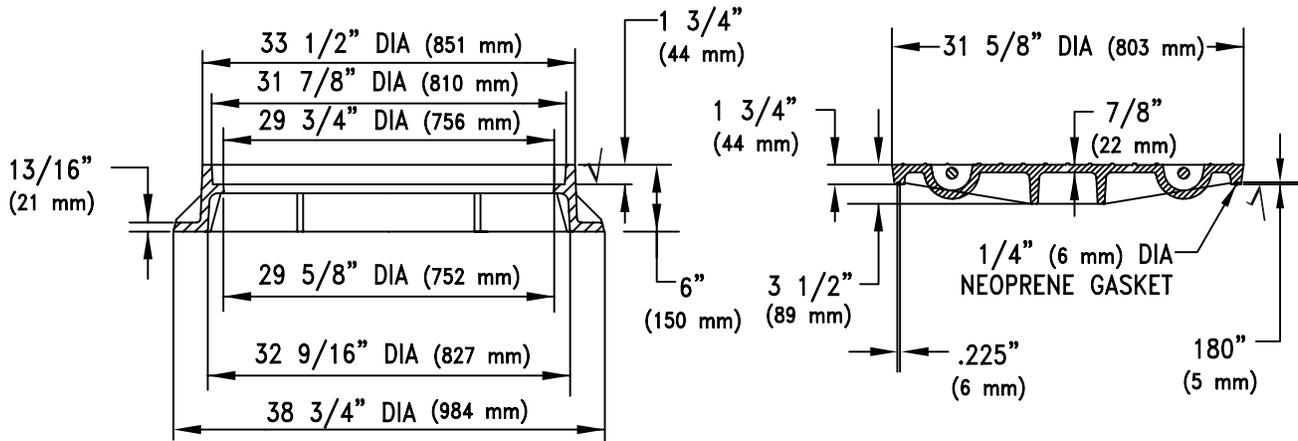
1. REFER TO GENERAL NOTES, STD. DET. WWM 213.0.
2. DETAIL FOR MANHOLES OF MAINS OF 27" (675 mm) DIAMETER OR LARGER.
3. THE COVER SHALL HAVE RECESSES FOR PICK BAR. VENT HOLES SHALL NOT BE PROVIDED.
4. FRAME WEIGHT 200 LBS. (91 kg.) (APPROX.).
5. COVER WEIGHT 217 LBS. (98 kg.) (APPROX.).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		30" (760 mm) WATERPROOF MANHOLE FRAME AND COVER		WWM 214.1
REVISED:				SHEET 1 OF 1
1/02				



**BOTTOM VIEW**

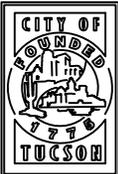
**FRAME AND COVER - PLAN VIEW**

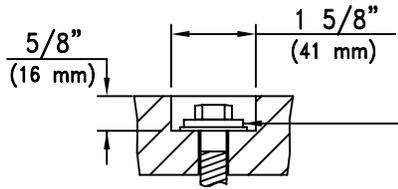


**FRAME SECTION A-A**

**COVER SECTION**

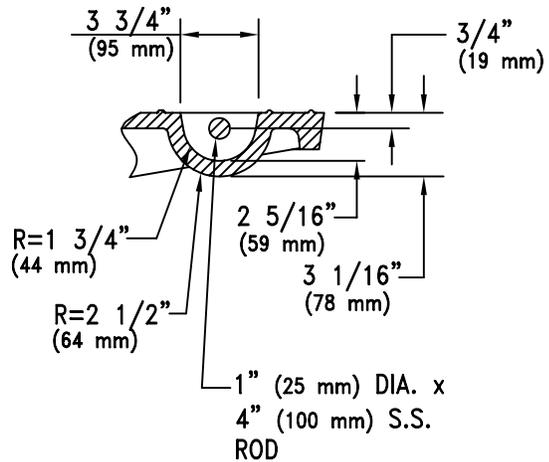
√ DENOTES MACHINED SURFACE

ISSUED:		STANDARD DETAIL		DETAIL NO.	
8/92		30" (760 mm) BOLTED WATERPROOF MANHOLE FRAME AND COVER		WWM 214.2	
REVISED:					SHEET 1 OF 2
7/02					



STAINLESS STEEL HEX BOLTS 1/2" (13 mm) - 13x2" (5x50 mm) BOLTS  
 STAINLESS STEEL WASHER 1/2" (13 mm) I.D. X 1 1/4" (32 mm) O.D.  
 RUBBER WASHER 1/2" (13 mm) FLAT

BOLT HOLE DETAIL

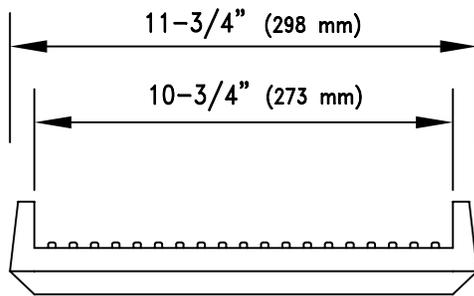
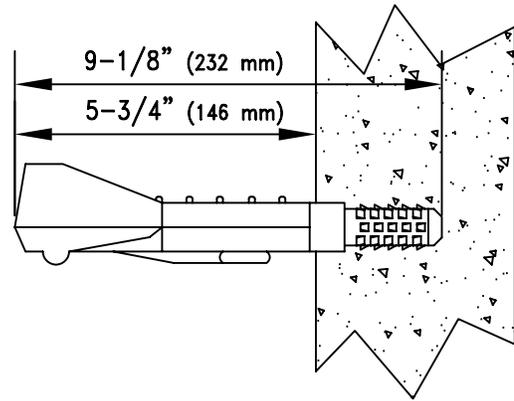
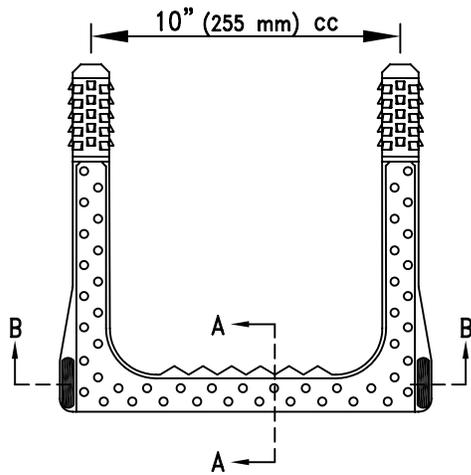


PICKBAR RECESS DETAIL

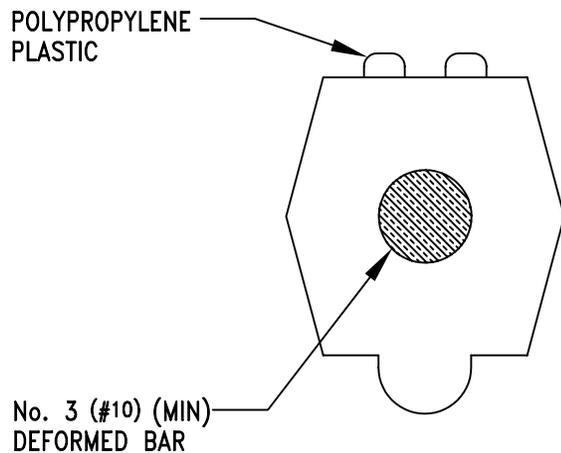
NOTES:

1. REFER TO GENERAL NOTES, STD. DET. WWM 213.0.
2. DETAIL FOR MANHOLES OF MAINS OF 27" (675 mm) DIAMETER OR LARGER.
3. THE COVER SHALL HAVE RECESSES FOR PICKBARS. VENT HOLES SHALL NOT BE PROVIDED.
4. FRAME WEIGHT 200 LBS. (91 Kg) (APPROX.).
5. COVER WEIGHT 217 LBS. (98 Kg) (APPROX.).

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		30" (760 mm) BOLTED		WWM 214.2
REVISED:		WATERPROOF MANHOLE		SHEET 2 OF 2
7/02		FRAME AND COVER		



SECTION B-B

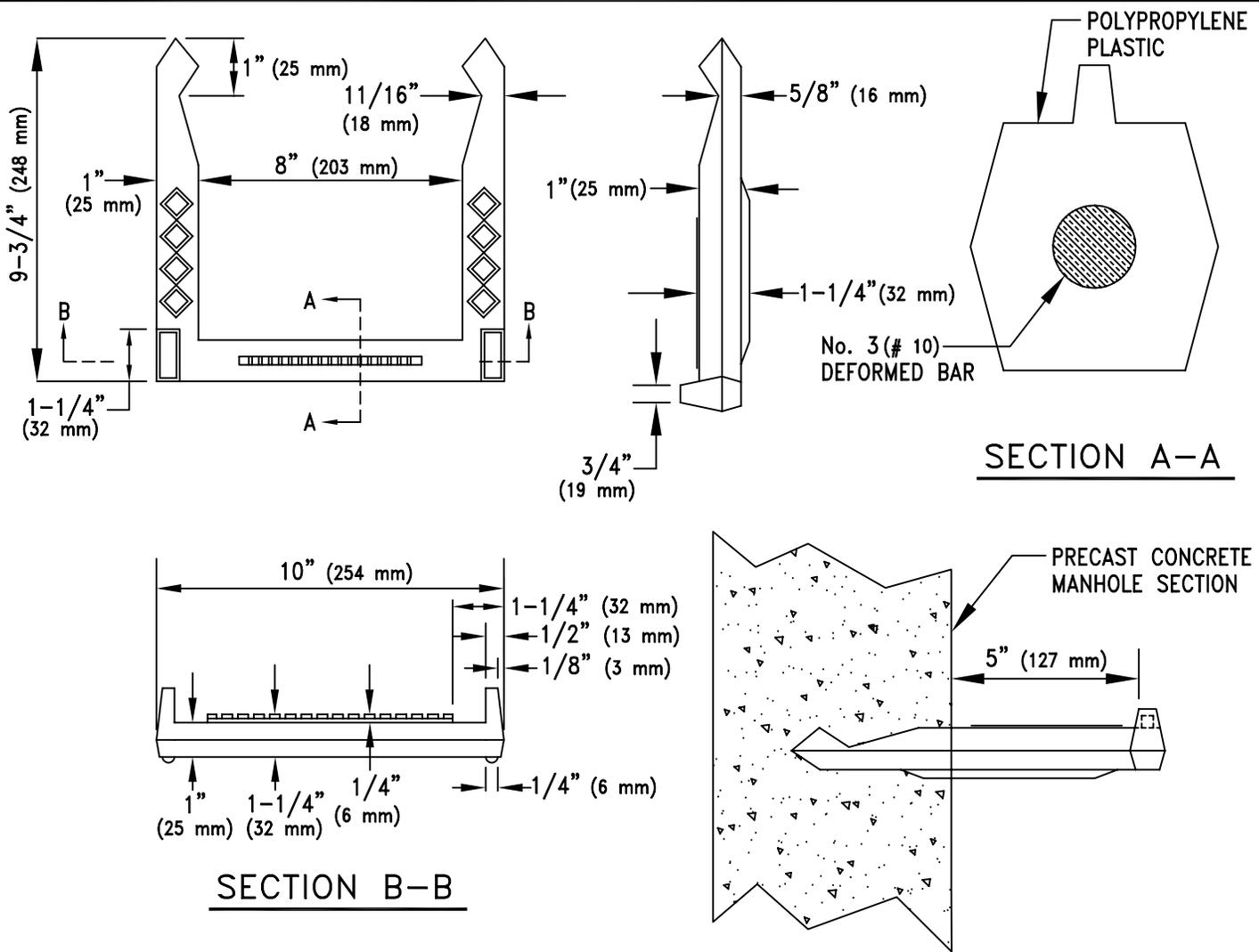


SECTION A-A

**NOTES:**

1. STEPS FOR PRECAST CONCRETE MANHOLES SHALL BE OF STEEL REINFORCED POLYPROPYLENE; M.A. INDUSTRIES INC., NO. PS-IPF, LANE INTERNATIONAL CORP. P-10938, NEXTEP MWT288 OR APPROVED EQUAL.
2. STEPS SHALL BE LOCATED AS FOLLOWS: UPPERMOST STEP SHALL BE NO MORE THAN 2'-2" (660 mm) BELOW TOP OF MANHOLE COVER; INTERMEDIATE STEPS SHALL BE SPACED AT 1'-0" (305 mm) MIN., 1'-3" (380 mm) MAX CENTER TO CENTER. THE BOTTOM STEP SHALL BE NO MORE THAN 1'-6" (455 mm) ABOVE THE FINISHED MANHOLE BASE.
3. STEPS TO BE DRIVEN INTO PRE-FORMED HOLES IN PRECAST CONCRETE MANHOLE SECTIONS BY THE MANHOLE MANUFACTURER PRIOR TO DELIVERY TO THE JOB SITE.
4. ALL STEPS WITHIN A MANHOLE SHALL BE OF THE SAME DESIGN, TYPE AND SIZE. (MIXING OF UNMATCHED STEPS WITHIN THE SAME MANHOLE IS NOT PERMITTED).
5. ALL STEPS WITHIN A MANHOLE SHALL BE ALIGNED VERTICALLY.
6. STEPS CAN BE USED FOR CAST IN PLACE REINFORCED CONCRETE JUNCTION BOXES.
7. LOOSE STEPS SHALL BE CAUSE FOR REJECTION OF THAT MANHOLE SECTION.

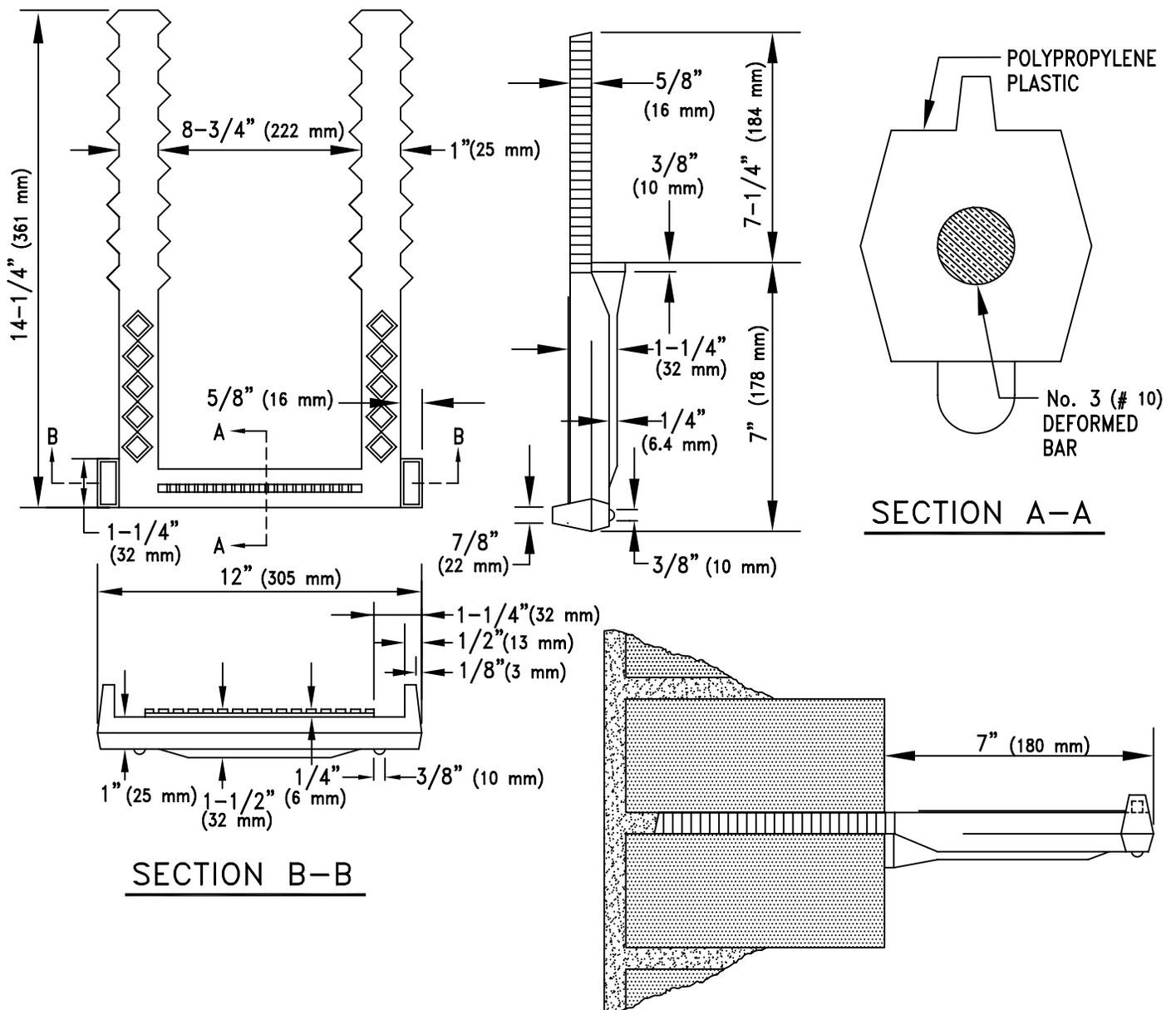
ISSUED:		STANDARD DETAIL		DETAIL NO.
2/93		MANHOLE STEP		WWM 216
REVISED:		TYPE I		SHEET 1 OF 1
7/02				



**NOTES:**

1. STEPS FOR MANHOLES SHALL BE OF STEEL REINFORCED POLYPROPYLENE PLASTIC, M.A. INDUSTRIES, INC., NO. PS-3 OR AN APPROVED EQUAL.
2. STEPS SHALL BE LOCATED AS FOLLOWS: UPPERMOST STEP SHALL BE NO MORE THAN 2'-2" (660 mm) BELOW TOP OF MANHOLE COVER; INTERMEDIATE STEPS SHALL BE SPACED AT 1'-0" (305 mm) MIN., 1'-3" (380 mm) MAX CENTER TO CENTER. THE BOTTOM STEP SHALL BE NO MORE THAN 1'-6" (455 mm) ABOVE THE FINISHED MANHOLE BASE.
3. STEPS FOR PRECAST CONCRETE MANHOLES SHALL BE CAST INTO THE CONCRETE WALL DURING MANUFACTURE OR MORTARED, WITH NON-SHRINK GROUT, INTO HOLES AFTER CONCRETE HAS SET, AND PRIOR TO DELIVERY TO THE JOB SITE.
4. ALL STEPS WITHIN A MANHOLE SHALL BE OF THE SAME DESIGN, TYPE AND SIZE.
5. ALL STEPS WITHIN EACH MANHOLE SHALL BE ALIGNED VERTICALLY.
6. STEPS CAN BE USED FOR CAST IN PLACE REINFORCED CONCRETE JUNCTION BOXES.
7. LOOSE STEPS SHALL BE CAUSE FOR REJECTION OF THAT MANHOLE SECTION.

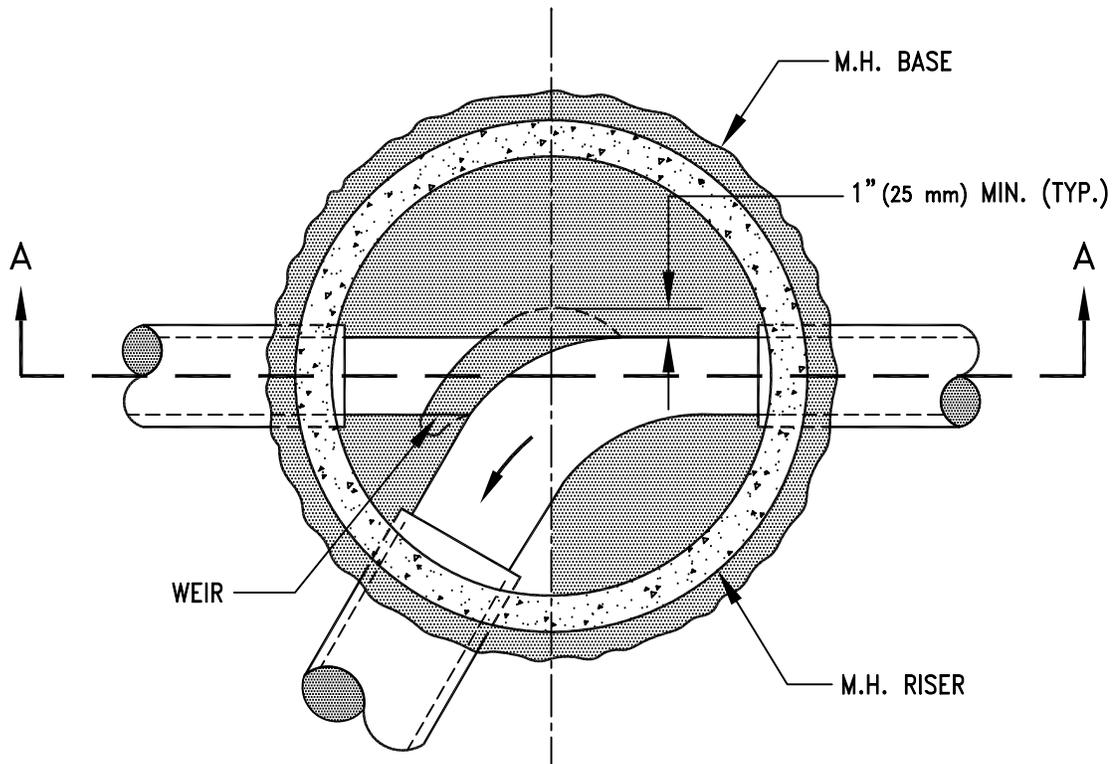
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE STEP TYPE 2		WWM 217
REVISED:				SHEET 1 OF 1
7/02				



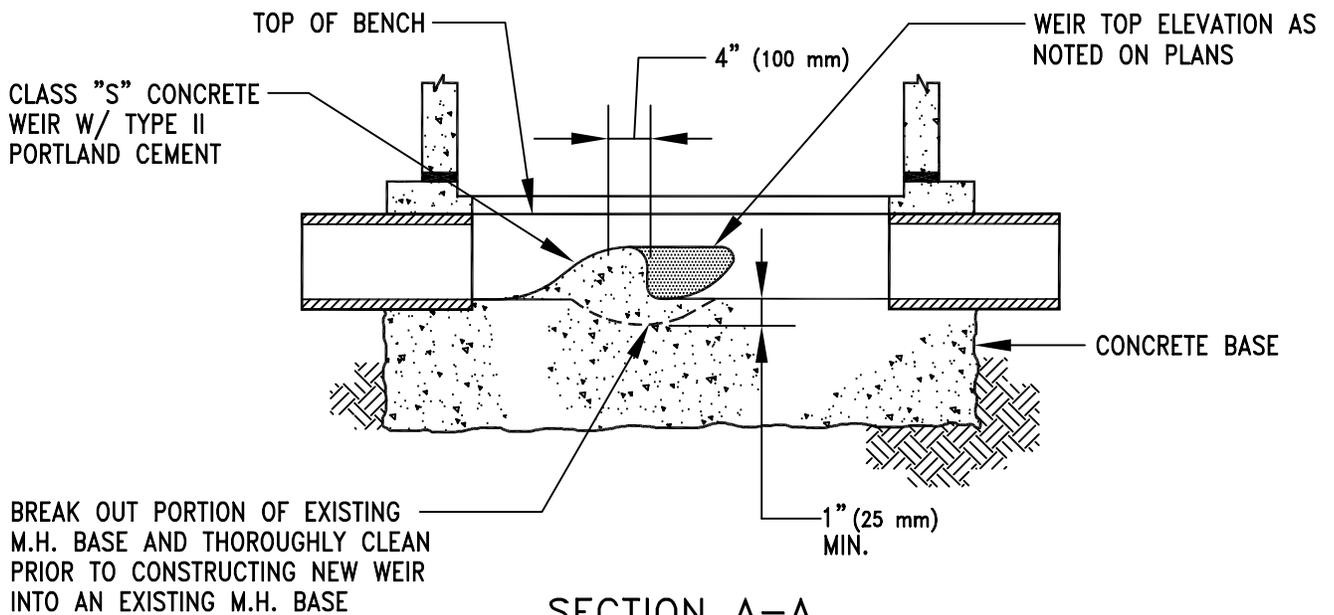
**NOTES:**

1. STEPS FOR BRICK MANHOLES SHALL BE OF STEEL REINFORCED POLYPROPYLENE PLASTIC, M.A. INDUSTRIES, INC., NO. PS-1B OR AN APPROVED EQUAL.
2. STEPS SHALL BE LOCATED AS FOLLOWS: UPPERMOST STEP SHALL BE NO MORE THAN 2'-2" (660 mm) BELOW TOP OF MANHOLE COVER; INTERMEDIATE STEPS SHALL BE SPACED AT 1'-0" (305 mm) MIN., 1'-3" (380 mm) MAX CENTER TO CENTER. THE BOTTOM STEP SHALL BE NO MORE THAN 1'-6" (455 mm) ABOVE THE FINISHED MANHOLE BASE.
3. STEPS SHALL BE INSTALLED IN MORTAR JOINT OF BRICK MANHOLE.
4. ALL STEPS WITHIN A MANHOLE SHALL BE OF THE SAME DESIGN, TYPE AND SIZE. (MIXING OF UNMATCHED STEPS WITHIN THE SAME MANHOLE IS NOT PERMITTED).
5. ALL STEPS WITHIN A MANHOLE SHALL BE ALIGNED VERTICALLY.
6. LOOSE STEPS SHALL BE CAUSE FOR REJECTION OF THE MANHOLE.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE STEP		WWM 218
REVISED:		TYPE 3		SHEET 1 OF 1
7/02				



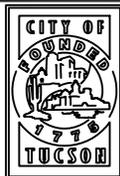
PLAN VIEW



SECTION A-A

DET219.DWG 08/23/00 16:38

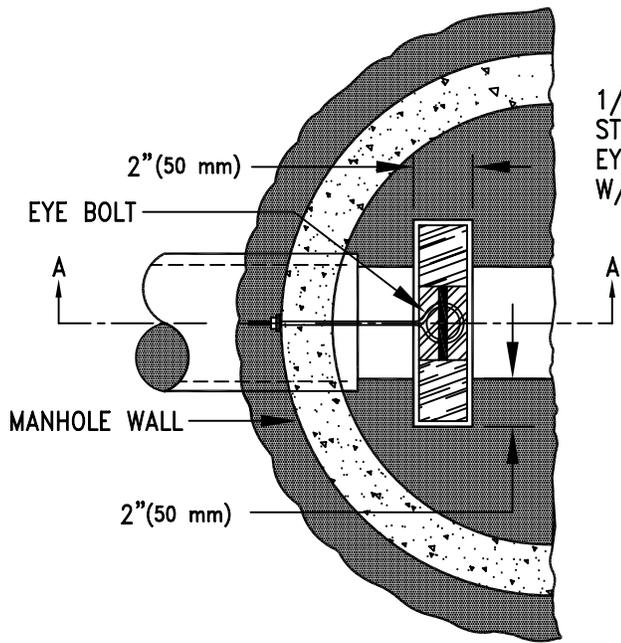
ISSUED:
8/92
REVISED:
7/02



STANDARD DETAIL
CONCRETE WEIR



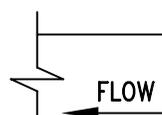
DETAIL NO.
WWM 219
SHEET 1 OF 1



DETAIL

1/2" (13 mm) DIA. STAINLESS STEEL (TYPE 304) THREADED EYE-BOLT (2" (50 mm) I.D.) W/ NUT AND WASHER

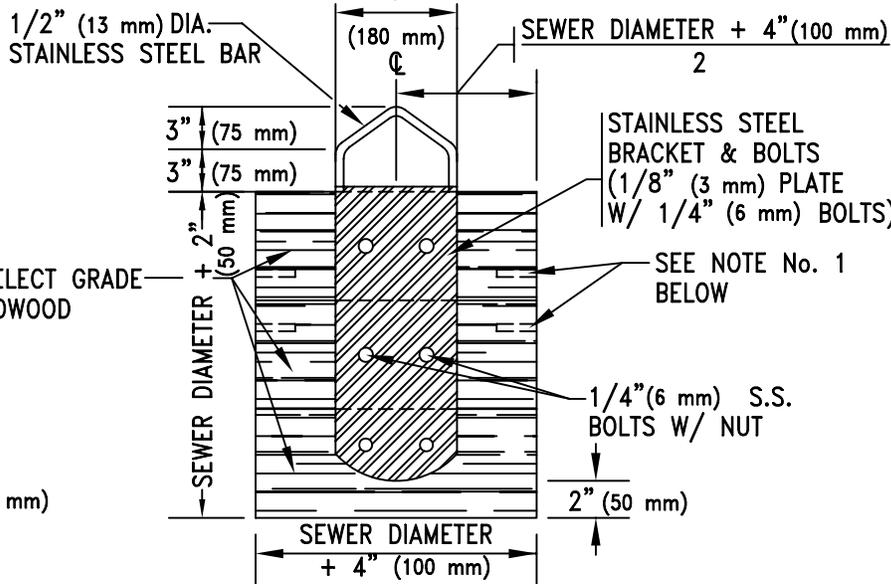
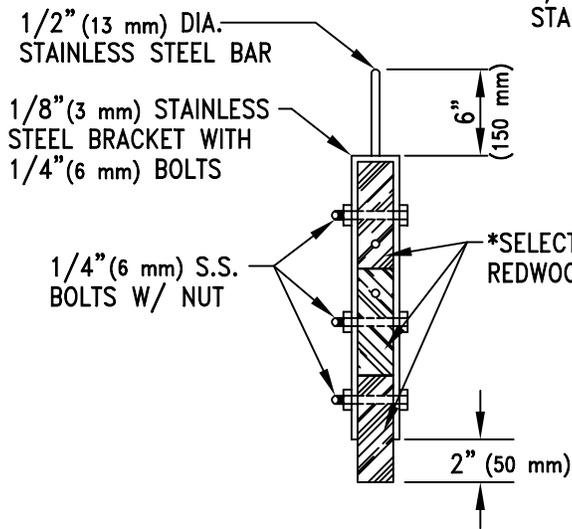
REDWOOD GATE  
MANHOLE WALL



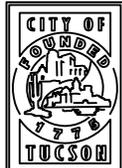
SECTION A-A

SIDE VIEW OF GATE

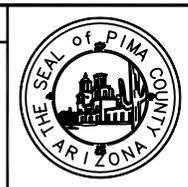
BACK VIEW OF GATE



\* SELECT GRADE 2" (50 mm) X 6" (150 mm) REDWOOD BOARDS - ROUGH CUT

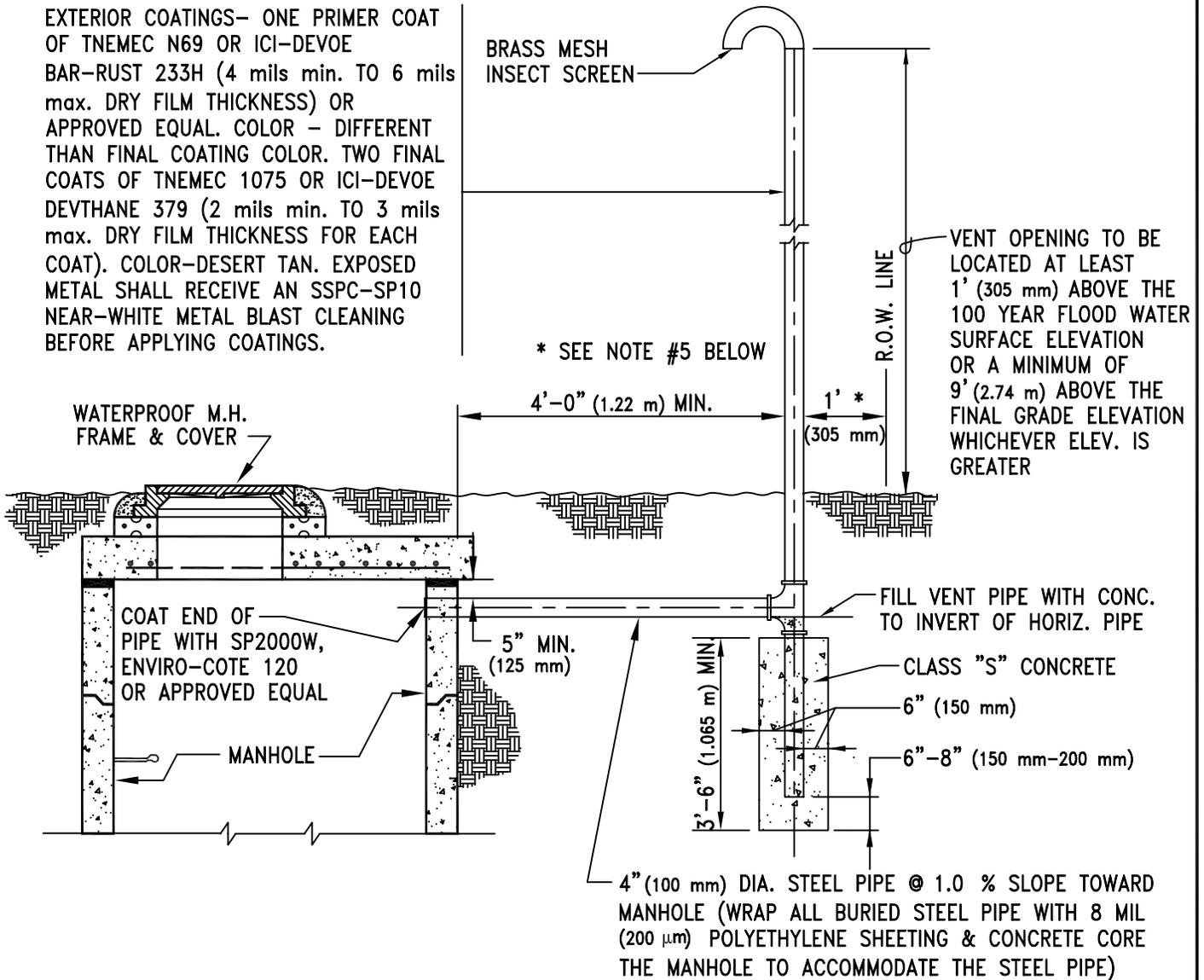
ISSUED:	
8/92	
REVISED:	
7/02	

STANDARD DETAIL
REDWOOD GATE DETAIL



DETAIL NO.
WWM 220
SHEET 1 OF 1

EXTERIOR COATINGS— ONE PRIMER COAT OF TNE MEC N69 OR ICI-DEVOE BAR-RUST 233H (4 mils min. TO 6 mils max. DRY FILM THICKNESS) OR APPROVED EQUAL. COLOR – DIFFERENT THAN FINAL COATING COLOR. TWO FINAL COATS OF TNE MEC 1075 OR ICI-DEVOE DEVTHANE 379 (2 mils min. TO 3 mils max. DRY FILM THICKNESS FOR EACH COAT). COLOR-DESERT TAN. EXPOSED METAL SHALL RECEIVE AN SSPC-SP10 NEAR-WHITE METAL BLAST CLEANING BEFORE APPLYING COATINGS.

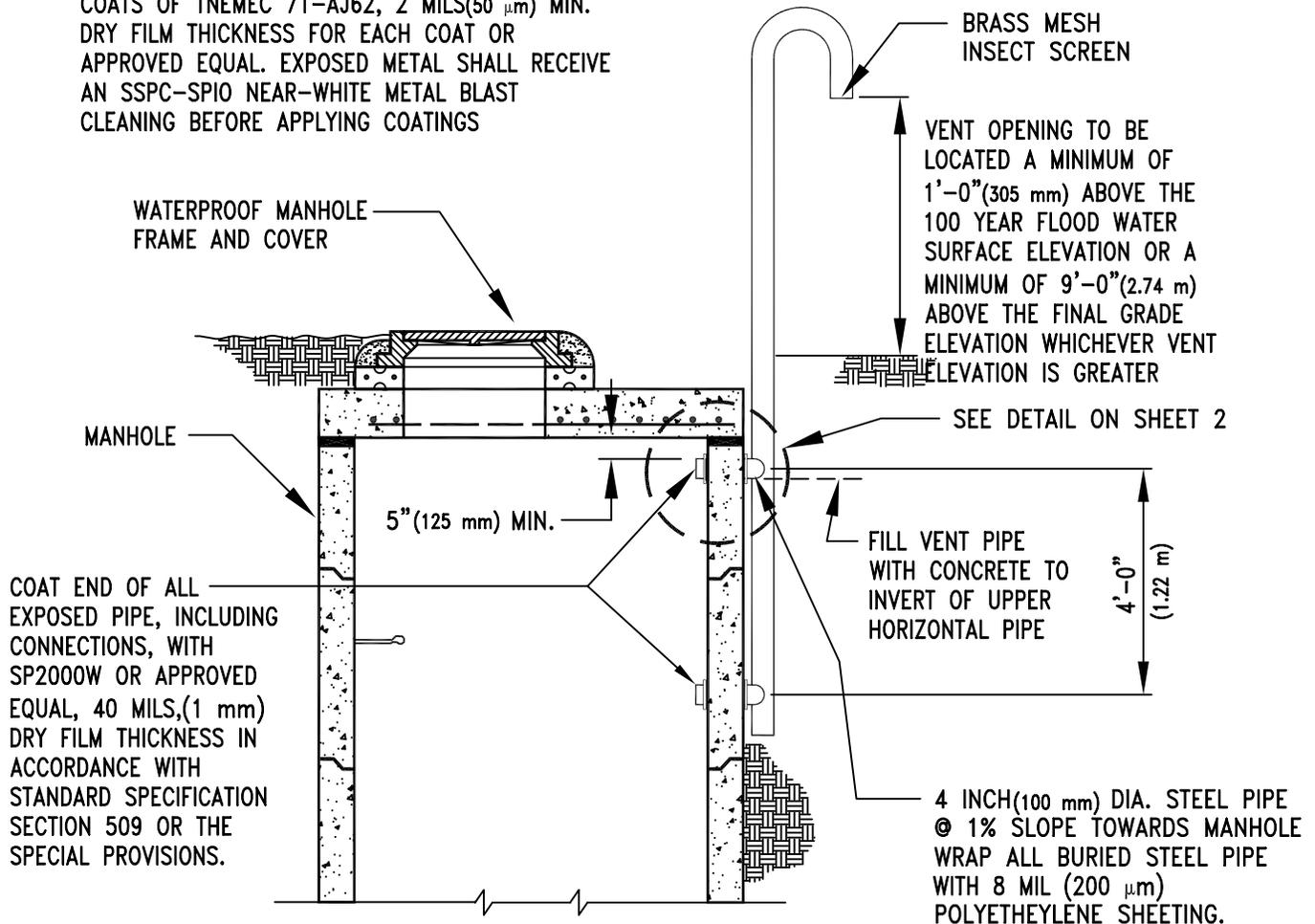


NOTES:

1. WATERPROOF COVERS SHALL BE USED AT ALL MANHOLE LOCATIONS WITHIN IN A 100 YEAR FLOOD PLAIN AREA.
2. MANHOLE VENTS ARE REQUIRED AT EVERY OTHER MANHOLE IF THE MANHOLE SPACING IS EQUAL TO OR LESS THAN 500 FEET (152 m).
3. MANHOLE VENTS ARE REQUIRED AT EVERY MANHOLE IF THE MANHOLE SPACING IS GREATER THAN 500 FEET (152 m).
4. ALL STEEL PIPE, EXCEPT THAT PORTION WHICH IS FILLED WITH CONCRETE, SHALL HAVE A 40 MIL (1mm) SP2000W, ENVIRO-COTE 120, OR APPROVED EQUAL INTERIOR LINING IN ACCORDANCE WITH SECTION 509 OF THE STANDARD SPECIFICATIONS OR AS SPECIFIED BY THE SPECIAL PROVISIONS.
5. FOR SEWER LINES LOCATED WITHIN A ROAD RIGHT OF WAY, THE VENT PIPE SHALL BE LOCATED ONE (1) FOOT (305 mm) INSIDE THE RIGHT OF WAY LINE. TYPE 'A' POST BARRICADES, PER STD. DET. 106, SHALL BE LOCATED ON EITHER SIDE OF THE VENT PIPE.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE VENT		WWM 221.1
REVISED:		ASSEMBLY DETAIL		SHEET 1 OF 1
7/02				

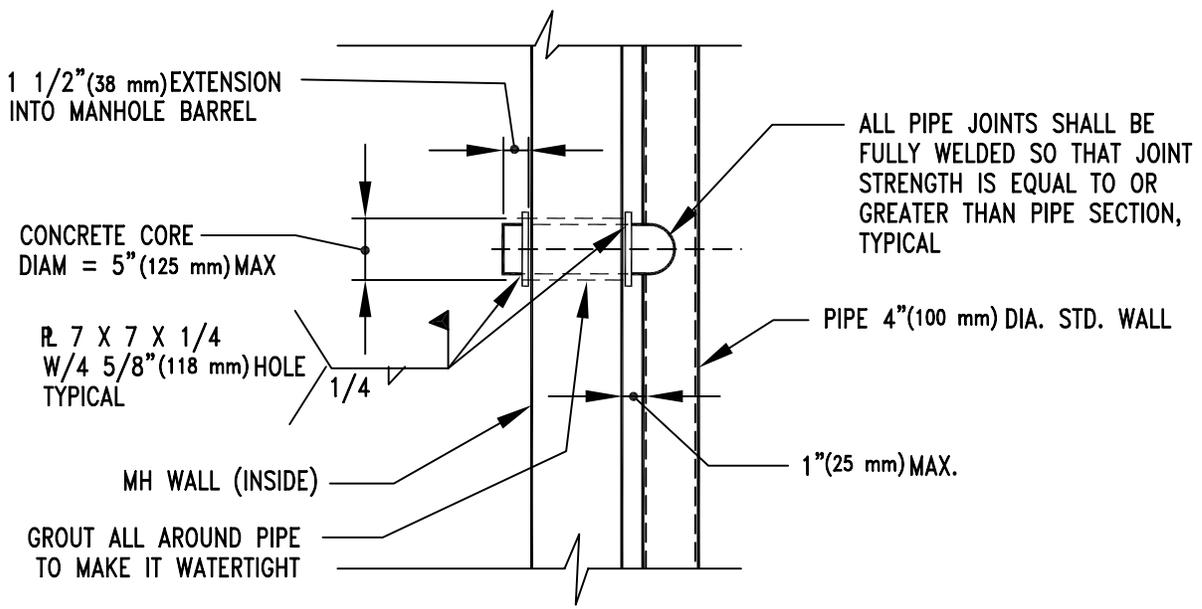
EXTERIOR COATINGS: ONE PRIMER COAT OF TNE MEC 104-1255, 8 MILS(200 μm) MIN. DRY FILM THICKNESS OR APPROVED EQUAL AND TWO FINAL COATS OF TNE MEC 71-AJ62, 2 MILS(50 μm) MIN. DRY FILM THICKNESS FOR EACH COAT OR APPROVED EQUAL. EXPOSED METAL SHALL RECEIVE AN SSPC-SPIO NEAR-WHITE METAL BLAST CLEANING BEFORE APPLYING COATINGS



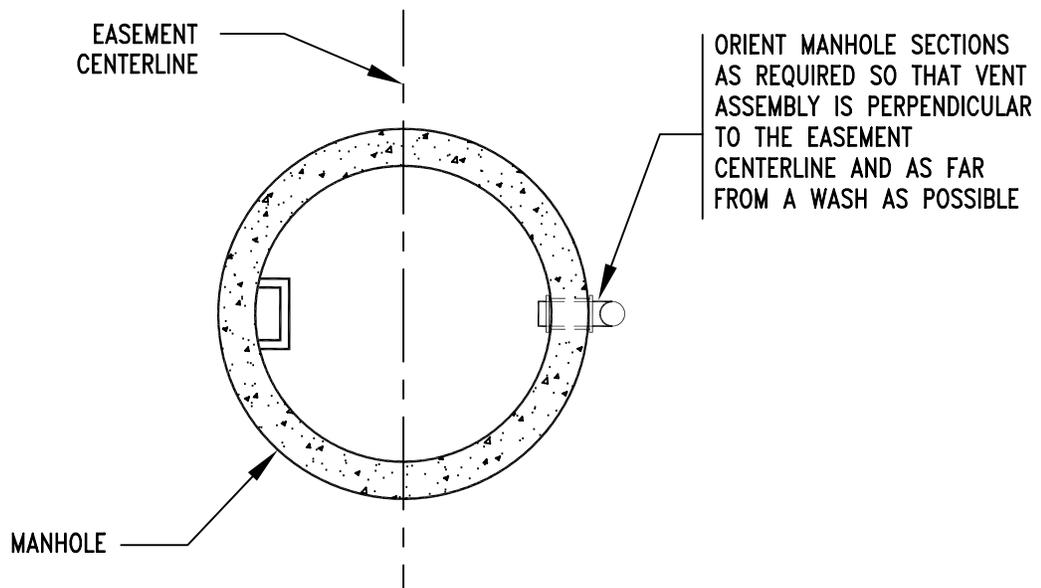
**NOTES:**

1. ALL STRUCTURAL SHAPES AND PLATES SHALL BE ASTM A-36 (A-36M). ALL STRUCTURAL SQUARE TUBE SHAPES SHALL BE ASTM A-500 GRADE B. ALL PIPE STEEL SHALL BE ASTM A-501 OR ASTM A53 TYPE E OR S, GR. B.
2. ALL STEEL PIPE (EXCEPT THE PORTION FILLED WITH CONCRETE) SHALL HAVE A 40 MIL(1 mm) DRY FILM THICKNESS SP2000W INTERIOR LINING. THE LINING SHALL MEET PCWMD SPECIFICATIONS.
3. NOTES 1 - 3 FROM STANDARD DETAIL WWM 221 APPLY.

ISSUED:		STANDARD DETAIL MODIFIED MANHOLE VENT ASSEMBLY		DETAIL NO.
8/92				WWM 221.2
REVISED:				SHEET 1 OF 2
7/02				



TYPICAL PIPE TO MANHOLE CONNECTION



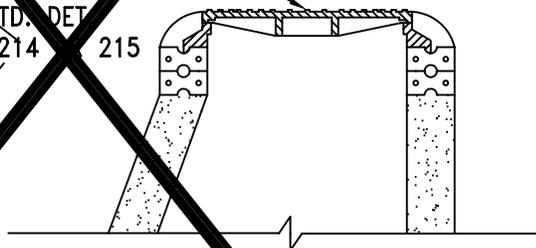
VENT ASSEMBLY ORIENTATION

ISSUED:		STANDARD DETAIL MODIFIED MANHOLE VENT ASSEMBLY		DETAIL NO.
8/92				WWM 221.2
REVISED:				SHEET 2 OF 2
7/02				

**NOTE:**

A MANHOLE SAFETY LANDING SHALL BE PLACED MID-WAY BETWEEN THE TOP OF THE BENCH AND THE TOP OF THE FRAME AND COVER IN MANHOLES EXCEEDING 25 FEET (7.6 m) IN DEPTH.

30" (760 mm)  
FRAME & COVER  
PER STD. DET.  
WWM 214 215



FIBERGLASS GRATING 26" (660 mm) DIA.  
BY 1" (25 mm) DEPTH 1KG BORDEN  
OR APPROVED EQUAL \*

RAM-NEK SEAL OR  
APPROVED EQUAL

6" (MAX.)  
(150 mm)

ELEVATION OF PRECAST  
CONCRETE SLAB SAFETY  
LANDING AS PER PLANS

1'-6"  
(460 mm)  
(MAX.)

4" (100 mm)

24" (610 mm) Ø  
OPENING

48" OR 60" I.D. MANHOLE  
(1.22 m) (1.53 m)

6" x 6" - D6 x D6  
(152 mm x 152 mm -  
MW 19 x MW 19) WWF

\* SHOP DRAWINGS REQUIRED

ISSUED:

8/92

DELETED

7/02



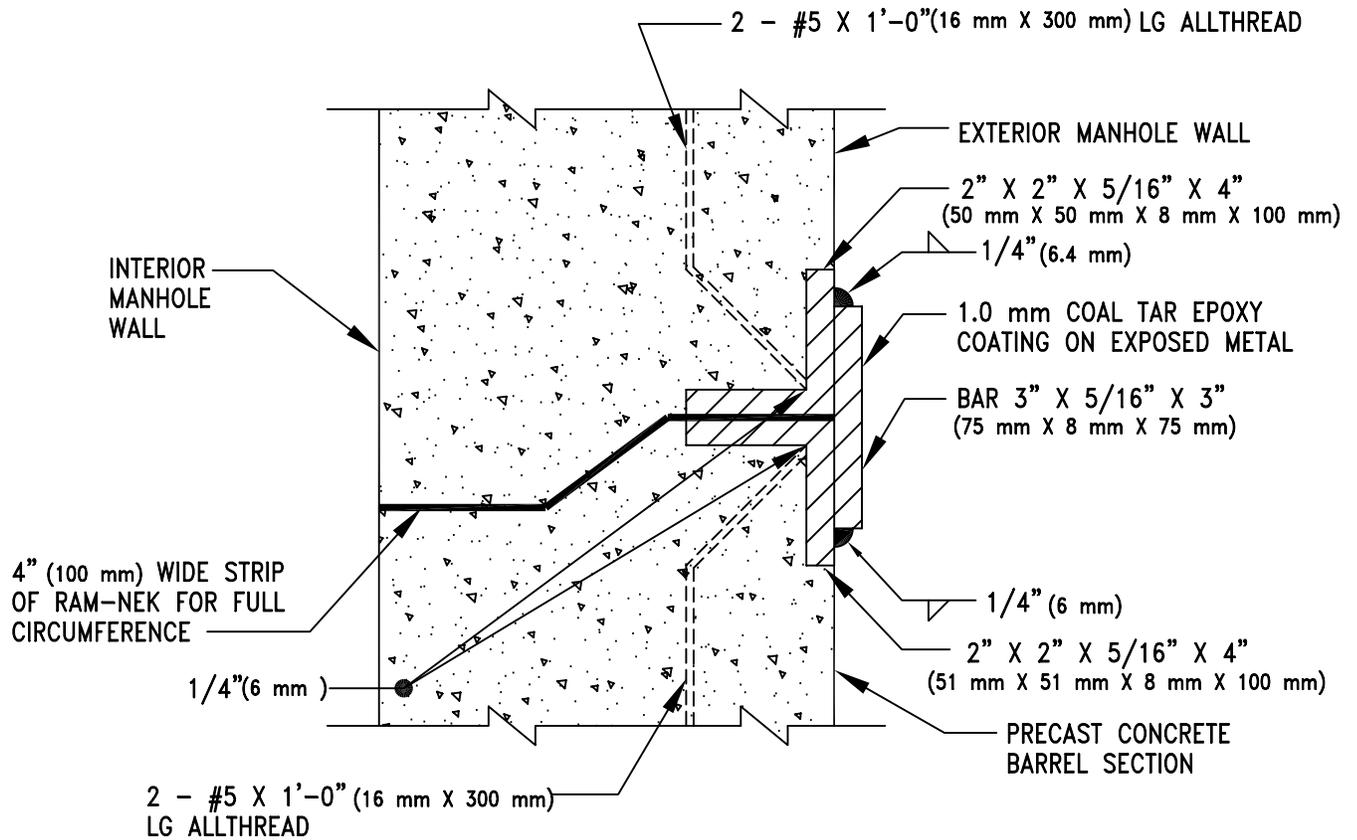
STANDARD DETAIL  
PRECAST CONCRETE  
MANHOLE  
SAFETY LANDING



DETAIL NO.

WM  
222

SHEET 1 OF 1



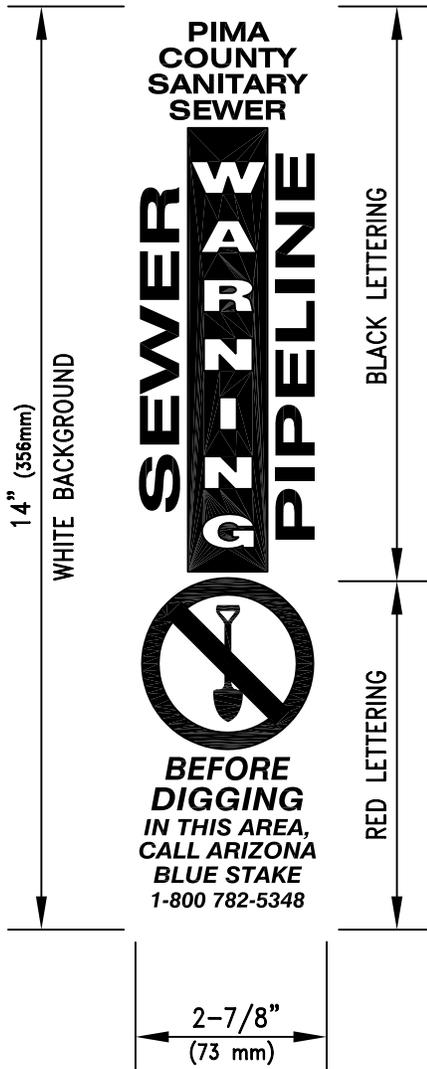
**NOTES:**

1. PROVIDE POSITIVE JOINT REINFORCEMENT AT THE UPSTREAM WASH FACE AND AT 90° INTERVALS AROUND THE CIRCUMFERENCE OF THE MANHOLE FROM THE UPSTREAM FACE. JOINT REINFORCEMENT SHALL BE USED ON ALL MANHOLE SECTION-TO-SECTION, SECTION-TO-GRADE RINGS, AND GRADE RINGS-TO-GRADE RING JOINTS AS DETAILED. ALL SECTIONS SHALL BE SECURED. JOINT REINFORCEMENT SHALL BE USED TO SECURE THE BOTTOM MANHOLE SECTION TO THE MANHOLE BASE.
2. FIELD WELD THE JOINT REINFORCEMENT AS INDICATED ON THE EXTERIOR OF THE BARREL SECTION AND COAT ALL EXPOSED METAL WITH A 4 MIL (100 μm) COAL TAR EPOXY DRY FILM THICKNESS.
3. THE COSTS OF PROVIDING AND INSTALLING THE JOINT REINFORCEMENT SHALL BE CONSIDERED INCIDENTAL TO AND INCLUDED IN THE UNIT PRICE BID FOR THE MANHOLE.
4. ALL WELDS SHALL BE IMMEDIATELY QUENCHED WITH TEN WEIGHT (10W) MOTOR OIL AFTER EACH WELD IS COMPLETED.
5. THE ALLTHREAD SHALL BE 5/8" (16 mm), GRADE 2, NON-GALVANIZED, COARSE.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE JOINT REINFORCEMENT		WWM 223
REVISED:				SHEET 1 OF 1
7/02				

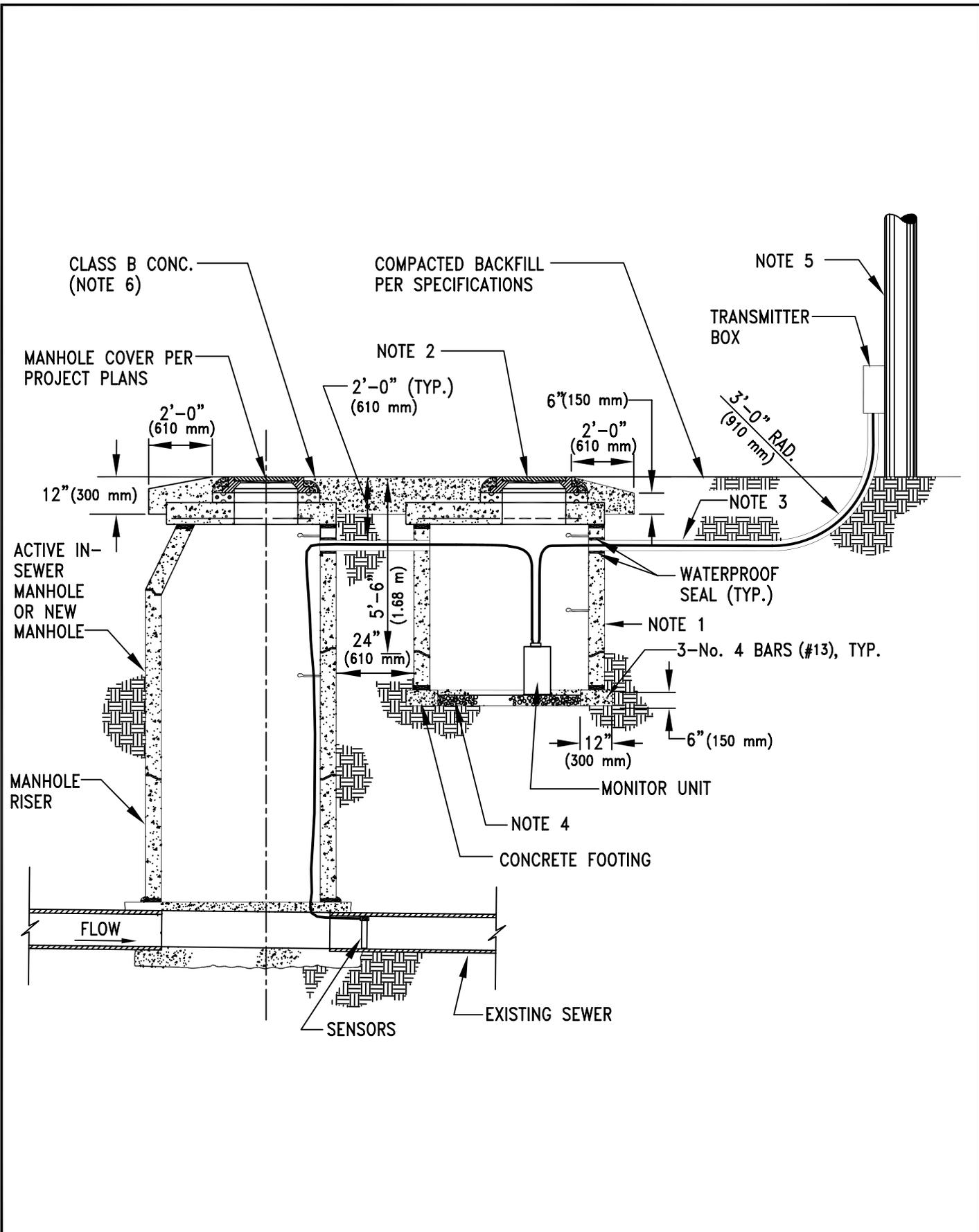
**NOTES:**

1. THE CONTRACTOR SHALL FURNISH AND INSTALL SEWER LINE MARKERS PER THE PLANS AND MANUFACTURER'S SPECIFICATIONS AT EACH MANHOLE LOCATION WHERE THE MANHOLE IS LOCATED OUTSIDE THE PAVED AREA OR WHERE THE CONSTRUCTION PLANS CALL FOR A SEWER LINE MARKER.
2. MARKERS SHALL BE INSTALLED 10 FEET (3 m) TO THE RIGHT AS YOU LOOK DOWNSTREAM ALONG THE SEWER LINE, OR ON THE EDGE OF THE SEWER EASEMENT IF 10 FEET (3 m) IS NOT AVAILABLE. IN ANY CASE, THE MARKER IS TO BE NO CLOSER THAN 10 FEET (3 m) FROM THE EDGE OF STRIP PAVEMENT OR 1 FOOT (300 mm) FROM THE FACE OF CURB. FOR LOCATIONS THAT DO NOT FIT THESE CONDITIONS, SPECIFIC INSTRUCTIONS SHALL BE OBTAINED FROM THE ENGINEER.
3. THE MARKERS SHALL BE UV-STABILIZED POLYPROPYLENE "SENTRY POSTS" AS MANUFACTURED BY REPNET INC. (1-800-522-4343) OR APPROVED EQUAL. THE MARKERS SHALL BE TUBULAR IN SHAPE, 4 FEET (1.2 m) HIGH ABOVE GROUND AFTER INSTALLATION AND APPROXIMATELY 2-1/2 INCHES (64 mm) IN DIAMETER, EXCEPT AT THE UPPER 11 TO 14 INCHES (280 mm TO 360 mm). THE TOP SHALL BE FLATTENED TO AN OVAL SHAPE AT LEAST 3 INCHES (75 mm) IN WIDTH AND ABOUT 1 INCH (25 mm) AT THE MINOR AXIS. THE TOP SHALL BE CAPPED SO AS TO BE WATER-RESISTANT. THE MARKERS SHALL BE REBOUNDABLE FOR THE LIFE OF MARKER. MARKERS SHALL BE GREEN IN COLOR.
4. MARKERS SHALL BE FOR USE WITH A CHISEL-POINTED, DRIVEABLE, REUSABLE, GALVANIZED, 18-INCH (460 mm) METAL SOIL ANCHOR, INTO WHICH THE MARKER IS INSERTED AND HELD IN PLACE BY A LOCKING MECHANISM. SOIL ANCHORS SHALL BE DRIVEN UNTIL FLUSH WITH GRADE LEVEL. A PURPOSE-BUILT DRIVER SHALL BE USED FOR INSTALLATION TO AVOID DAMAGE TO THE SOIL ANCHOR.
5. EACH MARKER SHALL BE INSTALLED WITH TWO WARNING MESSAGE DECALS, ONE PER EACH SIDE OF THE TOP FLATTENED OVAL SHAPE. DECALS SHALL BE AS THE STANDARD REPNET SD-1040 DECAL FOR SEWER PIPELINES, OR APPROVED EQUAL, WITH THE SPECIFIC MARKING INFORMATION SHOWN ON THE DRAWING TO THE LEFT OF THIS NOTE. DECALS SHALL BE MANUFACTURED OF PREMIUM-GRADE VINYL AND PRINTED WITH UV-RESISTANT INKS AND CLEAR-COATED WITH UV-BLOCKING INK. DECAL ADHESIVE SHALL BE PEEL- AND UV-RESISTANT.
6. FOR LOCATIONS WHERE THE MANHOLE MAY BE OBSCURED FROM THE MARKER, SUCH AS HEAVILY OVERGROWN AREAS, A SECOND DECAL SHALL BE PLACED ON BOTH SIDES OF THE MARKER, NO MORE THAN 6 INCHES (150 mm) BELOW EACH WARNING DECAL. THIS DECAL SHALL SHOW A BLACK DIRECTIONAL ARROW ON A WHITE BACKGROUND AND BE ABOUT 2 INCHES (50 mm) HIGH BY 3 INCHES (75 mm) WIDE. ARROW DECALS SHALL BE INSTALLED AFTER MARKER INSTALLATION TO POINT IN THE DIRECTION OF THE INDICATED MANHOLES. ARROW DECAL MATERIALS SHALL BE IDENTICAL TO THOSE USED IN THE WARNING DECALS.

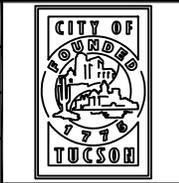


**MARKER DECAL**

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SEWER MARKER		WWM 224
REVISED:				
7/02				SHEET 1 OF 1



ISSUED:	8/92
REVISED:	7/02

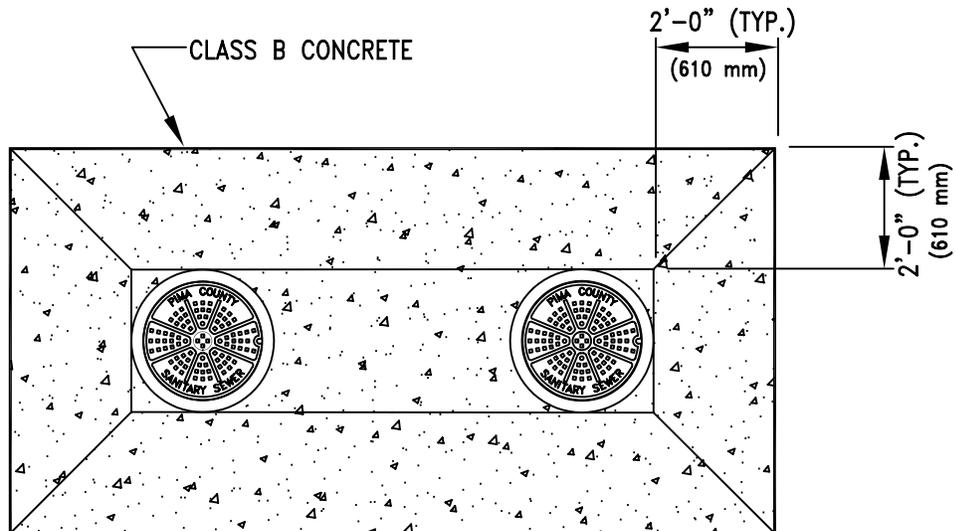


STANDARD DETAIL

MONITORING STATION



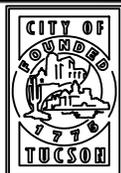
DETAIL NO.	WWM 225
SHEET 1 OF 2	

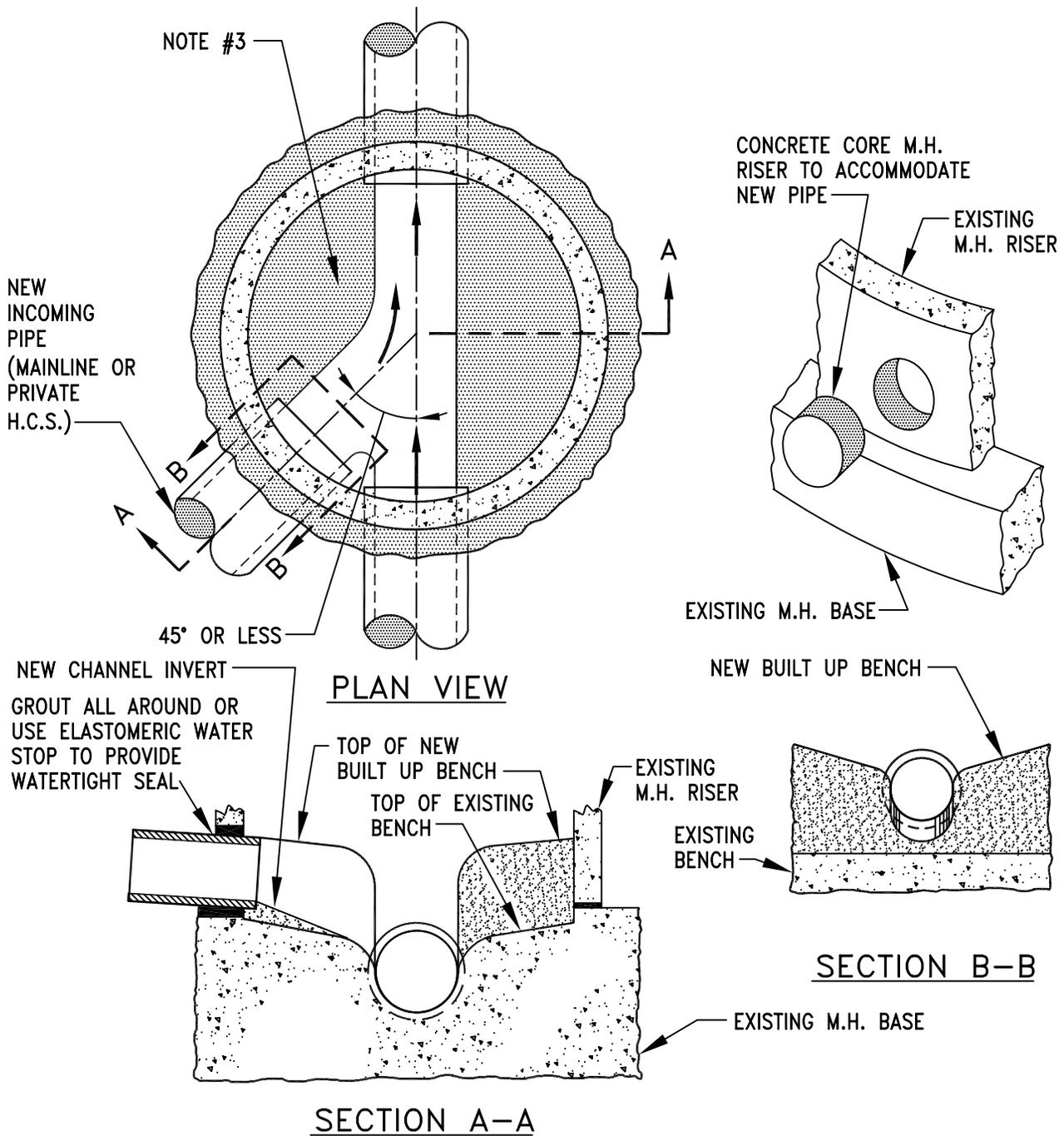


PLAN VIEW  
CONCRETE COLLAR

NOTES:

1. REMOTE MONITORING STATION EQUIPMENT MANHOLE 4'-0" (1.22 m) HIGH, 4'-0" (1.22 m) DIAMETER MANHOLE CONE SECTION, PER STD. DET. WWM 208.
2. NEW REMOTE MONITORING STATION MANHOLE, STANDARD 24" (610 mm) DIAMETER FRAME AND COVER, PER STD. DET. WWM 213.
3. 4" (100 mm) DIAMETER PVC PIPE, SCHEDULE 40 U.L., TYPICAL.
4. 4" (100 mm) THICK #57 CRUSHED STONE, PER ASTM C 33.
5. RISER POLE. COORDINATE WITH UTILITY COMPANY FOR LOCATION IF AN EXISTING POLE IS TO BE USED. IF A RADIO TRANSMITTER IS TO BE USED, AN ANTENNA WILL BE MOUNTED ON THE RISER POLE.
6. THE CONCRETE COLLAR IS NOT REQUIRED FOR STRUCTURES LOCATED WITHIN PAVED AREAS.

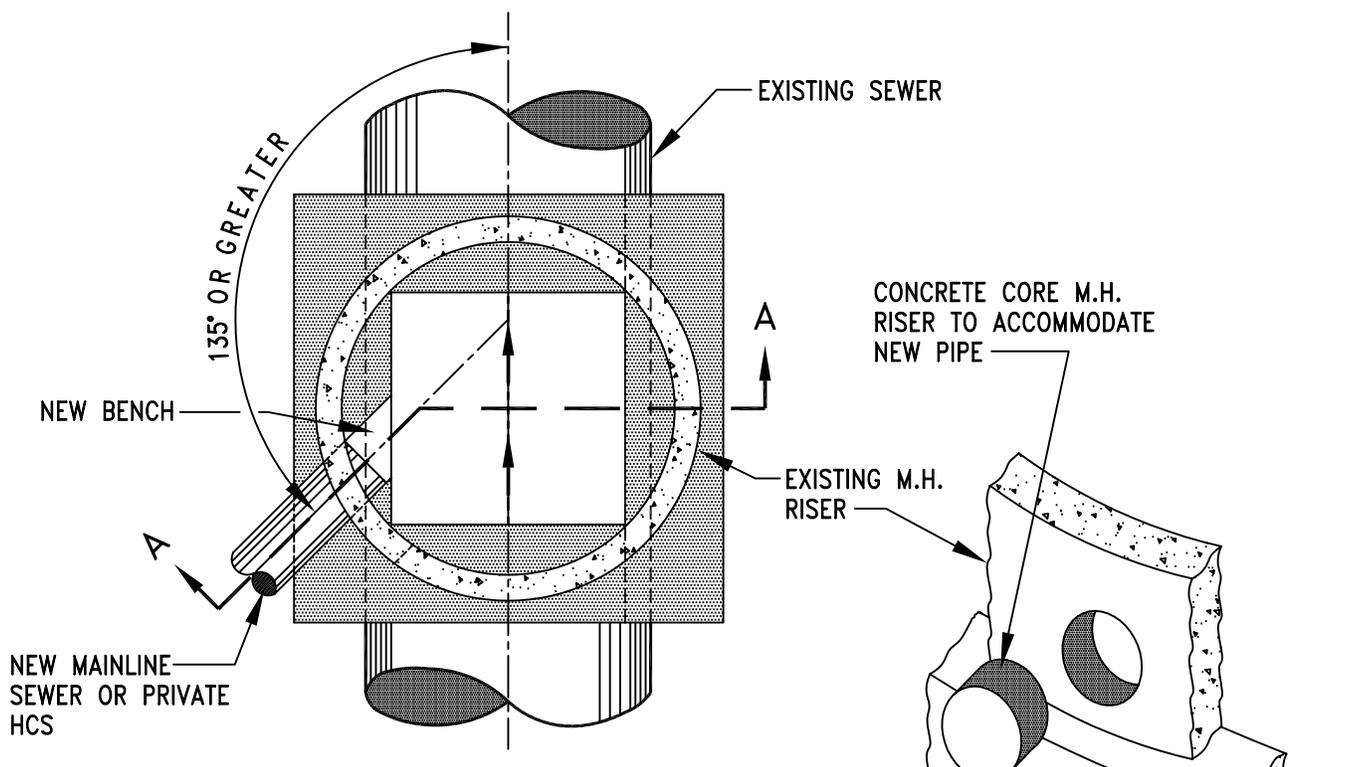
ISSUED:		STANDARD DETAIL		DETAIL NO.	
8/92		MONITORING STATION		WWM 225	
REVISED:					SHEET 2 OF 2
7/02					



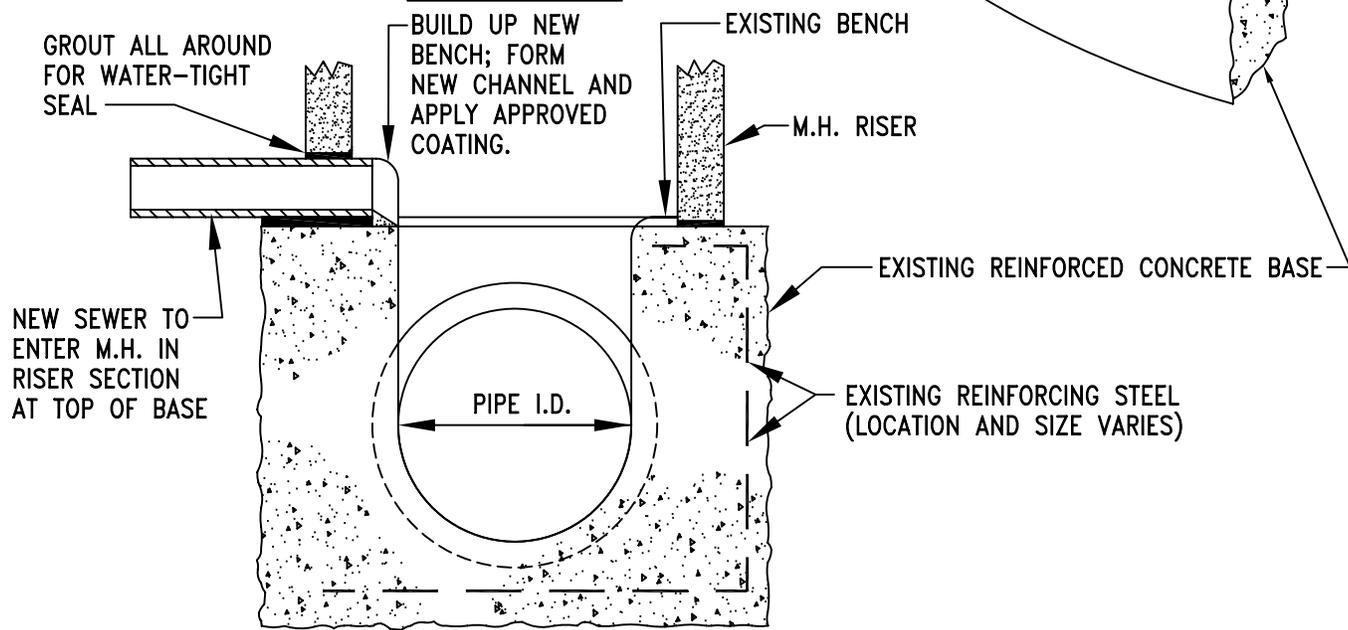
**NOTES:**

1. EXISTING MANHOLE BENCH SHALL BE THOROUGHLY CLEANED PRIOR TO CONSTRUCTING NEW BUILT UP BENCH. NEW BENCH SHALL BE CLASS "S" ( $f'_c = 3,000 \text{ psi} (20 \text{ MPa})$ ) CONCRETE W/ TYPE II PORTLAND CEMENT.
2. ALL CONNECTIONS TO EXISTING MANHOLES SHALL BE INSPECTED AND APPROVED BY PCWMD.
3. SHAPE NEW CHANNEL TO PROVIDE FOR A SMOOTH TRANSITION OF FLOW FROM NEW INCOMING PIPE TO OUTGOING MAIN.

ISSUED:		STANDARD DETAIL CONNECTION TO EXISTING MANHOLE (NON-REINFORCED BASE)		DETAIL NO.
8/92				WWM 301
REVISED:				SHEET 1 OF 1
7/02				



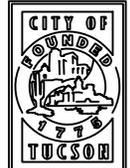
**PLAN VIEW**



**SECTION A-A**

**NOTES:**

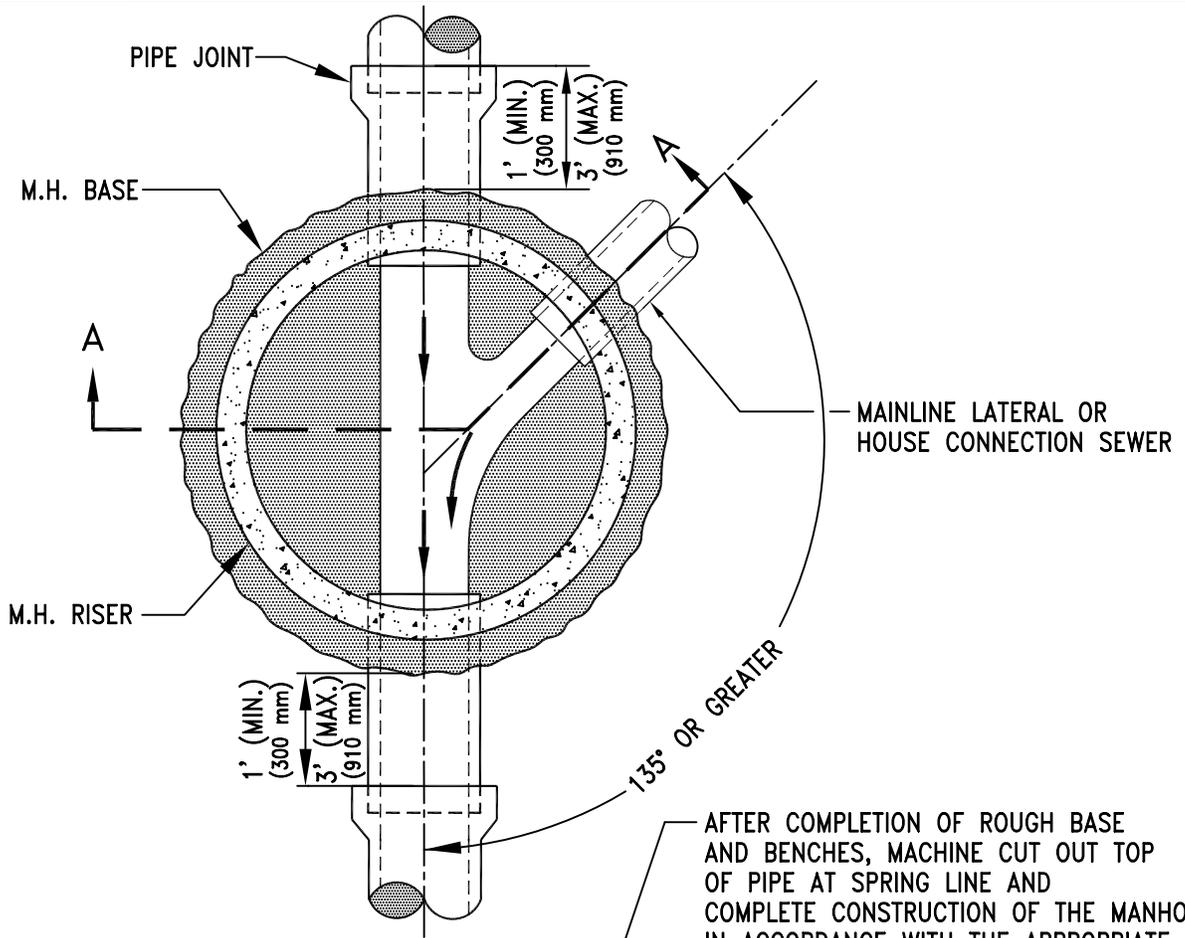
1. EXISTING MANHOLE BENCH SHALL BE THOROUGHLY CLEANED PRIOR TO CONSTRUCTING NEW BUILT UP BENCH. NEW BENCH SHALL BE CLASS "S" ( $f'_c = 3,000 \text{ psi} (20 \text{ MPa})$ ) CONCRETE W/ TYPE II PORTLAND CEMENT.
2. A SINGLE INCOMING 8" (200 mm) OR 10" (250 mm) DIAMETER SEWER THAT IS LOCATED 90° AWAY FROM ANOTHER SINGLE INCOMING 8" DIAMETER OR LARGER SEWER IS ACCEPTABLE.

ISSUED:	
8/92	
REVISED:	
7/02	

STANDARD DETAIL  
 CONNECTION TO  
 EXISTING MANHOLE  
 (REINFORCED CONCRETE BASE)

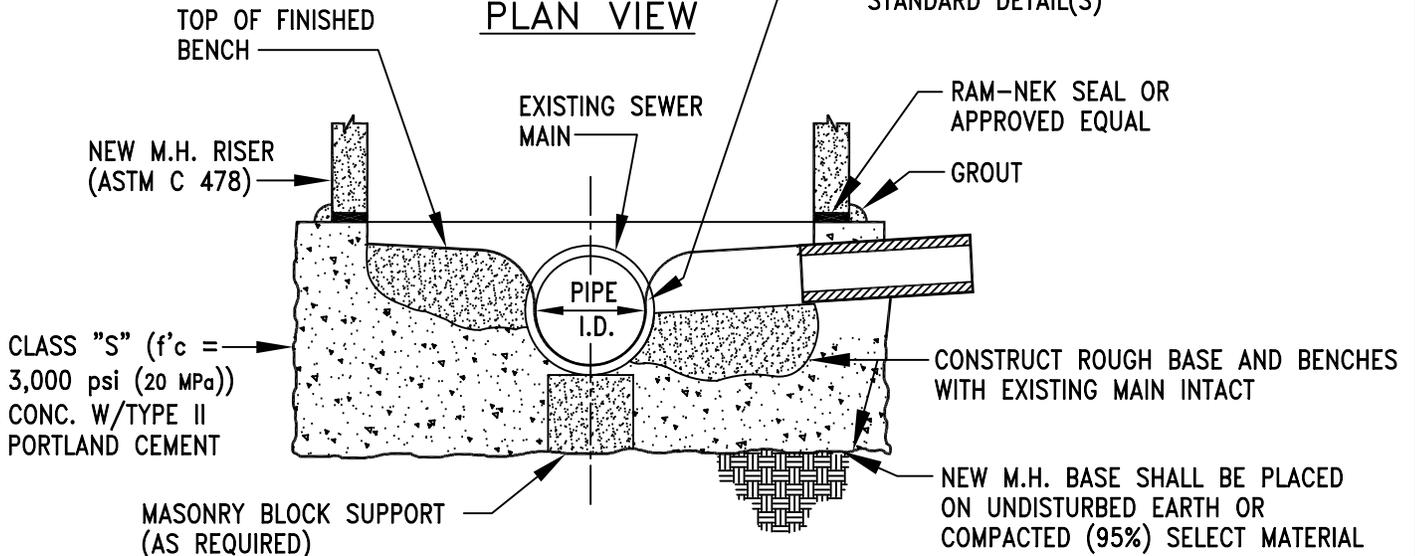


DETAIL NO.
WWM 302
SHEET 1 OF 1



**PLAN VIEW**

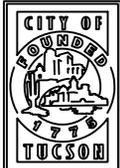
AFTER COMPLETION OF ROUGH BASE AND BENCHES, MACHINE CUT OUT TOP OF PIPE AT SPRING LINE AND COMPLETE CONSTRUCTION OF THE MANHOLE IN ACCORDANCE WITH THE APPROPRIATE STANDARD DETAIL(S)

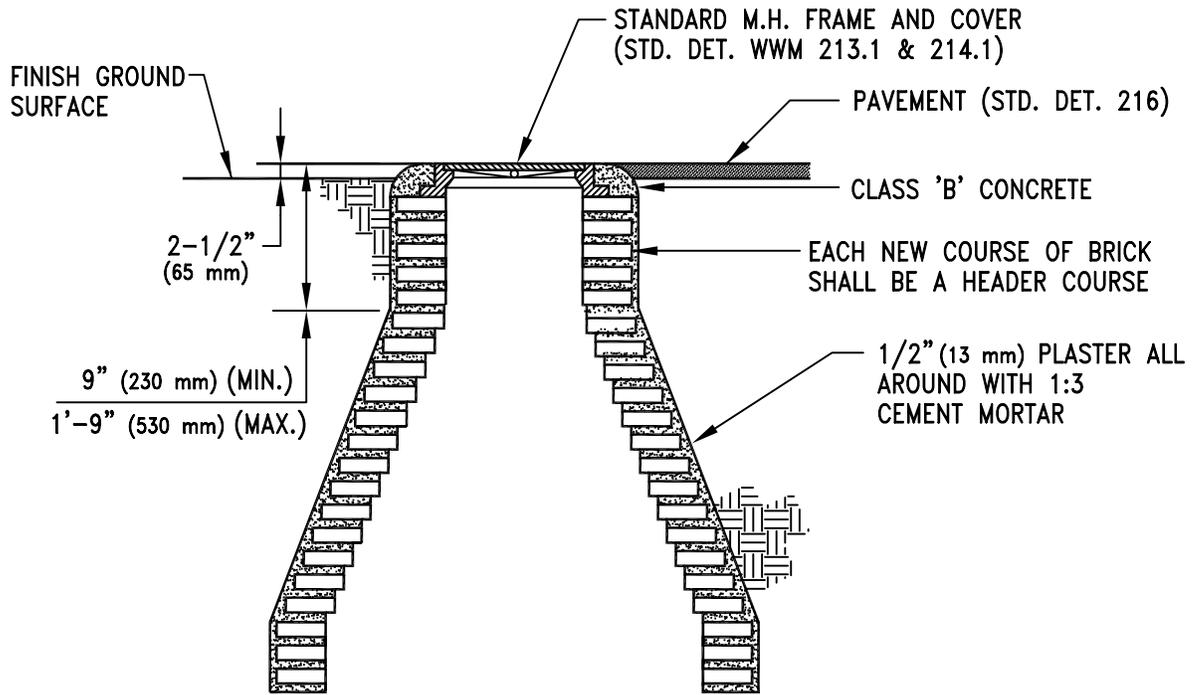


**SECTION A-A**

**NOTE:**

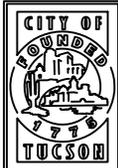
1. SPECIAL BEDDING MAY BE REQUIRED TO THE FIRST JOINT BEYOND OPEN TRENCH CONDITIONS (DETERMINED BY DEPTH OF THE EXCAVATION AND TYPE OF SOIL).
2. A SINGLE INCOMING 8" (200 mm) OR 10" (250 mm) DIAMETER SEWER THAT IS LOCATED 90° AWAY FROM ANOTHER SINGLE INCOMING 8" DIAMETER OR LARGER SEWER IS ACCEPTABLE.

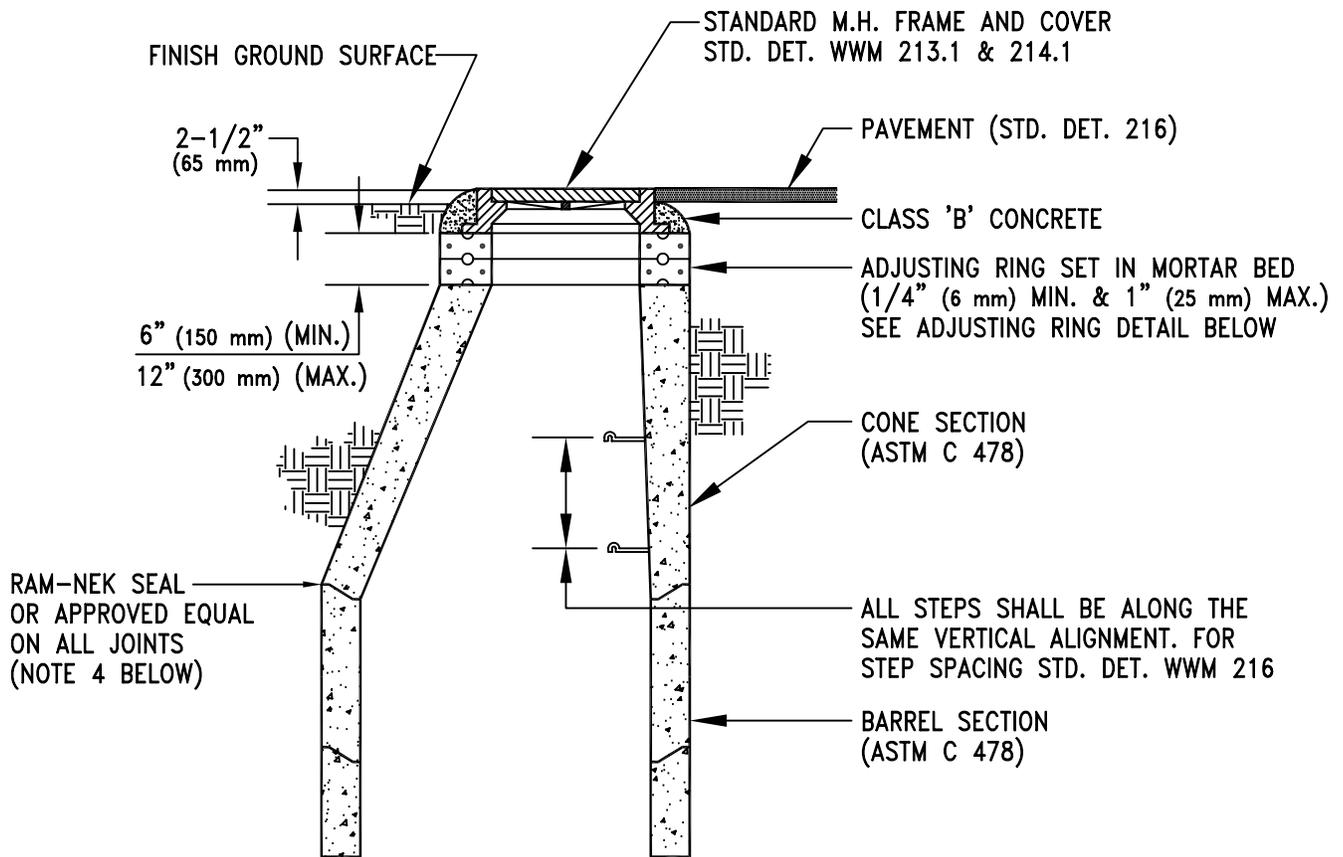
ISSUED:		<b>STANDARD DETAIL</b> <b>NEW MANHOLE</b> <b>OVER</b> <b>EXISTING SEWER</b>		DETAIL NO.
8/92				WWM 303
REVISED:				SHEET 1 OF 1
7/02				



**NOTES:**

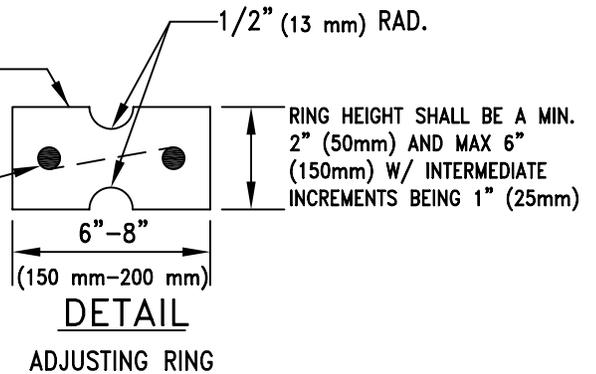
1. RECONSTRUCT CONE IF THE REQUIRED AMOUNT OF ADJUSTMENT CAUSES A VIOLATION OF THE DIMENSIONAL RANGE NOTED ABOVE.
2. ANY RECONSTRUCTION OF A PUBLIC MANHOLE FACILITY SHALL BE INSPECTED AND APPROVED BY PCWWMD.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		BRICK MANHOLE GRADE ADJUSTMENT		WWM 304
REVISED:		SHEET 1 OF 1		
7/02				



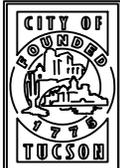
CLASS "S" ( $f'_c=3,000$  psi (20 MPa)) W/TYPE II PORTLAND CEMENT

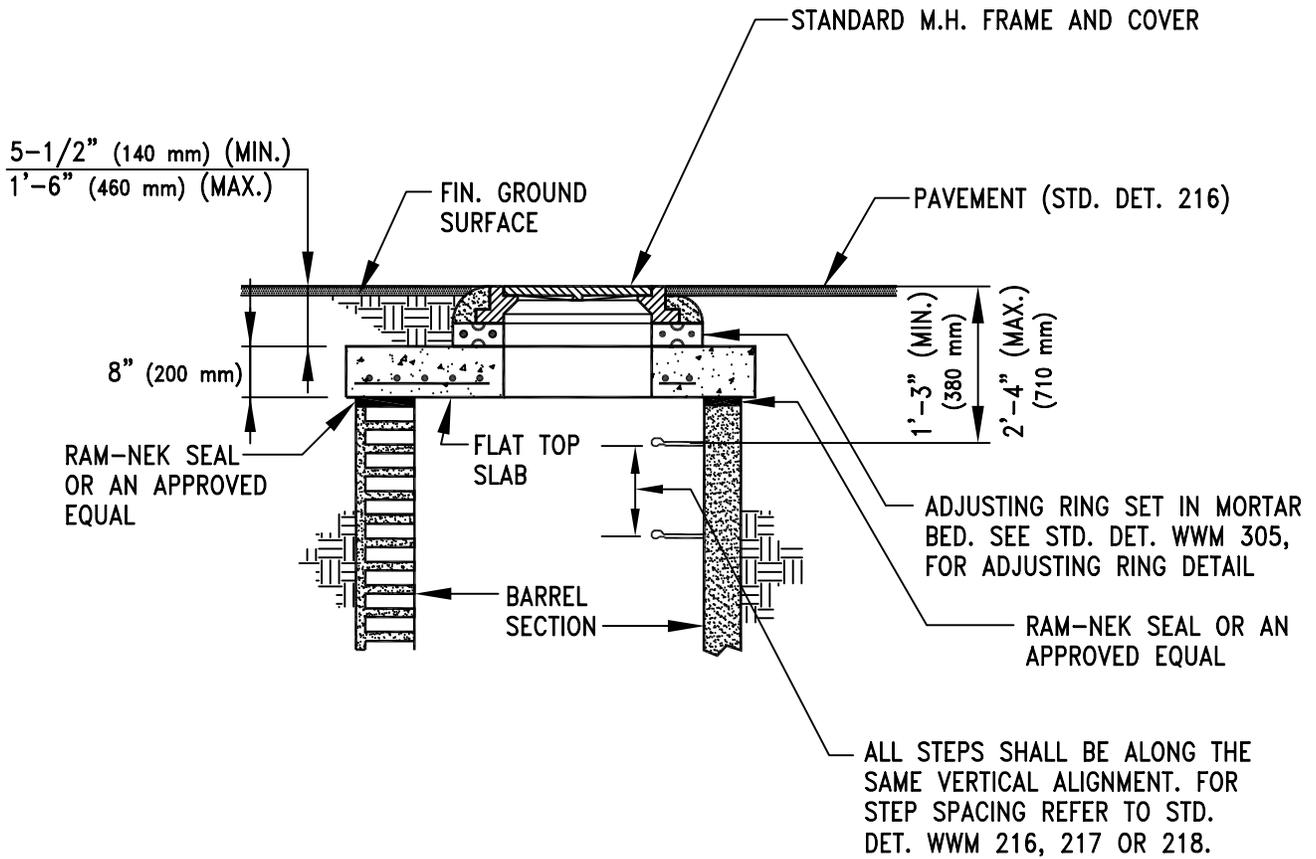
2-No. 3 (#10) HOOPS WITH MW3 WIRE TIES AT 90° FOR 3" (75 mm) AND 4" (100 mm) ADJUSTING RINGS. 6" (150 mm) ADJUSTING RING REQUIRES 4-No. 3 (#10) HOOPS WITH MW3 WIRE TIES AT 90°.



**NOTES:**

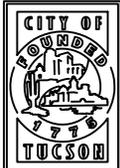
1. RECONSTRUCTION OF THE BARREL/CONE IN ACCORDANCE WITH THIS DETAIL WILL BE REQUIRED IF THE AMOUNT OF ADJUSTMENT CAUSES A VIOLATION OF THE DIMENSIONAL RANGE NOTED ABOVE.
2. ADDITIONAL OR REPLACEMENT MANHOLE SECTIONS SHALL BE NEW MATERIAL.
3. JOINTS OF THE NEW MANHOLE SECTIONS MUST PROVIDE A SUITABLE MATCH (IN CONFIGURATION AND PERFORMANCE) WITH THE EXISTING MANHOLE SECTIONS.

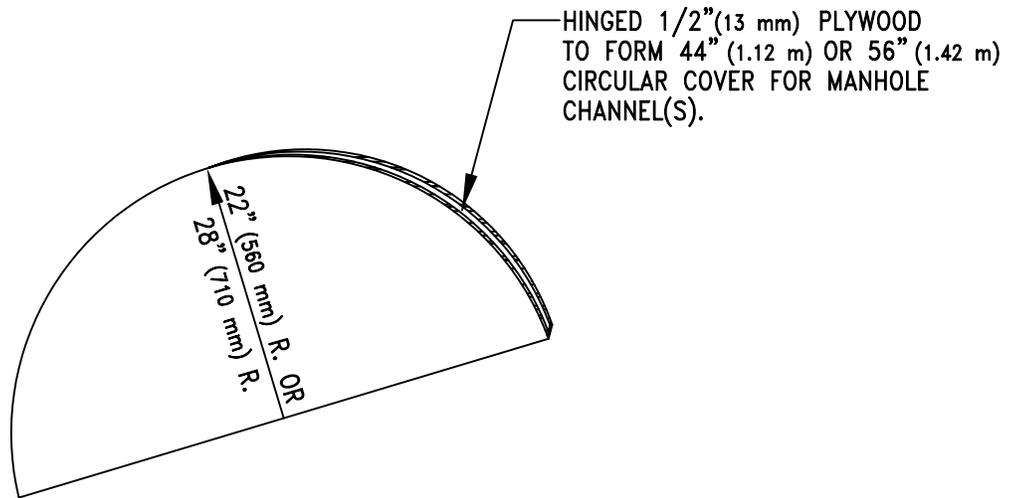
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		PRECAST		WWM 305
REVISED:		CONCRETE MANHOLE		
7/02	TUCSON	GRADE ADJUSTMENT		SHEET 1 OF 1



**NOTES:**

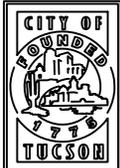
1. RECONSTRUCTION OF THE BARREL IN ACCORDANCE WITH APPROPRIATE STANDARD DETAIL WILL BE REQUIRED IF THE AMOUNT OF ADJUSTMENT CAUSES A VIOLATION OF THE DIMENSIONAL RANGE NOTED ABOVE.
2. ANY RECONSTRUCTION OF A PUBLIC MANHOLE FACILITY SHALL BE INSPECTED AND APPROVED BY PCWMD.

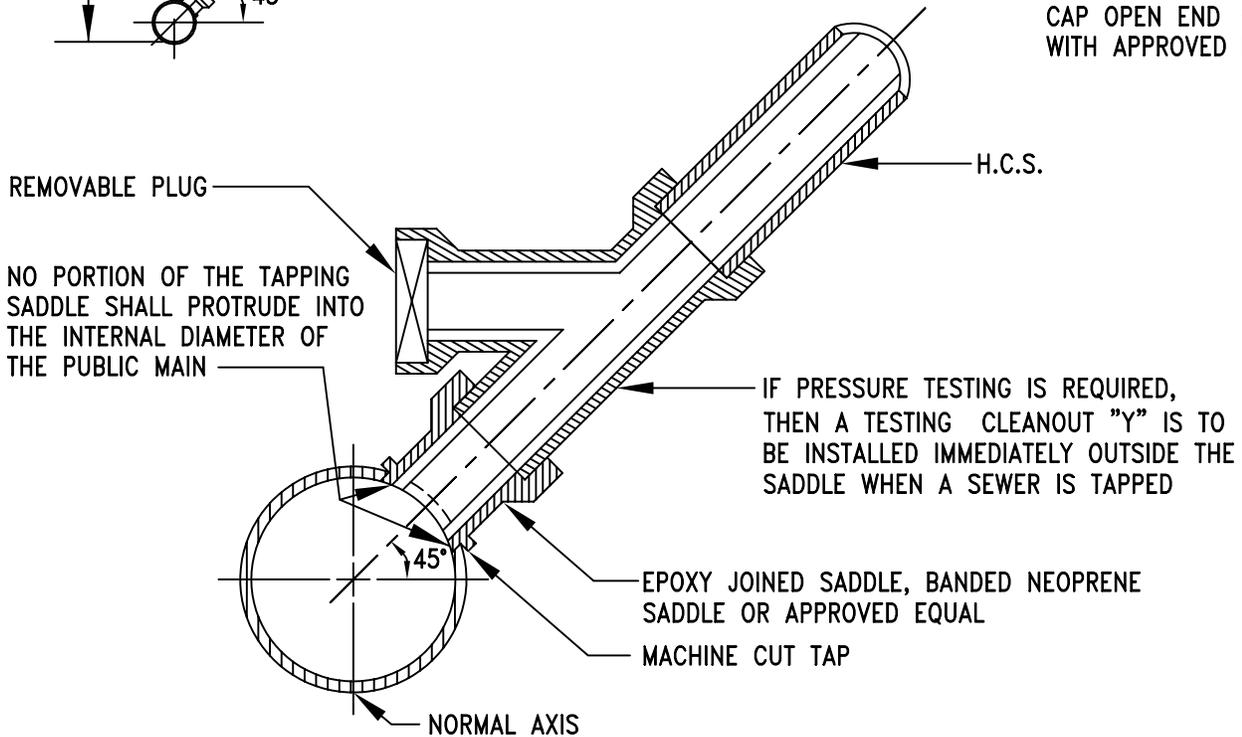
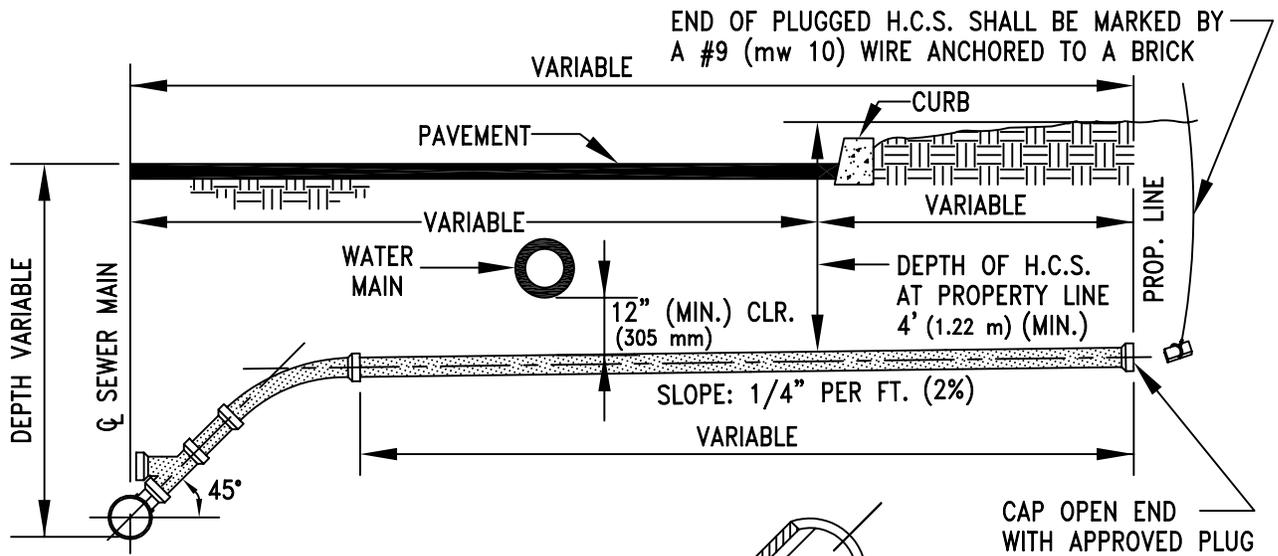
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		FLAT TOP		WWM 306
REVISED:		MANHOLE		
7/02	TUCSON	GRADE ADJUSTMENT		SHEET 1 OF 1



**NOTE:**

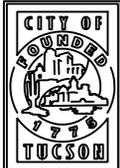
ALL SANITARY SEWER MANHOLES REQUIRING FRAME AND COVER ELEVATION ADJUSTMENTS SHALL HAVE THE CHANNEL(S) COVERED WITH PLYWOOD OR SIMILAR MATERIAL (APPROVED BY PCWMD) DURING THE MODIFICATIONS TO PREVENT DEBRIS FROM ENTERING THE SEWER LINES. ONCE THE MODIFICATIONS ARE COMPLETE, OR AS DIRECTED BY THE ENGINEER, THE PROTECTIVE COVER SHALL BE REMOVED. FOR 24 INCH (610 mm) MANHOLE OPENINGS TO A 5 FOOT (1.52 m) MANHOLE, THE PLYWOOD WILL REQUIRE 2 HINGED JOINTS AT THE THIRD POINTS OF THE CIRCULAR COVER.

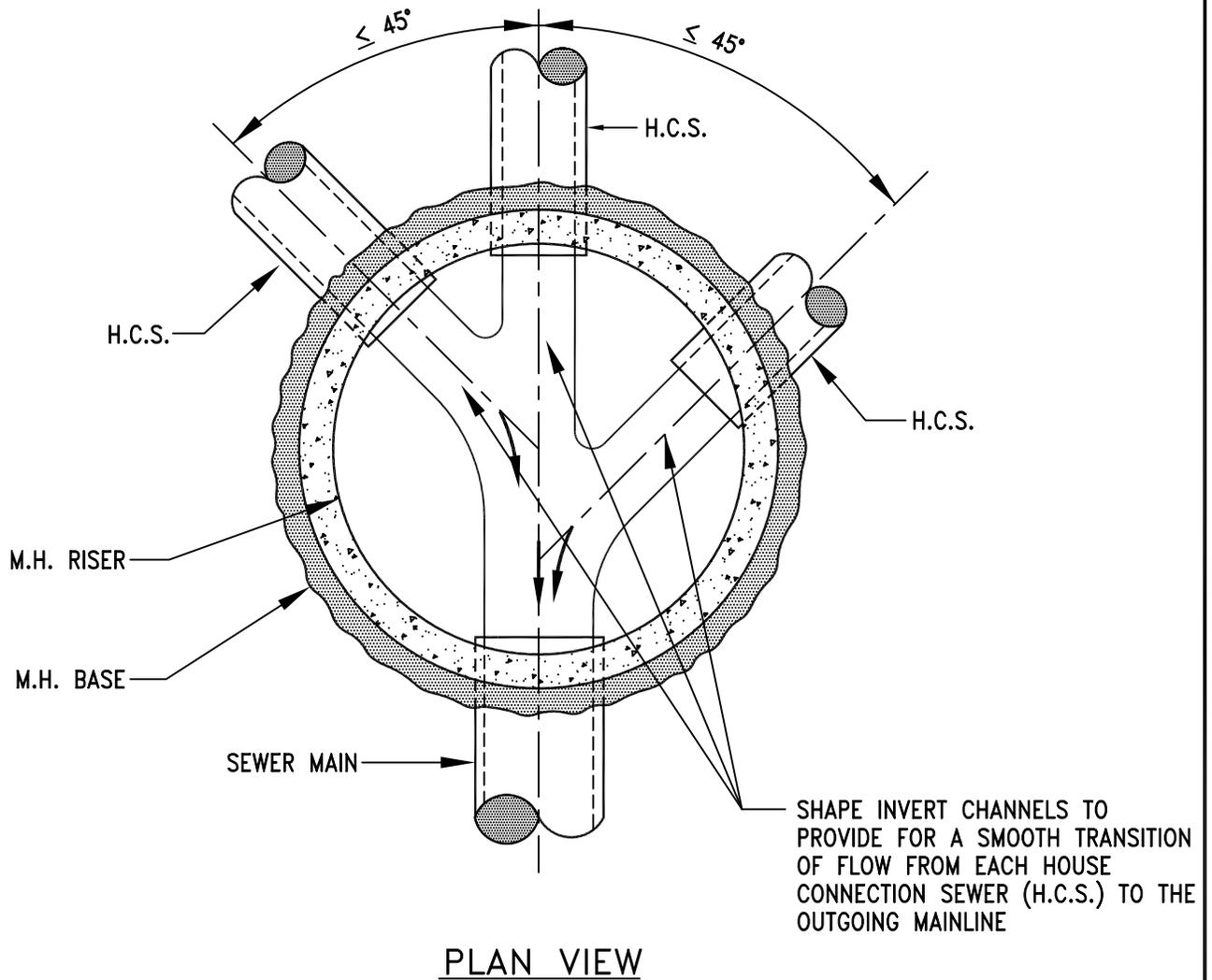
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MANHOLE CHANNEL		WWM 307
REVISED:		COVER		SHEET 1 OF 1
7/02				



**NOTES:**

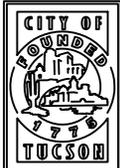
1. WHERE MINIMUM DEPTHS AND CLEARANCES CAN NOT BE MAINTAINED, A SPECIAL H.C.S. DESIGN WILL BE REQUIRED.
2. H.C.S. CONNECTIONS INTO SEWER MAINS 12" (300 mm) AND LARGER ARE NOT PERMITTED WITHOUT THE WRITTEN APPROVAL OF PCWMD.
3. FOR H.C.S.'S GREATER THAN 4" (100 mm) IN DIAMETER, THE APPROVAL OF PCWMD. - AS TO THE TYPE & LOCATION OF THE CONNECTION - SHALL BE ACQUIRED IN ADVANCE.
4. THE OWNERSHIP AND MAINTENANCE OF THE ENTIRE H.C.S. - FROM THE OUTSIDE SURFACE OF THE MAINLINE SEWER PIPE CONNECTED (OR MANHOLE) TO THE CONNECTED PLUMBING FIXTURES WITHIN THE BUILDING - SHALL BE THE RESPONSIBILITY OF THE CONNECTEE.
5. ALL CONNECTIONS TO PUBLIC SEWERS SHALL BE MADE WITH "Y" FITTINGS OR BY MACHINE CUT TAP. WHEN A TAP IS MADE, A MACHINE CUT TAP SHALL BE MADE.

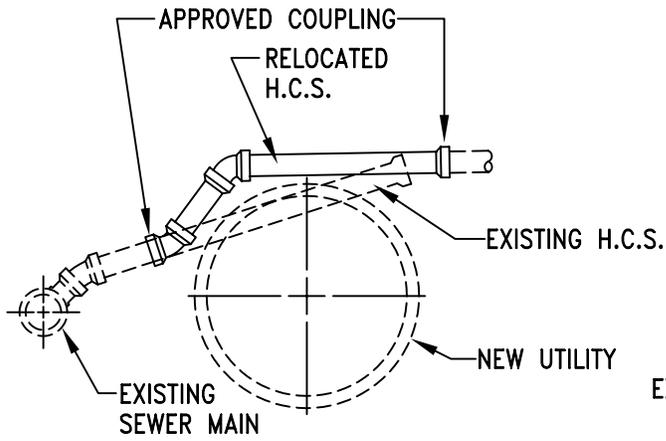
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		HOUSE CONNECTION		WWM 401
REVISED:		SEWER (H.C.S.)		SHEET 1 OF 1
7/02				



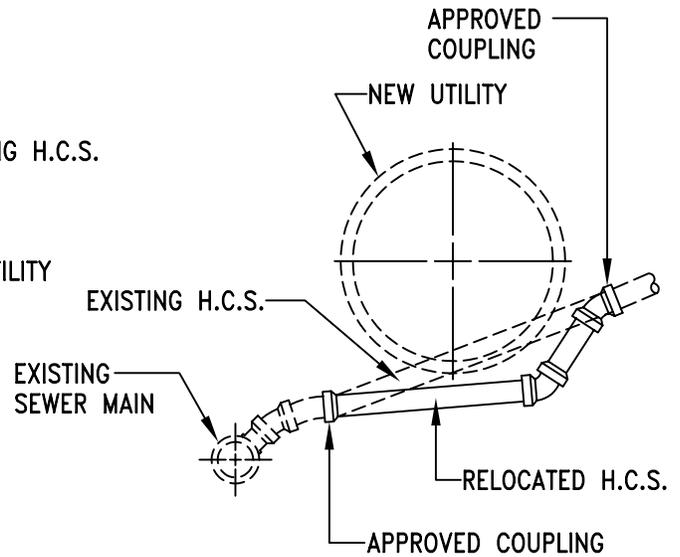
**NOTE:**

1. HOUSE CONNECTION SEWERS (H.C.S.) SHALL ONLY BE MADE INTO A TERMINAL MANHOLE, UNLESS OTHERWISE APPROVED, IN WRITING, BY PCWMD.
2. CROWN OF H.C.S.(S) TO MATCH CROWN OF SEWER MAIN.

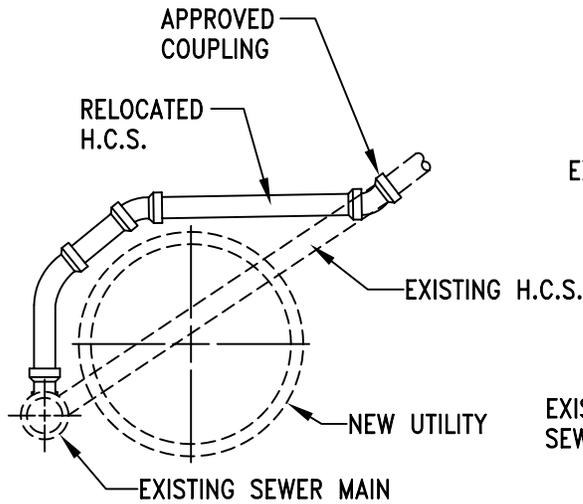
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		H.C.S. CONNECTION TO MANHOLE		WWM 402
REVISED:		SHEET 1 OF 1		
7/02				



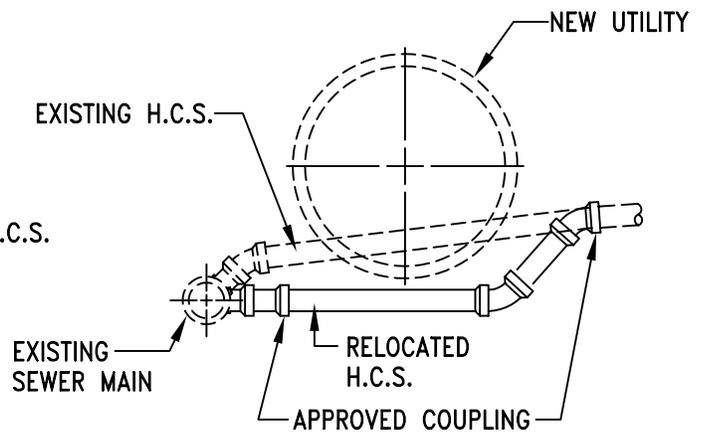
CASE "A"



CASE "C"



CASE "B"



CASE "D"

NOTES:

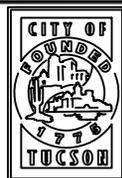
1. THE RELOCATED H.C.S. SHALL BE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) PIPE EXCEPT WHERE THE TOP OF THE H.C.S. IS LESS THAN 12 INCHES (305 mm) BELOW THE UTILITY OR HAS LESS THAN 3 FEET (910 mm) OF COVER TO FINISHED GRADE. IN THESE CASES THE PIPE MATERIAL SHALL BE DUCTILE IRON.
2. THE RELOCATED H.C.S. SHALL BE CONNECTED TO THE H.C.S. PIPE WITH APPROVED COUPLINGS.
3. USE OF CASE "D" TYPE REROUTING DEPENDS ON THE LEVEL OF FLOW (PRESENT AND FUTURE) WITHIN MAINLINE SEWER - SUBJECT TO CASE BY CASE APPROVAL BY ENGINEER / PCWMD
4. MINIMUM SLOPE ON ANY REROUTED SEGMENT OF H.C.S. TO BE 1.00%.

ISSUED:

8/92

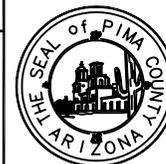
REVISED:

7/02



STANDARD DETAIL

HOUSE CONNECTION  
SEWER REROUTING

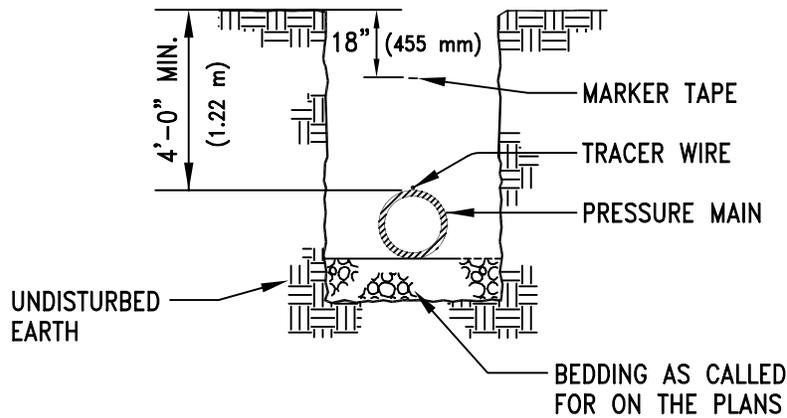
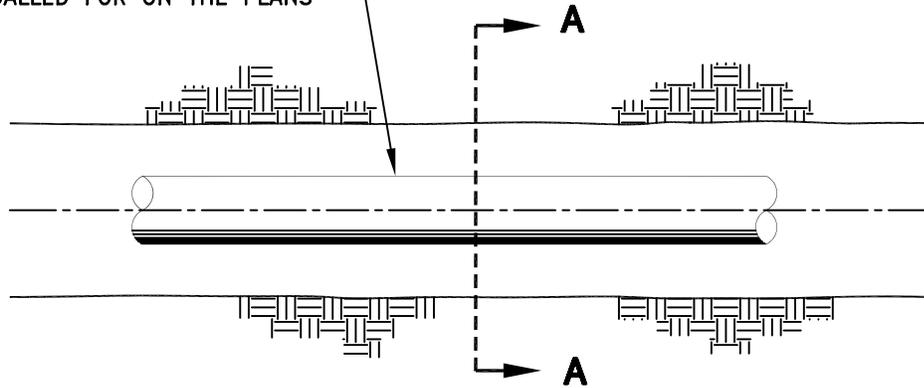


DETAIL NO.

WWM 404

SHEET 1 OF 1

PIPE MATERIAL TO BE AS CALLED FOR ON THE PLANS

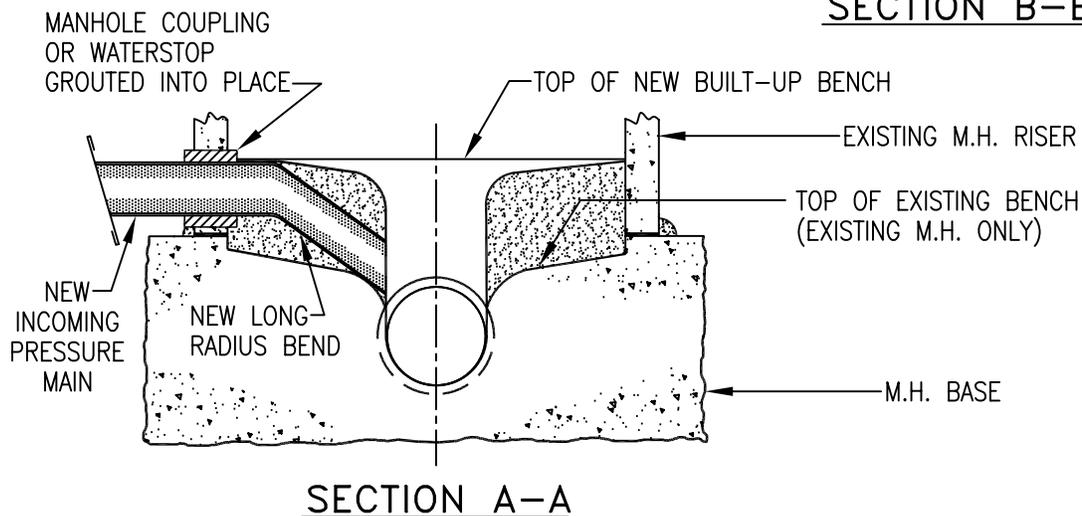
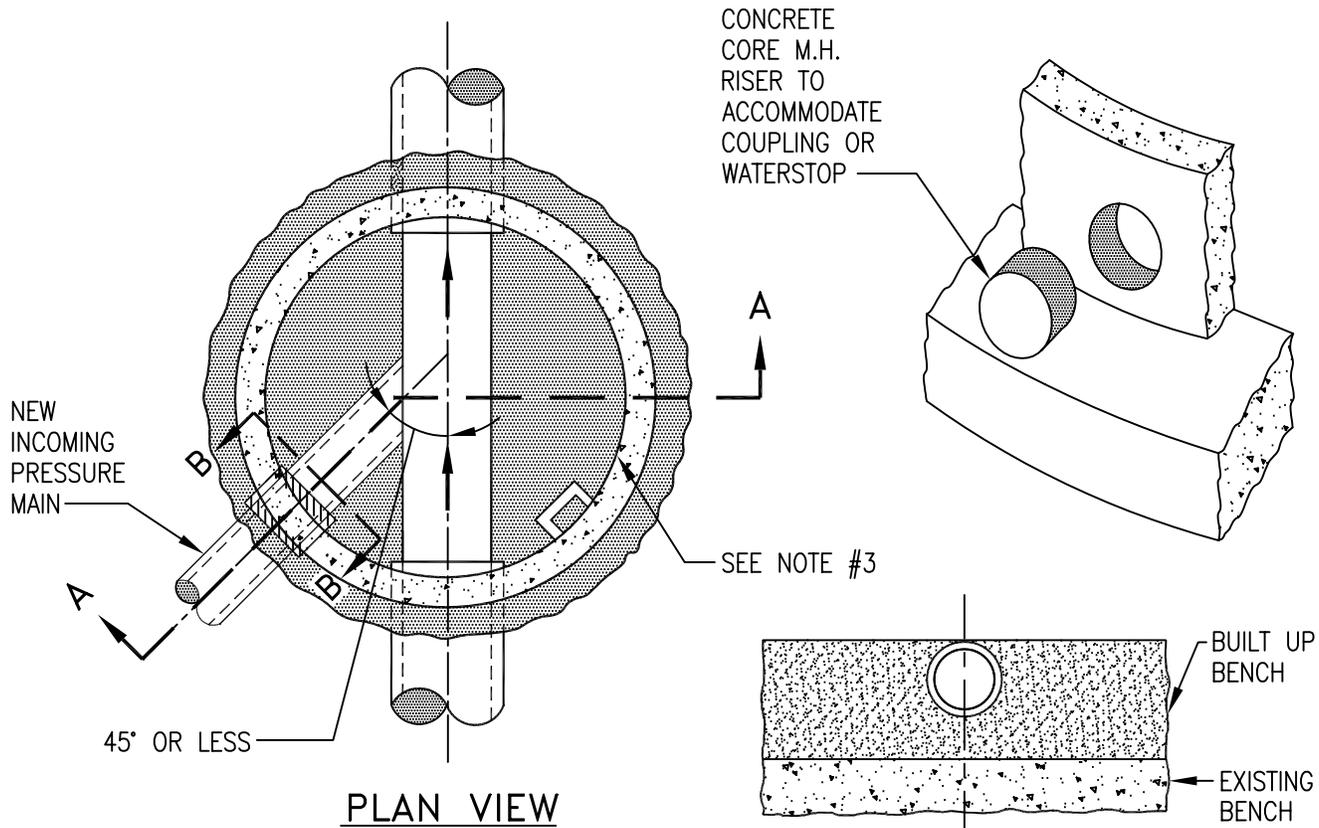


**SECTION A-A**

**NOTES:**

1. A CONTINUOUS MAGNETIC MARKER TAPE APPROVED BY PCWMD, SHALL BE BURIED 18 INCHES (455 mm) BELOW GROUND SURFACE AT FINAL GRADE. CONTINUOUS PRINTING ON THE TAPE SHALL STATE "CAUTION: SEWAGE PRESSURE LINE".
2. INSTALLATION OF ACCEPTABLE PRESSURE PIPE MATERIAL SHALL BE IN ACCORDANCE WITH CURRENT PCWMD STANDARDS.
3. THE HORIZONTAL LOCATION OF THE PRESSURE LINE SHALL BE IDENTIFIED BY A PERMANENT MARKER CONFORMING TO STD. DET. WWM 224.
4. THE TRACER WIRE SHALL BE 14 gauge (2.5 mm<sup>2</sup>) SOLID COPPER WIRE WITH 15 MIL (380 μm) PVC OR POLYETHYLENE COATING AND BE SECURELY TAPED TO THE TOP OF PIPE AT 20 FOOT (6 meter) INTERVALS.
5. TRACER WIRE SHALL BE BROUGHT TO THE GROUND SURFACE AT THE TEST STATION LOCATIONS INDICATED ON THE PLANS.

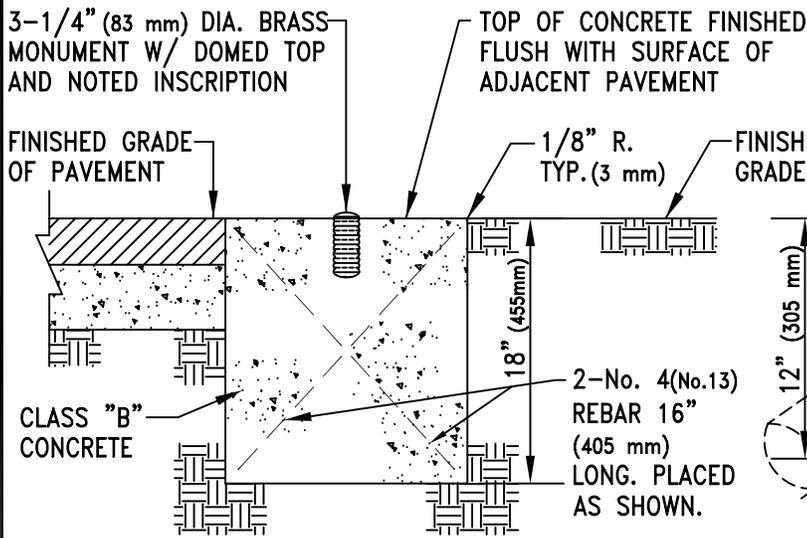
ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		MARKER TAPE		WWM 504
REVISED:		LOCATION		SHEET 1 OF 1
7/02				



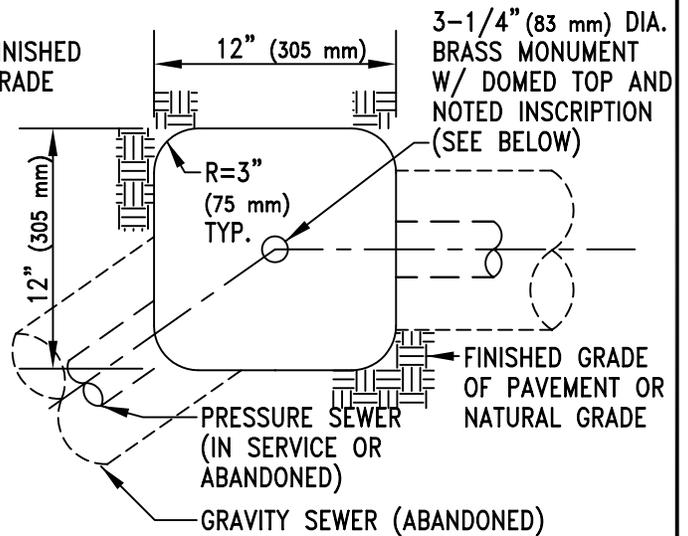
NOTES:

1. EXISTING MANHOLE BENCH TO BE THOROUGHLY CLEANED PRIOR TO CONSTRUCTING NEW BUILT UP BENCH. NEW BENCH SHALL BE CLASS "S" ( $f'_c = 3,000$  psi (20 MPa)) CONCRETE W/ TYPE II PORTLAND CEMENT.
2. IF CONNECTING TO TERMINAL MANHOLE, BRING PRESSURE MAIN INTO MANHOLE IN STRAIGHT LINE ALIGNMENT WITH OUTLET MAIN.
3. INTERIOR OF MANHOLE TO BE PROTECTED WITH A PCWMD APPROVED COATING.

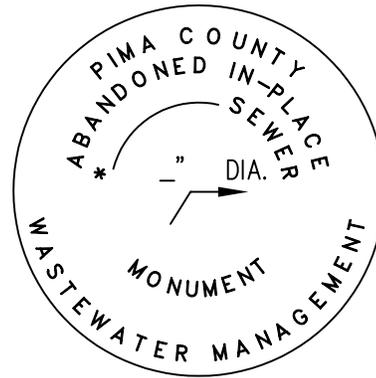
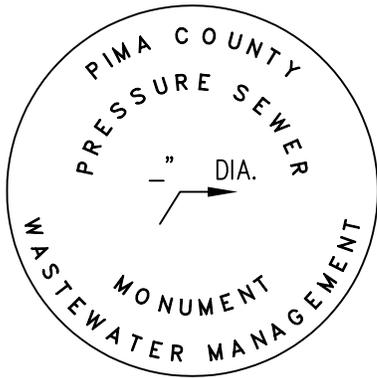
ISSUED:		STANDARD DETAIL PRESSURE MAIN CONNECTION EXISTING MANHOLE		DETAIL NO.
8/92				WWM 505
REVISED:				SHEET 1 OF 1
7/02				



SECTION VIEW



PLAN VIEW

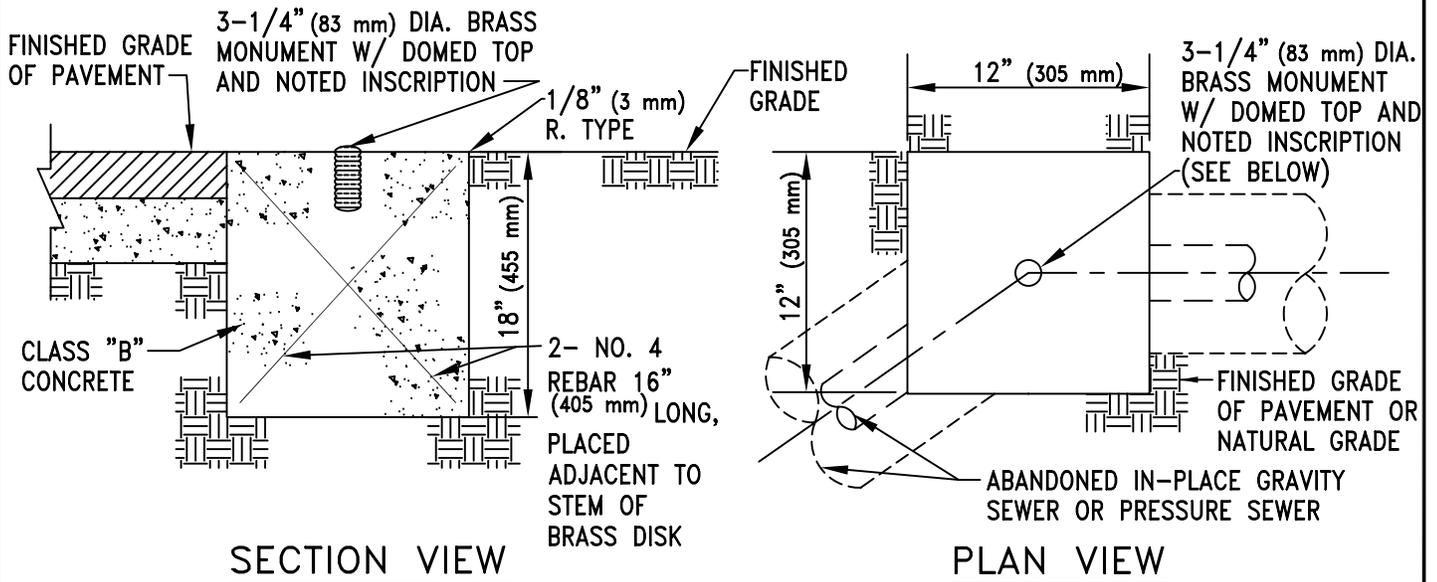


FOR \_" DIAMETER FORCE MAIN      FOR \_" DIAMETER  
PRESSURE OR GRAVITY SEWER

NOTES:

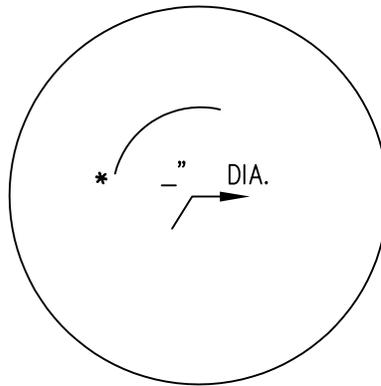
1. THE CONTRACTOR IS RESPONSIBLE FOR:
  - A. STAMPING FLOW ARROWS ON THE MONUMENT SHOWING THE APPROPRIATE DIRECTION(S) OF WASTEWATER FLOW IN THE PRESSURE SEWER.
  - B. STAMPING THE DIAMETER OF THE PRESSURE SEWER ON THE MONUMENT.
2. LETTER SIZE SHALL BE 3/16"(5 mm) FOR AGENCY NAME AND 5/32"(4 mm) FOR ALL OTHER LETTERING.
3. MONUMENT DATA SHALL BE AS SHOWN, WITH THE EXCEPTION THAT THE "UNDERLINE" NOTATION IS NOT TO BE CAST OR STAMPED. THIS NOTATION IS ONLY TO CALL ATTENTION TO THE NEED FOR INCLUSION OF THE PIPE DIAMETER AND/OR SEWER TYPE (i.e. "PRESSURE" OR "GRAVITY")
4. THE TWO No. 4 (#13) BARS MAY BE REPLACED WITH A MAGNET OF A SIZE APPROVED BY THE AGENCY AND PLACED AT THE BASE OF THE BRASS MARKER.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SEWER LOCATION		WWM 507
REVISED:		MONUMENT		SHEET 1 OF 1
7/02				



SECTION VIEW

PLAN VIEW

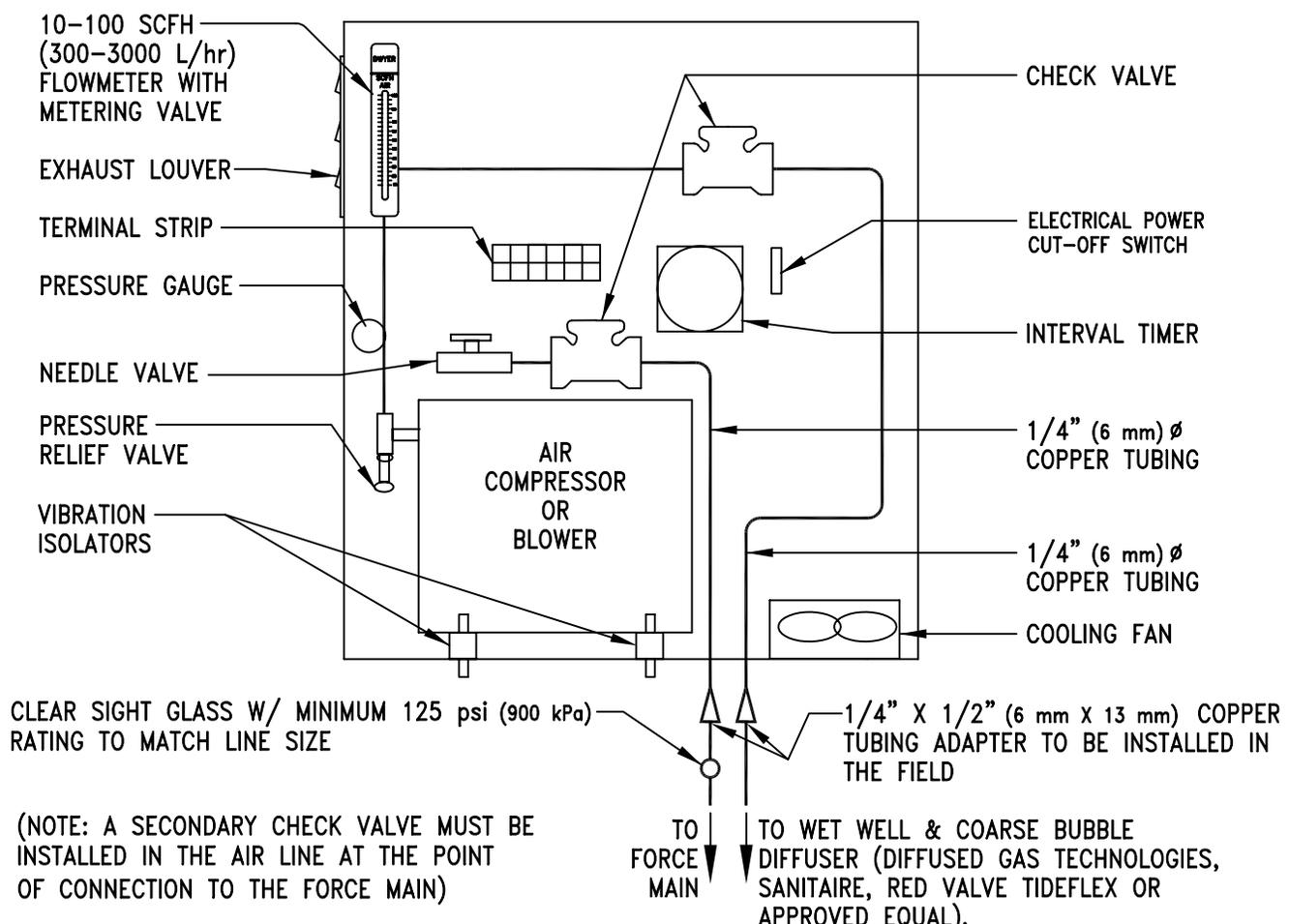


FOR \_" DIAMETER  
PRESSURE OR GRAVITY SEWER

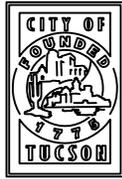
NOTES:

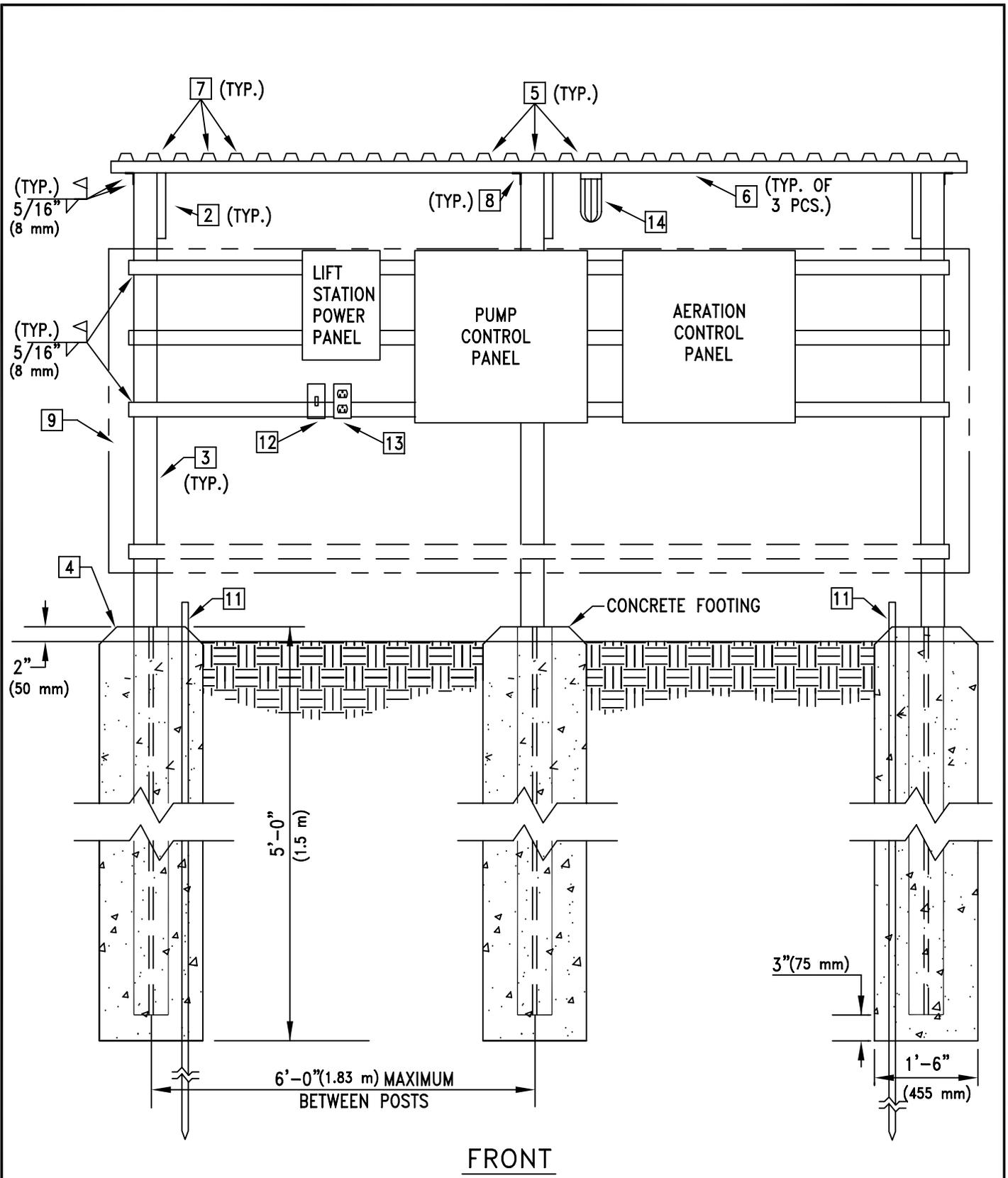
1. THE CONTRACTOR'S SURVEYOR IS TO DO THE FOLLOWING THINGS:
  - A. ARROW(S) ARE TO BE STAMPED SHOWING THE APPROPRIATE DIRECTION(S) OF WASTEWATER FLOW IN THE PRESSURE OR GRAVITY SEWER.
  - B. THE DIAMETER OF THE PRESSURE OR GRAVITY SEWER IS TO BE STAMPED ON THE MONUMENT.
2. THE WORD \* PRESSURE OR \* GRAVITY SHOULD BE USED DEPENDING UPON THE TYPE OF SEWER LINE BEING ABANDONED.
3. LETTER SIZE SHALL BE 3/16" (5 mm) FOR PIMA COUNTY WASTEWATER MANAGEMENT
4. LETTER SIZE SHALL BE 5/32" (4 mm) FOR ALL OTHER LETTERING.
5. PRINTED DATA SHALL BE AS SHOWN EXCEPT THE \* AND UNDERLINE MARK ARE NOT TO BE CAST OR STAMPED. THESE MARKS ARE ONLY USED TO CALL ATTENTION TO THE MONUMENT FABRICATOR AND SURVEYOR THAT CERTAIN INFORMATION MUST BE FILLED IN BY THEM.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		ABANDONED SEWER LOCATION MONUMENT		WWM 508
REVISED:				
11/94				

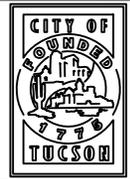


- NOTES:**
1. BOTTOM OF AIR DIFFUSER TO BE LOCATED 6" AT LEAST (150 mm) ABOVE THE PUMP INLET ELEVATION IN THE WET WELL. THE TOP OF THE DIFFUSER SHALL BE LOCATED 2" (51 mm) BELOW THE LOWEST LEVEL. LOCATE AS FAR FROM THE PUMP AS FEASIBLE.
  2. TIMER TO RUN 15 MINUTES ON AND 15 MINUTES OFF 24 HOURS PER DAY.
  3. COPPER TUBING TO BE BURIED UNDER THE SOIL FOR AT LEAST 5 FEET (1.5 m) TO DISSIPATE HEAT.
  4. AIR COMPRESSOR OR BLOWER SIZE AND TYPE TO BE DETERMINED BY THE ENGINEER AND SUBMITTED FOR REVIEW AND APPROVAL BY PIMA COUNTY WASTEWATER MANAGEMENT. EXAMPLE COMPRESSOR OR BLOWER WOULD BE GAST DIAPHRAGM COMPRESSOR, M-D PNEUMATIC BLOWER OR APPROVED EQUAL.
  5. APPROPRIATE RELAY(S) MUST BE INSTALLED TO PRECLUDE THE COMPRESSOR FROM OPERATING WHEN THE PUMP(S) ARE RUNNING. THE RELAY(S) MAY BE INSTALLED IN EITHER THE PUMP CONTROL PANEL OR AERATION PANEL.
  6. COMPONENTS OF THE AERATION PANEL WILL BE MANUFACTURED SO THAT ANY COMPONENT OF THE PANEL CAN BE REMOVED/REPLACED WITHOUT CUTTING TUBING OR PIPE.
  7. INSTALL FORTY MESH STAINLESS STEEL BUG SCREEN UNDER EXHAUST LOUVER AND FAN INLET.
  8. CHECK VALVES SHALL HAVE A RESILIENT SEAT. ENGINEER TO DETERMINE IF A STAINLESS STEEL CLOSURE SPRING IS NEEDED.
  9. ENCLOSURE SHALL BE NEMA 3R, 20"x 20" (510 mm x 510 mm) MINIMUM.

ISSUED:		STANDARD DETAIL PRIVATE PUMP STATION DUAL OUTLET AIR INJECTION PANEL		DETAIL NO.
8/92				WWM 509
REVISED:				SHEET 1 OF 1
7/02				



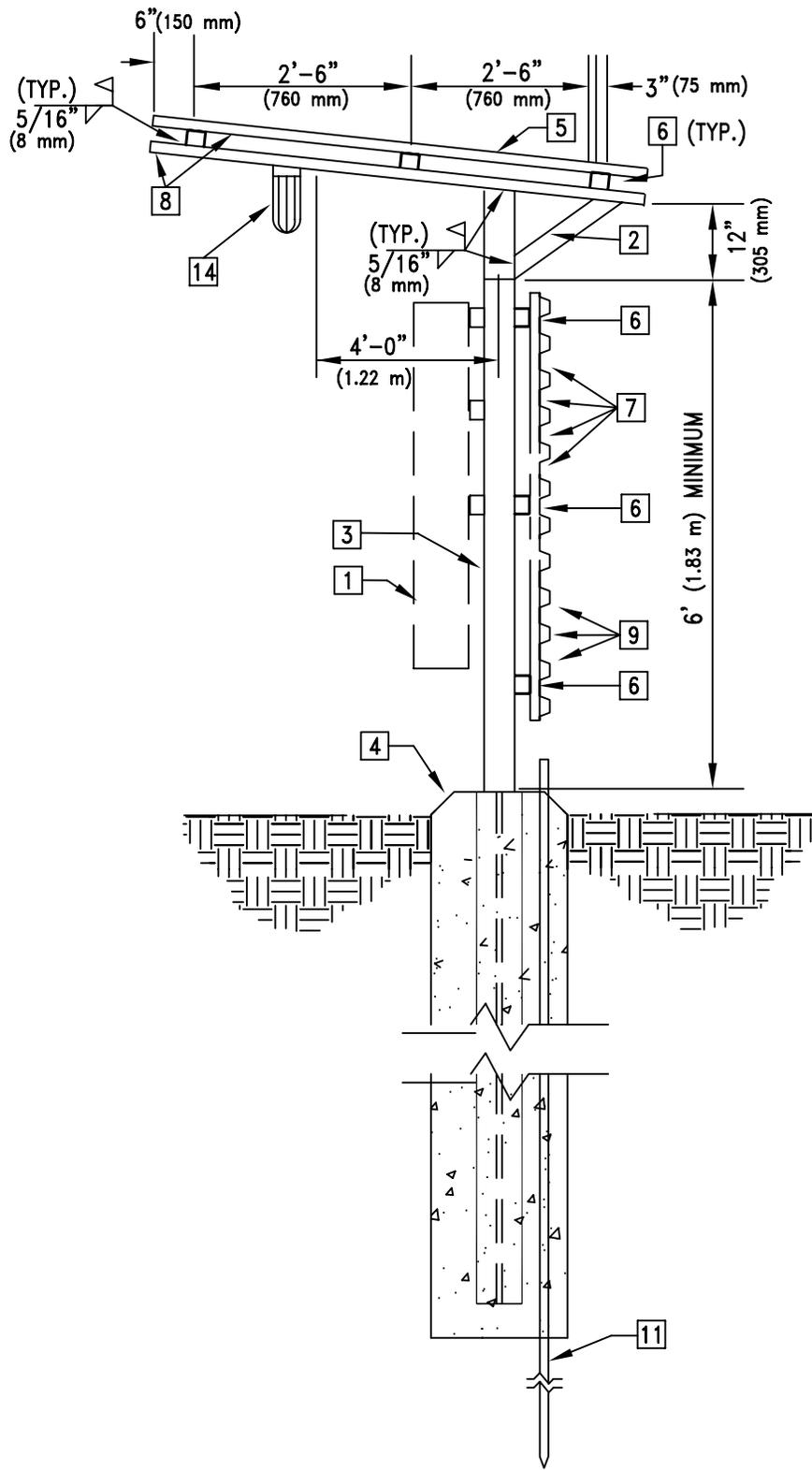
ISSUED:
8/92
REVISED:
7/02



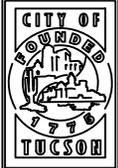
STANDARD DETAIL  
 SHADE AND  
 EQUIPMENT SUPPORT  
 STRUCTURE



DETAIL NO.
WWM 510
SHEET 1 OF 3



SIDE

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SHADE AND EQUIPMENT SUPPORT STRUCTURE		WWM 510
REVISED:				SHEET 2 OF 3
7/02				

## GENERAL NOTES

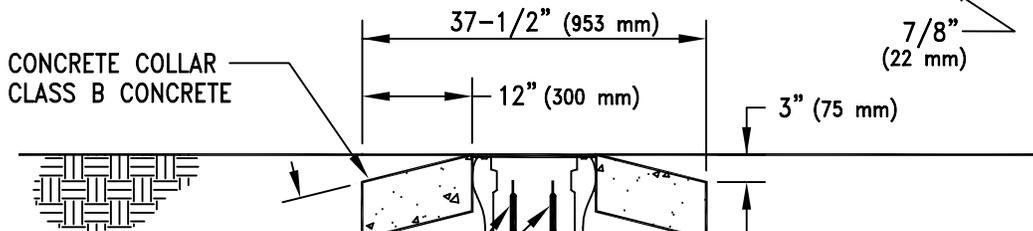
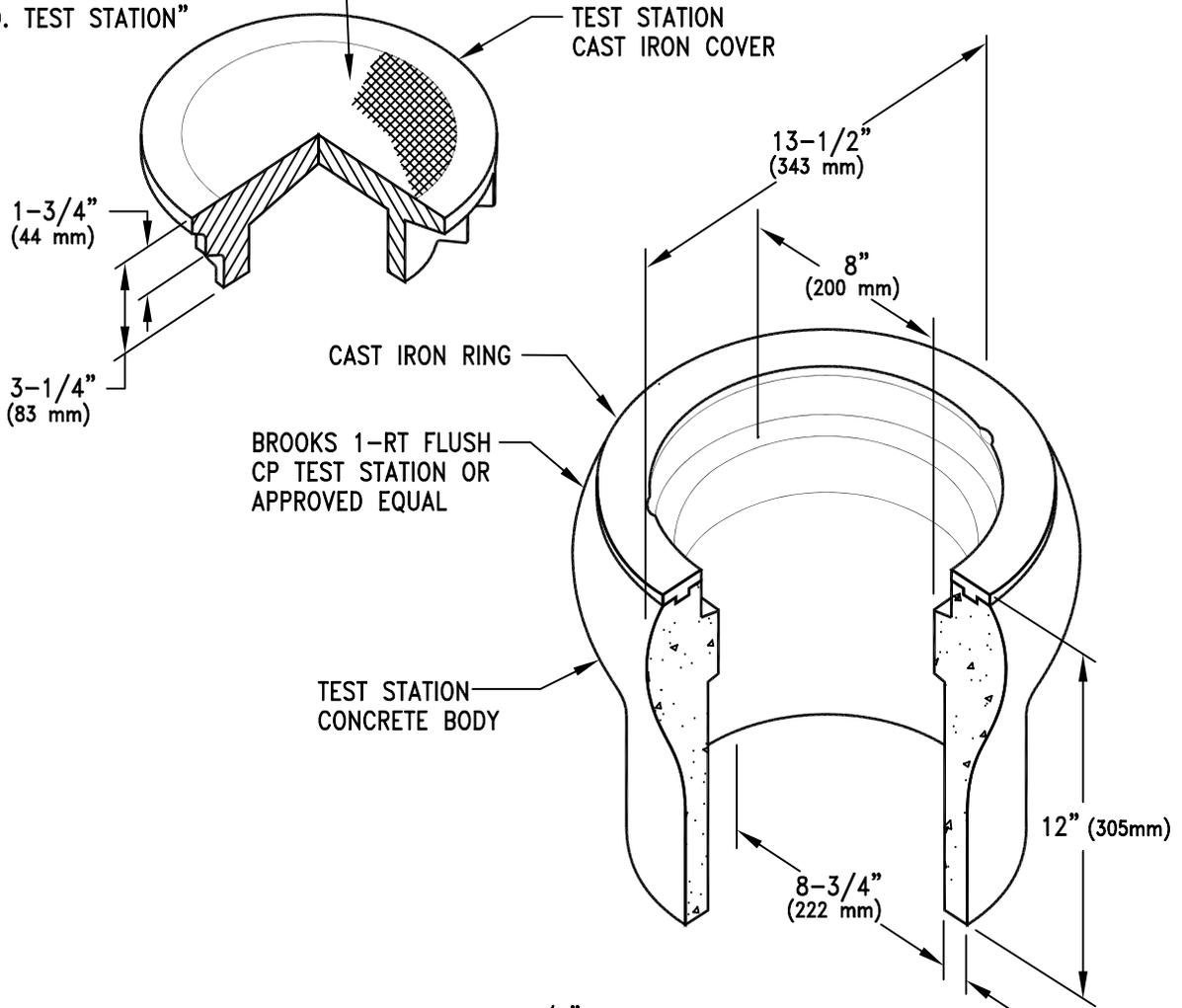
1. LOCATION, SIZE, AND MOUNTING CONFIGURATION OF EQUIPMENT SHOWN IS APPROXIMATE. LENGTH OF RACK AND NUMBER OF HORIZONTAL SUPPORTS (3 MIN.) TO BE ADJUSTED TO FIT EQUIPMENT. COORDINATE WITH EQUIPMENT MANUFACTURER'S RECOMENDATIONS.
2. UNDERGROUND AND ABOVEGROUND CONDUITS ARE NOT SHOWN. REFER TO PLANS FOR COMPLETE INFORMATION ON POWER CONDUITS.
3. ALL CONDUIT ENTRIES INTO RACKED EQUIPMENT FROM UNDERGROUND SHALL BE MADE WITH A SEALOFF FITTING.
4. PROVIDE EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS, SIZED PER NEC.
5. PANELBOARD SHALL BE AS SHOWN ON SCHEDULE. PANELBOARD SHALL ALSO HAVE THE FOLLOWING FEATURES:
  - UL LISTED AND NEC COMPLIANT
  - DEAD FRONT SAFETY TYPE
  - COPPER BUS BARS, INCLUDING FULL NEUTRAL
  - GROUND BAR
  - GALVANIZED STEEL CABINET WITHOUT KNOCKOUTS.
  - OWNER STANDARD LOCK
  - DIRECTORY CARD
  - ENGRAVED NAMEPLATE, 1/4" (6 mm) WHITE LETTERING ON BLACK BACKGROUND, SHOWING PANEL NAME, MAINS RATING, AND VOLTAGE.
6. PAINT ALL SHADE STRUCTURE AND EQUIPMENT SUPPORT MEMBERS WITH ONE COAT OF PAINT NO. 1 - ALKYD PRIMER AND ONE COAT OF PAINT NO. 2 - ALKYD (WHITE) CONFORMING TO THE REQUIREMENTS OF STD. SPECIFICATION 1002.

## KEYNOTES

1. ELECTRICAL EQUIPMENT ON RACK.
2. 2-1/2" X 1-1/2" X 3/16" (64 mm x 38 mm x 5 mm) ANGLE IRON.
3. 4" (100 mm) DIAMETER GALVANIZED STEEL SUPPORT POST (TYP.).
4. 2500 PSI (20 MPa) CONCRETE FOUNDATION.
5. 2.25" X 12" X 0.025" (57 mm x 305 mm x 0.64 mm) ALUMINUM RIB "W" PANEL AT 2% SLOPE.
6. UNISTRUT P-3000 CHANNEL CONTINUOUS (TYP.)
7. #7 (3 mm) S.M. SCREWS, 3/8" (10 mm) LONG, 6" (150 mm) O.C.
8. 1-3/4" X 1-1/4" X 3/16" (44 mm x 32 mm x 5 mm) ANGLE IRON.
9. 2.25" X 12" X 0.025" (57 mm x 305 mm x 0.64 mm) ALUMINUM RIB "W" PANEL. MOUNT TO (3) UNISTRUT CHANNELS ON BACK OF EQUIPMENT RACK.
10. OPEN SIDE TO THE NORTH, IF POSSIBLE, TO GET THE GREATEST SHADE.
11. GROUND ROD. 3/4" X 10' (19 mm x 3m) COPPER-CLAD STEEL. BOND GROUND RODS TO STRUCTURAL SUPPORTS AND PANELBOARD GROUND BAR WITH #8 AWG. (10 mm<sup>2</sup>) BARE COPPER.
12. WEATHERPROOF SWITCH FOR LIGHTING.
13. 20A GFCI TOOL RECEPTACLE WITH WP COVER. SHALL BE WEATHERPROOF WITH PLUG IN PLACE AND COVER CLOSED.
14. GE #H7113B3CDD ENCLOSED AND GASKETED COMPACT FLUORESCENT FIXTURE, OR APPROVED EQUAL. NO SHIELDING IS REQUIRED BY THE OUTDOOR LIGHTING CODE.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		SHADE AND		WWM 510
REVISED:		EQUIPMENT SUPPORT		
7/02		STRUCTURE		SHEET 3 OF 3

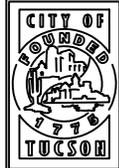
ARCWELD 1-1/2" (38 mm) LETTERING  
 ONTO CAST IRON COVER  
 "P.C.W.M.D. TEST STATION"



18" (460 mm) OF SLACK IN COILED LEADS,  
 (LEADS TO BE IDENTIFIED. ANODE LEAD  
 TO HAVE 2 KNOTS IN IT. TRACER  
 WIRE RUNNING NORTHERLY OR  
 EASTERLY TO HAVE ONE KNOT IN IT.  
 TRACER WIRE RUNNING SOUTHERLY OR  
 WESTERLY TO HAVE NO KNOTS IN IT.  
 KNOTS TO BE LOCATED APPROXIMATELY  
 6" (150 mm) FROM THE END OF THE LEADS.)

WIRE NUT BOTH LEADS TOGETHER

#14 GAUGE (1.5 mm<sup>2</sup>) SOLID COPPER WIRE  
 with 15 MIL (380 μm) PVC OR POLYETHYLENE  
 COATING

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		TEST STATION		WWM 511
REVISED:				SHEET 1 OF 1
7/02				