RULE NO.: R161-21.08

NOTICE OF PROPOSED RULE **POSTING DATE: January 14, 2021**

The Director of the Department of Austin Water proposes to adopt the following rule on or after February 15, 2021.

Comments on the proposed rule are requested from the public. Comments should be submitted to Mr. Eric Langhout, P.E.; Austin Water, 3907 S. Industrial Dr., Suite 236, Austin, Texas 78744, 512-972-0073, or via email at Eric.Langhout@austintexas.gov . To be considered, comments must be submitted before February 15, 2021, the 32nd day after the date this notice is posted. A summary of the written comments received will be included in the notice of rule adoption that must be posted for the rule to become effective.

An affordability impact statement regarding the proposed rule has been obtained and is available for inspection or copying at the address noted in the preceding paragraph.

EFFECTIVE DATE OF PROPOSED RULE

A rule proposed in this notice may not become effective before the effective date established by a separate notice of rule adoption. A notice of rule adoption may not be posted before February 15, 2021 (the 32nd day after the date of this notice) or not after March 25, 2021 (the 70th day after the date of this notice).

If a proposed rule is not adopted on or before March 25, 2021, it is automatically withdrawn and cannot be adopted without first posting a new notice of a proposed rule.

TEXT OF PROPOSED RULE

The text of the proposed rule, indicating changes from the current text, is attached to this notice.

BRIEF EXPLANATION OF PROPOSED RULE

R161-21.08: Proposed revision to the Standard Spec 506

Rule 3 – Standard Spec 506

- Standard Spec 506 – This Spec is being edited to remove SI units, change some unit displays, update Standard Details, and create acronyms where appropriate.
- Standard Spec 506.2 – Added experience requirements for contractors coring MH walls.
- Standard Spec 506.3.A – Added a requirement to submit plans to AW for review.
- Standard Spec 506.3.A.6 – Added a requirement to submit information on holiday testing equipment.
- Standard Spec 506.3.A.7 – Added information about connecting to existing manhole or junction boxes.
- Standard Spec 506.3.C – Added information on how to core through existing manholes.
- Standard Spec 506.4.A – Added COA abbreviations.
- Standard Spec 506.4.E – Added a prohibition on using bricks to construct manholes.
- Standard Spec 506.4.H – Added the requirement for a 4"-6" straight section invert for all MH up to 15” diameter pipes.
- Standard Spec 506.4.I – Added a reference to the ASTM 913 “Standard Specification for Precast Concrete Water and Wastewater Structures.”
- Standard Spec 506.4.N – Corrected SPL WW-703 to WW-146G.
- Standard Spec 506.5.A – Removed the first sentence about separation distance between adjacent pipes and moved to 506.5.F.
- Standard Spec 506.5.D – Added the requirement for a 4" to 6" straight section invert for all MH up to 15” diameter pipes.
- Standard Spec 506.5.E – Added "New" for Manholes; Added the requirement about coring distances in pre-cast MH.
- Standard Spec 506.5.F – Added information about coring distances in existing MH.
- Standard Spec 506.5.I.3 – Added "and replacing" for concrete rings.
- Standard Spec 506.5.J – Added requirements for quality control tests by contractor according to ASTM D4787 Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrate.
- Standard Spec 506.6.A.1.c – Added information about calibrated gauges for vacuum testing.
- Standard Spec 506.6.A.2.c – Added "(-10” Hg)".
- Standard Spec 506.6.A.2.d – Add "(-9” Hg)".

- Standard Spec 506.8 – Removed “S” from each Pay Item.
- Specific and Related Cross Reference Materials – Updated as needed.

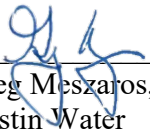
AUTHORITY FOR ADOPTION OF PROPOSED RULE

The authority and procedure for adoption of a rule to assist in the implementation, administration, or enforcement of a provision of the City Code is provided in Chapter 1-2 of the City Code. The authority to regulate construction requirements is established in Section 552.001 of the Texas Local Government Code and Title 15 of the City Code.

CERTIFICATION BY CITY ATTORNEY

By signing this Notice of Proposed Rule R161-21.08, the City Attorney certifies the City Attorney has reviewed the rule and finds that adoption of the rule is a valid exercise of the Director's administrative authority.

REVIEWED AND APPROVED



Date: 01/07/2021

Greg Meszaros, Director
Austin Water

Anne L Morgan

Date: 1/11/2021

Anne L. Morgan
City Attorney

SUMMARY OF 1st QUARTER
2021 STANDARD SPEC CHANGES

Rule 3 – Standard Spec 506

- Standard Spec 506 – This Spec is being edited to remove SI units, change some unit displays, update Standard Details, and create acronyms where appropriate.
- Standard Spec 506.2 – Added experience requirements for contractors coring MH walls.
- Standard Spec 506.3.A – Added a requirement to submit plans to AW for review.
- Standard Spec 506.3.A.6 – Added a requirement to submit information on holiday testing equipment.
- Standard Spec 506.3.A.7 – Added information about connecting to existing manhole or junction boxes.
- Standard Spec 506.3.C – Added information on how to core through existing manholes.
- Standard Spec 506.4.A – Added COA abbreviations.
- Standard Spec 506.4.E – Added a prohibition on using bricks to construct manholes.
- Standard Spec 506.4.H – Added the requirement for a 4"-6" straight section invert for all MH up to 15” diameter pipes.
- Standard Spec 506.4.I – Added a reference to the ASTM 913 “Standard Specification for Precast Concrete Water and Wastewater Structures.”
- Standard Spec 506.4.N – Corrected SPL WW-703 to WW-146G.
- Standard Spec 506.5.A – Removed the first sentence about separation distance between adjacent pipes and moved to 506.5.F.
- Standard Spec 506.5.D – Added the requirement for a 4" to 6" straight section invert for all MH up to 15” diameter pipes.
- Standard Spec 506.5.E – Added "New" for Manholes; Added the requirement about coring distances in pre-cast MH.
- Standard Spec 506.5.F – Added information about coring distances in existing MH.
- Standard Spec 506.5.I.3 – Added "and replacing" for concrete rings.
- Standard Spec 506.5.J – Added requirements for quality control tests by contractor according to ASTM D4787 Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrate.
- Standard Spec 506.6.A.1.c – Added information about calibrated gauges for vacuum testing.
- Standard Spec 506.6.A.2.c – Added "(-10” Hg)".
- Standard Spec 506.6.A.2.d – Add "(-9” Hg)".
- Standard Spec 506.8 – Removed “S” from each Pay Item.
- Specific and Related Cross Reference Materials – Updated as needed.

ITEM NO. 506 - MANHOLES ~~3-15-11~~ ***?-??-21***

506.1 - Description

This item governs construction of pre-cast and cast-in-place wastewater manholes, storm water manholes, storm water junction boxes and cast-in-place wastewater junction boxes, complete in place, including excavation, installation, backfilling and surface restoration; required items including rings, covers, coatings, and appurtenances; and incidental work such as pumping and drainage necessary to complete the work. Contractor-performed acceptance testing is required for wastewater manholes.

506.2 - Qualifications

Applicators of coatings to the interior surfaces of wastewater manholes, as specified in 506~~S~~.4.R and 506~~S~~.5.J, shall be listed on ***Austin Water (AW)*** Standard Products List ***(SPL)*** WW-511. ***Individual(s) setting up and operating equipment to core through the walls of existing manholes or junction boxes shall have experience in coring similar size holes through the walls of similar size and type structures on at least ten projects (or 15 manholes) in AW's jurisdiction.***

506.3 - Project Submittals

A. Products and Materials

The Contractor shall submit descriptive information and evidence that the materials the Contractor proposes for incorporation in the Work are of the kind and quality that satisfy the requirements in the Contract Documents. ***AW shall be included in all submittal review.*** The ~~City of Austin Water Utility Standard Products Lists~~ ***AW SPLs*** are considered a part of the Specifications for the Work. The Contractor shall use products from the SPLs for all water and wastewater construction unless alternative products are shown on the Drawings; called for in the specifications; or specified in the Bidding Requirements, Contract Forms and Conditions of the Contract.

The products included in the ~~Standard Products Lists~~***SPLs*** current at the time of plan approval shall govern; unless a specific product or products on the lists have subsequently been removed from those SPLs because of quality or performance issues. Products and materials that are not covered by SPLs shall meet the requirements in the contract documents.

Submittals for the products and materials covered by this specification shall include manufacturer catalog sheets, technical data sheets, shop drawings, product or material test results, requirements listed below, and any other information needed to adequately describe the product or material. For products covered by SPLs, the submittal shall include a copy of the applicable SPL with the proposed product identified. An SPL by itself is not considered an adequate submittal.

The submittal requirements of this specification item include:

1. For pre-cast manholes and junction boxes: shop drawings for each structure showing, at a minimum, the Project and Contractor's name: manufacturer's name and plant location; applicable specifications; list of materials (such as adjusting rings, boots, gaskets, and pre-cast sections) by type and quantity; elevation view showing diameter or size, ring and cover size and elevation, ring type (bolted or unbolted, flared top or flared bottom) wall thickness, elevations of transitions from large diameter sections to smaller diameter sections, base width and thickness, total depth, size of openings, reinforcement, and length of each pre-cast section; structure identification number and station location; pipe line identification; pipe material and size; pipe flowline elevations; plan view showing azimuthal orientation (based on 360 degrees clockwise) of the pipes relative to the outflow pipe; technical data sheets covering pipe-to-manhole or pipe-to-junction box connectors, and gaskets
2. For cast-in-place manholes and junction boxes: formwork drawings sealed by a registered Professional Engineer licensed in the State of Texas with documented experience in formwork design for wall pours that exceed 4***'*** ~~feet~~ in height and slabs that are not ground supported
3. For hydraulic cement concrete; mix components and proportions, material sources, materials test results

4. For mortar: mix components and proportions, material sources, materials test results

5. For non-shrink grout: technical data sheet indicating ASTM type and containing instructions on surface preparation, mixing, placing, and curing procedures

6. For wastewater manhole coatings and linings: technical data sheets that include instructions on surface preparation, mixing, placing, and curing procedures***; technical data sheets for coating thickness measuring equipment and for holiday detection test equipment.***

7. For connections to existing manholes or junction boxes: details showing the size, location, and method of removal of the wall section, including any temporary supports attached to the manhole or junction box wall; details showing the location of existing joints, other connecting pipes, and other features that penetrate or attach to the wall; and technical data sheets covering the pipe-to-manhole or pipe-to-junction box connectors.

B. Acceptance Test Records

Submittal of acceptance test records is required for wastewater manholes and shall include as a minimum the following items:

Name of the manhole manufacturer

Interior surface coating type and application method

Model and manufacturer of vacuum tester

Date tested/date re-tested

Indication of whether test passed or failed and statement of corrective action taken if test failed

Test Method Used

Location/station of manhole

Type of base: Precast/cast-in-place

Type of repairs made to the joints

The test records shall also be included as part of the Project records turned in with the acceptance package.

C. Installation

The Contractor shall submit evidence that the individual(s) setting up the equipment and coring through the walls of manholes and junction boxes are experienced with the equipment and procedures and have successfully cored through the same types of materials using the same types of equipment.

506.4 - Materials

A. Concrete

All cast-in-place concrete shall conform to City of Austin ***(COA)*** Standard Specification Item No. 403S, "Concrete for Structures." Cast in place concrete shall be Class A or as specified on the Drawings. Concrete used in precast concrete manhole base sections, riser sections and appurtenances shall conform to the requirements of Texas Department of Transportation Item 421, Hydraulic Cement Concrete. Concrete for backfill of over-excavated areas shall be ~~City of Austin~~***COA*** Class A, or Class J (~~City of Austin~~***COA*** Standard Specification Item 403S, Concrete For Structures) or Controlled Low Strength Material (~~City of Austin~~***COA*** Standard Specification Item 402S) as indicated on the Drawings.

B. Mortar

Mortar shall be composed of one part Portland cement, one part masonry cement (or ¼ part hydrated lime), and sand equal to 2½ to 3 times the sum of the volumes of the cements and lime used. The sand shall meet the requirements for "Fine Aggregate" as given in Standard Specification Item No. 403S "Concrete For Structures." Mortar shall not be used for any purpose on the inside of wastewater manholes.

C. Grout

Grout shall be the non-shrink type conforming to ASTM C 1107, Packaged, Dry, Hydraulic Cement Grout (Nonshrink), Grade C. Grout shall be used as packaged, with the mixed ingredients requiring only the addition of water.

D. Reinforcement

The reinforcing steel shall conform to the requirements of Standard Specification Item No. 406S, "Reinforcing Steel." Secondary, non-structural steel in cast-in-place stormwater manholes may be replaced by collated fibrillated polypropylene fibers, if approved by the Engineer or designated representative.

E. Brick

The brick for ring adjustment courses and for stormwater manholes shall be of first quality, sound, hard burned, perfectly shaped brick conforming to the requirements of ASTM C 62, Grade SW, or concrete brick meeting the requirements of ASTM C 55, Grade N-1. ***Use of brick to construct any part of wastewater manholes is prohibited.***

F. Rings and Covers

Rings and covers shall conform to the requirements of ~~City of Austin~~***COA*** Standard Specification Item No. 503~~S~~, "Frames, Grates, Rings and Covers."

1. Replacement Rings and Covers, 24***"*** ~~in~~ Diameter Lids

   This ring and cover shall be used for the replacement of broken rings and covers, minor manhole adjustment, or as otherwise directed by the Engineer or designated representative.

2. Rings and Covers, 32***"*** ~~in.~~ Diameter Lids

   This ring and cover shall be used for all new manhole construction, except as otherwise directed by the Engineer or designated representative.

G. Bulkheads

Bulkheads shall meet the requirements of ~~City of Austin~~***COA*** Standard Specification Item No. 507~~S~~ "Bulkheads."

H. Precast Base Sections, Riser Sections, Flat-top Slabs and Cones

Precast concrete base sections, riser sections, flat-top slabs, and cones shall conform to the requirements of ASTM C 478. The width of the invert shall be specifically sized for the connecting pipes. Inverts shall be "U" shaped channels. The channel depth at the point where a pipe connects to the manhole wall, for pipes 24***"*** ~~inches~~ in diameter and smaller, shall be a minimum of three fourths of the diameter of the pipe, with the top of the channel being a smooth transition between the inlet and outlet pipe connection points. For manholes connecting to pipes larger than 24***"*** ~~inches~~ in diameter, the channel depth at the point where a pipe connects to the manhole wall shall be at least equal to the full pipe diameter. Changes in flow direction in the inverts of manholes shall be made by constructing smooth, long-radius sweeps to minimize splashing, turbulence, and eddies. The manhole invert grade shall 1) be a continuation of the inlet and outlet pipe grades carried through to the centerline of the manhole, or 2) have a minimum slope of 2.5 percent between the inlet and outlet pipe inverts, or 3) have a minimum difference of 0.10***'*** ~~feet~~ between the inlet and outlet pipe inverts, whichever provides the maximum difference in invert elevation between the inlet and outlet

pipes~~.~~***, 4) have a straight section of invert that is 4" to 6" in length to transition between the curved portion of the invert channel and the connecting pipes in order to accommodate the mandrel apparatus for up to 15" dimeter pipes.*** In all cases, the bottom(s) of the channel(s) shall provide a smooth transition between the inlet and outlet pipes. Where wastewater lines enter a manhole above the flowline of the outlet, the invert shall be filleted to prevent splashing and solids deposition.

Joints for wastewater base sections, riser sections, and cones shall conform to the requirements of ASTM C 443. Additionally, joint dimensions for 48***"*** ~~inch~~ inside diameter wastewater manhole sections and cones shall comply with ~~City of Austin Standard No. 506S-13,~~ ***the*** "Wedge Seal ***Offset*** Joint Detail, Precast Manhole Section~~.~~", ***located in SPL WW-146.*** Joint dimensions for wastewater manhole sections and cones larger than 48***"*** ~~inch~~ inside diameter shall comply with ~~City of Austin~~ ***COA*** Standard No. 506S-12, "O-Ring Joint Detail Precast Manhole Section" or ~~City of Austin Standard No. 506S-13,~~ "Wedge Seal ***Offset*** Joint Detail, Precast Manhole Section"***, located in SPL WW-146***. Precast bases for 48***"*** ~~inch~~ inside diameter manholes shall have preformed inverts. Inserts acceptable to the Engineer or designated representative shall be embedded in the concrete wall of the manhole sections to facilitate handling; however, through-wall holes for lifting will not be permitted.

I. Precast Junction Boxes

Precast junction boxes ***shall conform to the requirements of ASTM C913 and*** shall be allowed only where indicated on the Drawings or acceptable to the Engineer or designated representative.

J. Pipe-to-Manhole and Pipe-to-Junction-Box Connectors

Resilient connectors, ring waterstops, and seals at connections of wastewater pipes to pre-cast and cast-in-place manholes and junction boxes shall be watertight, flexible, resilient and non-corrosive, conforming to ASTM C 923. Metallic mechanical devices for securing the connectors, ring waterstops, and seals in place shall be Type 304 stainless steel.

K. Precast Flat-Slab Transition/Junction Box Lids

Precast slab transitions and lids shall be designed to safely resist pressures resulting from loads which might result from any combination of forces imposed by an HS-20 loading as defined by the American Association of State Highway and Transportation Officials (AASHTO). The joints of precast slab transitions and of lids for wastewater applications shall conform to the requirements of ASTM C443.

L. Precast-Prefabricated Tee Manholes

Tee manholes shall be allowed only where indicated on the Drawings or as directed by the Engineer or designated representative. The main pipe section shall conform to the requirements of ~~City of Austin~~***COA*** Standard Specification Item No. 510, "Pipe." The vertical manhole portion (tee) above the main pipe shall conform to the requirements of the precast components.

The manhole tee shall have a minimum inside diameter of 48***"*** ~~inches~~ and shall rise vertically centered or tangent to the main pipe, as indicated on the Drawings or as directed by the Engineer or designated representative. An access hole less than 48***"*** ~~inches~~ in diameter shall be cut into the main pipe to allow a ledge for support of access ladders. Unless otherwise specified on the Drawings, the main pipe portion of the tee manhole shall be included in the unit price bid for the unit tee manhole price.

M. Precast Grade Rings

Rings shall be reinforced Class A concrete

1. Precast Grade Rings, 24½***"*** ~~inches~~ Inside Diameter

This adjustment ring shall be used only for adjusting existing manholes with 24" ~~inch~~ diameter lids and for Wastewater Access Device. Inside to outside diameter dimension of ring shall be 6" ~~inches~~ with a thickness of 3" ~~inches~~ to 6" ~~inches~~.

2. Precast Grade Rings, 35" ~~inches~~ Inside Diameter

This adjustment ring shall be used for all new manhole construction with 32" ~~inch~~ diameter lids. Inside to outside diameter dimension of ring shall be 6" ~~inches~~ with a thickness of 2" ~~inches~~ to 6" ~~inches~~.

N. High Density Polyethylene Grade Rings

Plastic grade (adjusting) rings shall be injection molded from high density polyethylene identified according to ASTM D4976. Reprocessable and recyclable ethylene plastic materials are allowed. Manufacturers of HDPE adjusting rings shall be listed on SPL WW-~~703~~***146G***.

O. Controlled Low Strength Material

Controlled low strength material (CLSM) shall meet Standard Specification Item 402S, Controlled Low Strength Material.

P. Cement Stabilized Sand

Cement stabilized sand for bedding or backfilling shall contain 2 bags of Portland cement per cubic yard. The sand shall meet the requirements for "Fine Aggregate" in Standard Specification Item 403S, "Concrete for Structures."

Q. Waterproofing Joint Materials

O-rings and wedge seals for the joints of all wastewater manholes, and for stormwater manholes when indicated on the Drawings, shall conform to the requirements of ASTM C443. Cold applied preformed plastic gaskets for stormwater manholes shall be as specified in City of Austin Standard Specification Item No. 510, "Pipe." Plastic seals wrapped around manholes at joints, and hydrophillic waterstops installed in joints, shall be listed on SPL WW-146A. PVC waterstops installed in joints and waterproofing compounds applied to the exterior surfaces of manholes and junction boxes shall be as specified in the Contract Documents.

R. Interior Surface Coatings for Wastewater Manholes

Interior surface coatings for wastewater manholes shall be either: as specified on the Drawings, as designated in writing by the Engineer or designated representative, or as included on SPL WW-511, which lists acceptable products, uses and applicators.

S. Structural Lining Systems for Wastewater Manholes

Structural lining systems for wastewater manholes shall be either: as specified on the Drawings, as designated in writing by the Engineer or designated representative, or as included on SPL WW-511A.

506.5 - Construction

A. General

~~A minimum horizontal separation of 12 inches shall be maintained between adjacent pipes inside and outside a manhole or junction box.~~ Pipe ends within the base section or junction box walls shall not be relied upon to support overlying manhole dead and live load weights. All wastewater branch connections to new or existing mains shall be made at manholes, with the branch pipe crown installed at an elevation no lower than the elevation of the effluent pipe crown. Changes in flow direction in the inverts shall be made by constructing smooth, long-radius sweeps to minimize splashing, turbulence, and eddies. Where wastewater lines enter the manhole up to 24" ~~inches~~ above the flowline of the outlet, the invert shall be sloped upward in a U-shaped channel three-fourths of the diameter of the incoming pipe to receive the flow, thus preventing splashing or solids

deposition. A drop pipe shall be provided for a wastewater pipe entering a manhole whenever the invert cannot be constructed to prevent splashing and solids deposition. Construction of extensions to existing systems shall require placement of bulkheads at locations indicated or directed by the Engineer or designated representative.

Unless otherwise indicated on the Drawings, stormwater manholes shall have eccentric cones and wastewater manholes shall have concentric cones, except on manholes over large mains where an eccentric cone shall be situated to provide access to an invert ledge. Eccentric cones may be used where conflicts with other utilities dictate. Flat-slab tops may be used only where clearance problems are encountered or where specified on the Drawings. Cast-in-place wastewater junction boxes shall be allowed only where indicated on the Drawings or where accepted by the Engineer or designated representative.

B. Foundation Support

Manholes shall be founded at the established elevations on uniformly stable subgrade. Unstable subgrade shall be over-excavated a minimum of 12*"* ~~inches~~ and replaced with a material acceptable to the Engineer or designated representative. Precast base units shall be founded and leveled on a 6*"* ~~inch~~ thick layer of coarse aggregate bedding. A pipe section with a prefabricated tee manhole and half the length of the adjoining pipe sections on each side shall be founded on a minimum of 6*"* ~~inch~~ thick layer of unreinforced Class A concrete (~~City of Austin~~*COA* Standard Specification Item No. 403S, "Concrete For Structures"). The cast-in-place concrete cradle shall be placed against undisturbed trench walls up to the pipe's springline.

C. Cast-in-Place Concrete

Structural concrete work shall conform to Standard Specification Item No. 410S, *"*Concrete ~~for~~ Structures.*"* Forms shall be used for all slabs that are not ground supported and for all vertical surfaces above the foundation level. Formwork shall be designed according to American Concrete Institute ACI 347, Guide to Formwork for Concrete. Outside forms on vertical surfaces may be omitted where concrete can be cast against the surrounding earthen material that can be trimmed to a smooth vertical face.

D. Manhole Bases

Pre-cast bases shall conform to requirements in 506.4.H.

Cast-in-place bases shall have a minimum thickness of 12*"* ~~inches~~ at the invert flowline. The widths of all manhole inverts shall be specifically sized for the connecting pipes. Inverts shall be "U" shaped channels. The channel depth at the point where a pipe connects to the manhole wall, for pipes 24*"* ~~inches~~ in diameter and smaller, shall be a minimum of three-fourths of the pipe diameter, with the top of the channel being a smooth transition between the inlet and outlet pipe connection points. For manholes connecting to pipes greater than 24*"* ~~inches~~ in diameter, the channel depth at the point where a pipe connects to the manhole wall shall be equal to the full pipe diameter. The manhole invert grade shall 1) be a continuation of the inlet and outlet pipe grades carried through to the centerline of the manhole, or 2) have a minimum slope of 2.5 percent between the inlet and outlet pipe inverts, or 3) have a minimum difference of 0.10*'* ~~feet~~ between the inlet and outlet pipe inverts, whichever provides the maximum difference in invert elevation between the inlet and outlet pipes~~,~~ ***4) have a straight section of invert that is 4" to 6" in length to transition between the curved portion of the invert channel and the connecting pipes in order to accommodate the mandrel apparatus for up to 15" dimeter pipes.*** In all cases, the bottom(s) of the channel(s) shall provide a smooth transition between the inlet and outlet pipes. Changes in flow direction in the inverts of manholes shall be made by constructing smooth, large-radius sweeps to prevent splashing, turbulence, and eddies. The lowermost riser section may be set in the Portland cement concrete, while still plastic, after which the base shall be cured a minimum of 24 hours prior to proceeding with construction of the manhole up to 12*'* ~~feet~~ in depth. The base shall be cured an additional 24 hours prior to continuing construction above the 12*'* ~~foot~~ level.

Wastewater manholes having cast-in-place bases may be constructed over existing wastewater pipes and the top half of the pipe removed to facilitate invert construction, except where the existing pipe is PVC, in which case, the entire pipe shall be removed from inside the manhole. The manhole floor shall rise outwardly from the springline elevation of the pipe, approximately ***1"*** ~~one inch~~ for each 12***"*** ~~inch~~ of run (8 percent slope). The floors of stormwater manholes, also, shall rise outwardly from the springline elevation of the pipe, approximately ***1"*** ~~one inch~~ for each 12***"*** ~~inches~~ of run (8 percent slope).

Wastewater manholes with lines larger than 18***"*** ~~inches~~ shall require pre-cast bases; manholes constructed over in-service mains however, may be built on cast-in-place bases if the flow cannot be interrupted.

E. Pipe Connections to ***New*** Manholes and Junctions Boxes

Wastewater pipe connections to ***new*** manholes and junction boxes shall be made using flexible, resilient, and non-corrosive watertight boot connectors or ring waterstops acceptable to the Engineer and conforming to the requirements of ASTM C-923. Any voids in the annular space between the pipe and boot connector or ring waterstop and the inside of the manhole wall shall be filled with non-shrink grout to prevent solids collection. ***New precast manholes and manholes with cast-in-place bases shall have holes for pipe penetrations in the manhole wall separated by a minimum of 7", designed by the manhole manufacturer and as measured from the inside diameter of the cored or formed holes on the inside wall of the manhole to ensure the structural integrity of the manhole wall.***

F. Pipe Connections to Existing Manholes and Junction Boxes

Wastewater pipe connections to existing manholes and junction boxes shall be made by removing the wall section by coring ~~or alternative method approved by the Engineer or designated representative~~; installing flexible, resilient, and non-corrosive boot connectors or ring waterstops acceptable to the Engineer ~~or designated representative~~ and conforming to the requirements of ASTM C-923; filling any voids in the annular space between the pipe and boot connector or ring waterstop and the inside of the manhole or junction box wall with non-shrink grout; rebuilding the invert to conform to Section 506~~S~~.5.D; rehabilitating the interior walls with structural lining material listed on SPL WW-511A, and coating the interior of the manhole with material listed on SPL WW-511. ***Connections to existing manholes and junction boxes shall be made at locations that allow the removal limits of the wall section to be no closer than 12" to the inside diameter of the nearest existing connecting pipe. Equipment used to remove the wall section shall be operated in a manner that does not damage the adjacent interior coating, substrate, or wall. This includes installation of anchors or other supports that are attached to the manhole or junction box wall for temporary support of the removal equipment.***

G. Waterproofing

PVC waterstops, hydrophillic waterstops, joint wrapping, and waterproofing compounds shall be installed as specified. Material wrapped around manholes at joints shall be listed on SPL WW-146A regardless of whether installation of the material is required by the Contract for waterproofing or is volunteered by the Contractor for ensuring acceptance of the manhole joints.

H. Backfilling

Backfilling of manholes shall conform to the density requirements of ~~City of Austin~~***COA*** Standard Specification Item No. 510, ***"***Pipe.***"*** Manhole construction in roadways may be staged to facilitate pavement base construction. Manholes constructed to interim elevations to facilitate interim construction shall be covered with steel plates that conform to the requirements of ~~City of Austin~~***COA*** Standard 804S-4, sheets 5, 6 and 7, Steel Plating. Steel plates on wastewater manholes shall be set in mortar to minimize inflow of storm water runoff. Manholes shall be completed to finish elevation prior to placement of the roadway's finish surface except on pavement reconstruction projects, where

castings may be adjusted after paving is completed. The excavation for completion of manhole construction shall be backfilled in accordance with ~~City of Austin~~***COA*** Standards for Trench Repair.

I. Height Adjustment of Manholes

1. General

All adjustments shall be completed prior to the placement of the final roadway surface except on pavement reconstruction projects, where castings may be adjusted after paving is completed.

Brick shall not be used in making height adjustments to wastewater manholes. Mortar shall not be used for any purpose on the inside of wastewater manholes.

Manhole components to be reused shall be carefully removed and the contact areas shall be cleaned of all mortar, concrete, grease and sealing compounds. Any items broken in the process of removal and cleaning shall be replaced in kind by the Contractor at its expense.

If the adjustment involves lowering the top of a manhole, a sufficient depth of pre-cast concrete rings or brick courses shall be removed to permit reconstruction. Existing mortar shall be cleaned from the top surface remaining in place and from all brick or concrete rings to be reused and the manhole rebuilt to the required elevation. The manhole ring and cover shall then be installed with the top surface conforming to the proposed grade.

If the adjustment involves raising the elevation of the top of the manhole in accordance with ***"***Minor Manhole Height Adjustment," the top of brick or concrete ring shall be cleaned and built up vertically to the new elevation, using new or salvaged concrete rings or bricks and the ring and cover installed with the top surface conforming to the proposed grade.

After rings and covers are set to grade, the inside and outside of the precast concrete grade rings shall be wiped with non-shrink grout to form a durable surface and water-tight joints. The grouted surface shall be smooth and even with the manhole cone section. Grout shall not be placed when the atmospheric temperature is at or below 40°F. If a sudden drop in temperature below 40°F occurs or ~~tempartures~~***temperatures*** below 40°F are predicted, the grouted surfaces shall be protected against freezing for at least 24 hours.

2. Minor Manhole Height Adjustment (New and Existing Manholes)

Minor manhole height adjustments shall be performed as indicated on ~~City of Austin~~***COA*** Standard 506S-4, "Minor Manhole Height Adjustment", and shall consist of adding precast reinforced concrete rings to adjust new and existing manholes to final grade. Brick shall not be used in making height adjustments to wastewater manholes.

If the adjustment involves raising the elevation of the top of the manhole, the top of brick or concrete ring shall be cleaned and built up vertically to the new elevation, using new or salvaged concrete rings or bricks and the ring and cover installed with the top surface conforming to the proposed grade.

For new manhole construction, the maximum allowable throat or chimney height, including the depth of the ring casting, shall be limited to 21***"*** ~~inches~~ of vertical face on the interior surface. For adjustments of existing manholes that fall within the limits of overlay and street reconstruction projects, the maximum vertical allowable height, including the depth of the ring casting, shall be limited to 27***"*** ~~inches~~ of vertical face on the interior surface. All other existing manholes shall have a maximum allowable throat or chimney height adjustment, including the depth of the ring casting, of 12***"*** ~~inches~~ of vertical face on the interior surface. Any adjustment that will exceed these requirements shall be accomplished as indicated on ~~City of Austin~~***COA*** Standard 506S-2, ***"***Major Manhole Height Adjustment***"*** and as described below. Manholes not located in paved areas shall have bolted covers. Manholes located within paved areas (street right of way only) shall be standard non-bolted unless otherwise noted on the drawings.

3. Major Manhole Height Adjustment (Existing Manholes Only)

Any adjustment that exceeds the requirements of Minor Manhole Adjustments, shall be accomplished as indicated on ~~City of Austin~~***COA*** Standard 506S-2, ***"***Major Manhole Height Adjustment,***"*** and shall consist of any combination of removing ***and replacing*** the concrete rings, and/or the manhole cone section, and/or the straight riser section of the manhole in order to bring the manhole to final grade. Major manhole adjustments shall apply only to existing manholes. Manholes not located in paved areas shall have bolted covers. Manholes located within paved areas (street right of way only) shall be standard non-bolted unless otherwise noted on the drawings.

J. Interior Coatings of Wastewater Manholes and Junction Boxes

The interior surfaces of all Portland cement concrete wastewater manholes and junction boxes shall be coated with products specified either on the Drawings, designated in writing by the Engineer or representative, or listed on SPL WW-511. Product selection shall conform to usage described in that SPL. Surface preparation shall follow the product manufacturer's recommended procedures contained in technical data sheets unless otherwise specified in the contract documents. The Contractor shall measure the coating thickness according to ASTM D 6132, Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Over Concrete Using an Ultrasonic Gage. Thickness measures shall be made at locations designated by the Engineer or designated representative. All thickness measurements shall be witnessed by the Engineer or designated representative.

The contractor shall test for discontinuities (holidays) in each new layer of interior organic coating applied to wastewater manholes and junction boxes. The test methods and equipment shall confirm to ASTM D4787, Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrate. Each new layer of applied coating shall be tested to detect pinholes, voids, cracks, thin spots, and foreign inclusions. All discontinuity testing shall be performed using high-voltage, pulse-type equipment and witnessed by the Engineer or designated representative. The test voltage shall depend on the coating thickness according to the tabulated values in ASTM D4787. Test voltages for common coating thicknesses are as follow:

Coating or Lining Thickness, Mils	***Test Voltage***
20	***2700***
40	***5500***
80	***11500***
120	***16500***

K. Structural Linings of Existing Wastewater Manholes

The interior surfaces of existing wastewater manholes and junction boxes at locations shown in the Drawings or as designated by the Engineer shall be strengthened by application of structural lining systems either as specified on the Drawings, directed in writing by the Engineer or designated representative, or listed on SPL WW-511A. Selection of products for coating the interior of existing manholes shall be based on the condition of the manholes. Surface preparation shall follow the product manufacturer's recommended procedures contained in technical data sheets unless otherwise specified in the contract documents.

L. Abandonment of Existing Manholes

Manholes designated on the Drawings for abandonment, shall be removed to a level not less than four feet below grade. Two-foot long sections of the inlet and outlet pipes shall be cut and removed on the outside of the manhole, the ends of the remaining pipe and the pipe sections penetrating the manhole wall shall be securely plugged, and the structure filled with material in accordance with ***COA*** Standard 506S-15 or as directed by the Engineer or designated representative.

506.6 - Acceptance Testing of Wastewater Manholes

Manholes shall be tested separately and independently of the wastewater lines.

A. Test by the Vacuum Method

A vacuum test shall be performed by the Contractor prior to backfilling those manholes that fall within the right-of-way that require detouring of vehicular traffic. A second vacuum test will not be required after backfilling and compaction is complete unless there is evidence that the manhole has been damaged or disturbed subsequent to the initial vacuum test.

For manhole installations which do not require detouring of vehicular traffic, the vacuum method is recommended and may be used by the Contractor prior to backfilling the manhole to insure proper installation so that defects may be located and repaired; however, a vacuum test shall be performed after backfilling, and compaction are complete. Testing after backfill and compaction are complete will be the basis for acceptance of the manhole.

1. Equipment

   a) The manhole vacuum tester shall be a device approved for use by the Engineer or designated representative.

   b) Pipe sealing plugs shall have a load resisting capacity equal to or greater than that required for the size of the connected pipe to be sealed.

   c) Gauges shall be calibrated and read in inches of mercury (inches Hg or in Hg) or pounds per square inch gauge (psig) or both.

2. Procedures - applicable to new 48***"*** ~~inch~~ diameter manholes

   a) Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before installation or unless it is applied at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints. Tests shall be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.

   b) After cleaning the interior surfaces of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs shall be as recommended by the plug manufacturer. Plugs and the ends of pipes connected by flexible boots shall be blocked to prevent their movement during the vacuum test.

   c) The vacuum test head shall be placed on the top of the cone section or, inside of the top of the manhole cone section, and the compression seal band inflated to the pressure recommended by its manufacturer. The vacuum pump shall be connected to the outlet port with the valve open. When a vacuum of 10***"*** ~~inches~~ of mercury ***(-10" Hg)*** (-5 psig) has been attained, the valve shall be closed and the time noted. Tampering with the test equipment will not be allowed.

   d) The manhole shall have passed the test if the vacuum does not drop below 9 ~~inches~~ of mercury ***(-9" Hg)*** (-4.5 psig) within 3 minutes of the time the valve was closed. The actual vacuum shall be recorded at the end of the 3 minutes during which the valve was closed.

   e) When the standard vacuum test cannot be performed because of design or material constraints (examples: T-Type manholes, T-Lock Liners, or other reasons acceptable to the Engineer or designated representative), testing of individual joints shall be performed as directed by the Engineer or designated representative.

B. Test by the Exfiltration Method

At the discretion of the Engineer or designated representative, the Contractor may substitute the Exfiltration Method of testing for the Vacuum test described in Section 506.6.A. above. This method may only be used when ground water is not present. If ground water is present a Vacuum Test shall be used unless otherwise directed by the Engineer or designated representative. All backfilling and compaction shall be completed prior to the commencement of testing.

The procedures for the test shall include the following:

1. Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints. Tests shall be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.
2. After cleaning the interior surface of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs shall be as recommended by the plug manufacturer.
3. Concrete manholes shall be filled with water or otherwise thoroughly wetted for a period of 24 hours prior to testing.
4. At the start of the test, the manhole shall be filled to the top with water. The test time shall be 1 hour. The Construction Inspector must be present for observation during the entire time of the test. Permissible loss of water in the 1-hour test time is 0.025 gallons per diameter foot, per foot of manhole depth. For a 4*'* ~~-foot~~ diameter manhole, this quantity converts to a maximum permissible drop in the water level (from the top of the manhole cone) of 0.1*"/foot* ~~inches per foot~~ of manhole depth or 1.0*"* ~~inches~~ for a 10*'* ~~-foot~~ deep manhole.

C. Failure to Pass the Test - Records of Tests

If the manhole fails to pass the initial test method as described in (A) Test by the Vacuum Method and, if allowed, (B) Test by the Exfiltration Method, or if visible groundwater leakage into the manhole is observed, the Contractor shall locate the leak, if necessary by disassembly of the manhole. The Contractor shall check the gaskets and replace them if necessary. The Contractor may re-lubricate the joints and re-assemble the manhole, or the Contractor may install an acceptable exterior joint sealing product (see ~~City of Austin~~*AW* Standard Products List Item SPL WW-146A) on all joints and then retest the manhole. If any manhole fails the vacuum and/or exfiltration test twice, the Contractor shall consider replacing that manhole. If the Contractor chooses to attempt to repair that manhole, the manhole must be retested until it passes. In no case shall cold applied preformed plastic gaskets be used for repair. Records of all manhole testing shall be made available to the Engineer or designated representative at the close of each working day, or as otherwise directed by the Engineer or designated representative. Any damaged or visually defective products, or any products out of acceptable tolerance shall be removed from the site.

D. Inspection

The Engineer or designated representative shall make a visual inspection of each manhole after it has passed the testing requirements and is considered to be in its final condition. The inspection shall determine the completeness of the manhole; any defects shall be corrected to the satisfaction of Engineer or designated representative.

506.7 - Measurement

A "Junction Box" and "Box Manholes" will be measured by each structure of the indicated size regardless of depth.

A "Standard Pre-cast Manhole with Pre-cast Base", "Standard Pre-cast Manhole with Cast-in-Place (CIP) Base", "Special Manhole", "Drop Manhole with Pre-cast Base", "Drop Manhole with Cast-in-Place (CIP)

Base", "Centered Tee Manhole", or "Tangent Tee Manhole" will be measured by each structure of the indicated size for the first 8' ~~feet~~ of depth.

An "Extra Depth Manhole" will be measured by linear vertical foot of Standard Pre-cast Manhole with Pre-cast Base, Standard Pre-cast Manhole with CIP Base, Drop Manhole with Pre-cast Base, Drop Manhole with CIP Base, Special Manhole, Centered Tee Manhole, or Tangent Tee Manhole of the indicated size in excess of ~~eight feet~~*8'* of depth. Manhole depth will be measured from the invert flow line to the finished surface elevation.

"Minor Manhole Height Adjustment" and "Major Manhole Height Adjustment" will be measured by each unit for the indicated size. Only existing manholes will be measured for minor or major manhole height adjustment.

"Connection to Existing Manhole or Junction Box" will be measured per each for the indicated type of structure and location.

"Structural Lining" will be measured by the linear vertical foot for the indicated structure.

New manholes constructed to interim elevations to facilitate stage construction shall be measured as one unit regardless of the number of interim elevations constructed. All labor, materials and other expenses necessary for the stage construction shall be included in the unit price bid for the completed unit. Cost of abandonment of existing manholes shall be included in the unit price bid for the completed unit, unless Pay Item No. 506 AB is indicated on the Drawings and identified in Standard Contract Bid Form 00300U.

506.8 - Payment

Payment for completed junction boxes and manholes of the type indicated on the Drawings shall be made at the appropriate unit bid price. The unit bid price shall include all labor, equipment, materials, (including but not limited to frames and grates, rings and covers, adjusting rings, cone sections, riser sections, gaskets, drop piping and fittings, bases, pipe-to-manhole connectors, concrete, reinforcing steel, non-shrink grout, mortar, joint wrap where specified, and, for wastewater manholes, interior coatings), time and incidentals necessary to complete the work.

Payment for a "Junction Box" and "Box Manhole" will be made at the unit price bid for the indicated size, complete in place.

Payment for the first 8' ~~feet~~ of a "Standard Pre-cast Manhole with Pre-cast Base", "Standard Pre-cast Manhole with Cast-in-Place (CIP) Base", "Special Manhole", "Drop Manhole with Pre-cast Base", "Drop Manhole with Cast-in-Place (CIP) Base", "Centered Tee Manhole", or "Tangent Tee Manhole" will be made at the unit price bid for the indicated type and size, complete in place.

Payment for that portion of a Standard Pre-cast Manhole with Pre-cast Base, Standard Pre-cast Manhole with CIP Base, Drop Manhole with Pre-cast Base, Drop Manhole with CIP Base, Special Manhole, Centered Tee Manhole, or Tangent Tee Manhole in excess of 8' ~~feet~~ in depth will be made at the unit price bid for "Extra Depth Manhole" of the indicated type and size, complete in place.

Payment for "Minor Manhole Height Adjustment" and "Major Manhole Height Adjustment" will be made at the unit bid price, complete in place.

Payment for "Structural Lining" will be made at the unit price per linear vertical foot, which will include surface preparation, environmental adjustments, lining application, and curing, as required.

Payment for "Connection to Existing Manhole or Junction Box" shall be made at the unit price per connection and will include removing the wall section by coring or alternative method approved by the Engineer or designated representative, rehabilitating the interior walls, rebuilding the invert, and preparing and coating the interior surfaces of the structure.

When indicated in the Drawings, abandonment of existing manholes shall be made at the unit price for abandonment.

The intended use of each item shall be designated by a two-letter code (Wastewater = WW; Stormwater = SW) in the spaces provided after the pay item number:

Pay Item No. 506~~S~~ M___:	Standard Pre-cast Manhole w/Pre-cast Base, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ M1___:	Standard Pre-Cast Manhole w/CIP Base, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ S___:	Special Manhole, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ D___:	Drop Manhole w/Pre-cast Base, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ D1___:	Drop Manhole w/CIP Base, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ C___:	Centered Tee Manhole, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 506~~S~~ T___:	Tangent Tee Manhole, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 506~~S~~ J___:	Junction Box, ___ Ft. × ___ Ft.	Per Each.
Pay Item No. 506~~S~~ B___:	Box Manhole ___ Ft. × ___ Ft.	Per Each.
Pay Item No. 506~~S~~ 2___:	Major Manhole Height Adjustment, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ 4___:	Minor Manhole Height Adjustment, ___ Dia.	Per Each.
Pay Item No. 506~~S~~ AB___:	Abandonment of existing Manholes:	Per Each.
Pay Item No. 506~~S~~ EDM___	Extra Depth of Manhole, ___ Dia.	Per Linear Vert. Foot.
Pay Item No. 506~~S~~ SL___:	Structural Lining of ___:	Per Linear Vert. Foot.
Pay Item No. 506~~S~~ CN___:	Connection to Existing ___:	Per Each.

End

SPECIFIC CROSS REFERENCE MATERIALS	
Standard Specification Item No. 506, "Manholes"	
~~City of Austin~~ ***COA*** Standard Specifications ***Items***	
Designation	Description
Item 402S	***Controlled Low Strength Material***
Item 403S	Concrete For Structures
Item 406S	Reinforcing Steel
~~Item 402S~~	~~Controlled Low Strength Material~~
Item 410S	Concrete Structures
Item 503~~S~~	Frames, Grates, Rings and Covers
Item 504~~S~~	Adjusting Structures
Item 507~~S~~	Bulkheads
Item 510	Pipe

Texas Department of Transportation Standard Specifications For Construction and Maintenance of Highways, Streets and Bridges	
Designation	Description
Item 421	Hydraulic Cement Concrete
~~City of Austin~~*COA* Utilities Criteria Manual	
Designation	Description
Section 2.8.0	Abandonment of Facilities
Subsection 2.~~8.2~~*9.4.D*	Manholes
~~City of Austin Water Utility Documents~~ *AW Standard Products Lists*	
Designation	Description
SPL WW-146	*Concrete Manhole Sections*
SPL WW-146A	Manhole Seals~~, Plastic, Watertight~~
SPL WW-146G	*Manhole Grade Rings, Plastic*
SPL WW-511	*Organic* Lining ~~System~~ for Wastewater Manholes
SPL WW-511A	Structural Lining ~~System~~ for Wastewater Manholes
~~SPL WW-703~~	~~Adjusting (grade) rings for manhole chimney sections~~
~~City of Austin~~*COA* Standard *Details*	
Designation	Description
506S-2	Major Manhole Height Adjustment
506S-4	Minor Manhole Height Adjustment
506S-15	Abandoned Manhole
506S-12	O-Ring Joint Detail, Precast Manhole Section
~~506S-13~~	~~Wedge Seal Joint Detail, Precast Manhole Section Adjustment~~
506S-15	Abandoned Manhole
804S-4, 5, 6 and 7 of 9	Steel Plating
~~City of Austin~~*COA* Standard Contract	
Designation	Description
00300U	Bid Form (Unit Prices)
American Society for Testing and Materials (ASTM)	

Designation	Description
ASTM C 55	Specification for Concrete Building Brick
ASTM C 62	Specification for Building Brick Solid Masonry Units Made from Clay of Shale
ASTM C478/C478M	Standard Specification for Precast Concrete Manhole
ASTM C443/C443M	Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C923/C923M	Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures Pipes
ASTM C1107	Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D4787	***Continuity Verification of Liquid or Sheet Lining Applied to Concrete Substrate***
ASTM D~~6132~~***4976***	Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D~~4976~~***6132***	Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coating Over Concrete Using an Ultrasonic Gage
American Concrete Institute	
Designation	Description
Item 347	Guide to Formwork for Concrete

RELATED CROSS REFERENCE MATERIALS	
Standard Specification Item No. 506, "Manholes"	
AW Standard Products Lists	
SPL WW-219	***32 Inch Manhole Cover Casting Sets***
~~City of Austin~~***COA*** Utilities Criteria Manual	
Designation	Description
Section 2	Water***, Reclaimed Water*** and Wastewater ~~Design~~ Criteria
~~City of Austin~~***COA*** Standards	
Designation	Description
1100S-1	Casting Adjustments
503S-4S	Storm Sewer Manhole Ring and 32” Cover
~~503S-4W~~	~~Sanitary Sewer Manhole Ring and 32” Cover~~
503S-5S	Bolted Storm Sewer Manhole Ring and 32” Cover
~~503S-5W~~	~~Watertight Manhole Ring and 32” Cover (W&WW)~~
506S-1	Manhole Invert Plan

506S-5	Typical Box Manhole 30” and Larger Pipe
506S-7	Precast Manhole with Drop Inlet on Cast in Place Foundation
506S-8	Precast Manhole with Drop Inlet on Precast Base
506S-9	Precast Manhole On Cast-In-Place Foundation
506S-10	Wastewater Manhole on Precast Base
506S-11	Storm Sewer Manhole Details
American Association of State Highway and Transportation Officials (AASHTO)	
Designation	Description
M306	Standard Specifications for Drainage Structure Castings