TECHNICAL SPECIFICATIONS

FOR

CITY OF BURNET

EAGLES NEST PUMP STATION
GROUND STORAGE TANK AND SITE WORK IMPROVEMENTS

BURNET COUNTY, TEXAS

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3/19/26

TBPELS Firm Reg. F-3524
TBPELS Firm Reg. 10194981

March 2026

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SECTION 1

GENERAL REQUIREMENTS

0110 SUMMARY OF THE WORK

The work covered by these specifications consists of water pump station improvements at a Site located on the north side of State Highway 29 on the east side of Big Sky, a private road in the Eagles Nest Subdivision which lies approximately 2.5 miles west of downtown Burnet, Texas.

The work generally consists of the expansion of the existing Eagles Nest Pump Station site area, including all excavation and embankment for this site work, a new 100,000 gallon welded steel ground storage tank and foundation, related yard piping and valves, connections to existing pump station yard piping, placing flexible base drive area and all final site grading, fencing and restoration. Currently, the existing tank filling operation is not automated. The water level in the existing tank tracks the level in the City of Burnet Post Mountain tanks which provide elevated storage for the lower system pressure zone. The tank roof will be fitted with a covered flange to install level transducers to signal an onsite control valve to open and close.

The work is detailed on the plans which are made a part of these Specifications. Erosion and sedimentation controls are required to be in place prior to beginning of work. Contractor shall maintain these controls during construction, limit work to the areas shown on the construction drawings, and complete final restoration per TCEQ and permit requirements.

Contractor shall limit soil disturbance to the area of limits of construction shown on the drawings.

The proposed improvements are intended to be completed to reduce or minimize system downtime for customers during the switchover from existing to new facilities. Since the existing pump station provides water system pressure to the Eagles Nest Subdivision, all Contractor operations which require any pump station outage will require a minimum of 72 hour written notice to the City of Burnet and the Eagles Nest HOA. The Contractor will develop an implementation schedule for review by Owner prior to beginning work. This construction schedule will include critical construction milestones and timelines for each sequential task.

0120 SHOP DRAWINGS

A catalog, specification sheet, or other information sheet prepared by the manufacturer shall be submitted in three (3) copies for approval to the Engineer for all pipe and equipment which the Contractor proposed to install or supply. The submittal shall include but not be limited to all pipe and pipe appurtenances, valves, pumps, electrical equipment, controls and meters. The data supplied shall be sufficiently detailed to allow the Engineer to determine the suitability of the equipment and its adherence to the specifications.

Upon completion of the project, the Contractor shall furnish to the Owner three complete sets of technical information by site covering the maintenance, operation and parts list of each piece of equipment installed. The information shall be bound in book from in a neat usable manner.

0130 UNDERGROUND UTILITIES

The utmost caution shall be exercised in laying the pipeline around and/or across any underground utilities. An attempt has been made to show the location of known lines on the construction plans. The location of these shown is not guaranteed to be accurate or complete. The Contractor will, at his own expense, locate and protect these lines, and if they are damaged, he will replace them at no cost to the Utility Owner and to the satisfaction of the Utility Owner.

0140 SAFETY DEVICES

The Contractor shall supply and use ample and proper barricades, lights, handlines, and other equipment designed to protect the workmen and public during the prosecution of the work. Upon completion of the job, the safety devices shall be removed and the site restored to its original condition.

0150 INSPECTION

All work done under this contract shall be subject to inspection by the Engineer, TCEQ, or Owner at any time.

0160 SUPERINTENDENCE AND SUPERVISION

The Contractor shall be personally in charge of all construction work or shall have on the job a competent construction superintendent. In the absence of the superintendent from the job site, an acting superintendent shall be appointed to be in full charge of the work. The superintendent and acting superintendent shall be given full authority to follow any and all instructions given by the Engineer or his representative.

0170 IMPLIED WORK

Work specified in the Specifications but not shown on the Plans, and work drawn on the Plans but not specified are to be executed as if fully set out in both ways; and any work or material which is not directly or indirectly noted in the Specifications or Plans, but is necessary for the proper carrying out of the obvious intentions thereof, is to be understood as implied work and to be provided by the Contractor in his proposal as fully as if specifically described or delineated. Any discrepancies between Plans and Specifications must be reported to the Engineer for correction and interpretation before the work is executed.

0180 SUBCONTRACTORS

All subcontractors shall be acceptable to and approved by the Owner prior to any subcontractor commencing work. The Contractor shall furnish the names of all proposed subcontractors at the time of the preconstruction conference.

0190 MEASUREMENT AND PAYMENT

The bid items for this Contract shall be bid as shown in the Bid Proposal and shall be paid for as bid, complete, installed and tested as shown on the plans and judged satisfactory by the Engineer. The Contract price shall be the total compensation for all labor, materials, equipment and incidentals used to complete the work and perform all cleanup operation.

SECTION 2

CONCRETE STRUCTURES

0210 DESCRIPTION

This section shall govern for the construction of all types of structures involving the use of structural concrete.

All concrete structures shall be constructed in accordance with the design requirements and details shown on the Plans, in conformity with the pertinent provisions of the items contracted for, and the incidental items referred to, and in conformity with the special requirements herein set forth.

Concrete shall be of fine and course aggregate, so graded and proportioned, and thoroughly mixed with Portland Cement and water as will produce a homogenous mixture of such quality that concrete shall have a minimum compressive strength of 3,600 psi after 28 days.

0220 MATERIALS

0221 Cement: The cement shall be Type I of a standard brand of Portland cement conforming to ASTM Designation C-150, latest revision. Only one brand of cement will be permitted in any structure.

0222 Mixing Water: The water used with the cement shall be clean and suitable for drinking or for ordinary household use.

0223 Aggregate: The coarse aggregate shall consist of gravel, crushed stone, or combinations of these two. Coarse aggregate shall conform to ASTM C-33, latest revision. Gravel shall consist of durable particles of crushed or uncrushed gravel of uniform quality throughout. It shall have wear of not more than 40 percent when tested according to AASHTO Method T-96.

Crushed stone shall consist of durable particles of stone of uniform quality and having the same wear as that required of gravel. The coarse aggregate shall be free from excess salt, alkali, roots and other objectionable matter. The maximum size aggregate shall be a 1-inch diameter.

Fine aggregate shall consist of natural sand and be free of broken material, foreign material, excess salt, alkali or vegetable matter. It shall contain no more than 0.5 percent by weight of clay lumps. Fine aggregate shall conform to ASTM 33, latest revision.

0224 Admixtures: Water reducing admixtures shall conform to Type A or Type D as set forth in ASTM Designation C-494. Air entraining admixtures shall conform to requirements of ASTM Designation C-260.

No cement will be used unless the manufacturer shall have certified that the admixture meets the requirements of either Designation ASTM C-260 or Designation ASTM C-494 and any admixtures shall be approved by the Engineer during the submittal process.

Calcium chloride will not be permitted as an admixture.

0230 MIX DESIGN

It shall be the responsibility of the Contractor to furnish the mix design. The mix design must prove to meet the requirements for concrete strength, durability and slump. Testing of all mix design specimens will be conducted in a laboratory designated by the Engineer and all costs for testing shall be paid by the Contractor.

Trial batches, when required, will be made and tested prior to placing the concrete on the job. When transit mix concrete is used, the batch size shall not be less than 50% of the rated capacity of a representative truck.

Mix design from previous or concurrent jobs may be used without trial batches if it can be shown that no substantial change in any of the proposed ingredients has been made and approval of the Engineer is given.

The coarse aggregate factor shall not be more than 0.82 except that when the voids in the coarse aggregate exceed 48% of the total dry loose volume, the coarse aggregate factor shall not exceed 0.85. The coarse aggregate factor shall not be less than 0.70 for Grades 1, 2 and 3 aggregate.

Water-reducing or retarding agents may be used with all classes of concrete at the option of the Contractor. Water reducing or retarding agents are required for hot weather placement and continuous slab placement.

Entrained air will be required for Class A and Class C concrete. The concrete shall be designed to entrain 5% air when Grade 2 coarse aggregate is used and 6% air when Grade 3 coarse aggregate is used. Concrete, as placed in the structure, shall contain the amount as stated above with a tolerance of plus or minus 1-1/2 percent.

0240 CONSISTENCY

Concrete shall be of such consistency as to ensure the required workability and result in compact masses having dense, uniform surfaces. The quantities of the mix design shall not be varied unless authorized by the Engineer. In cases where the characteristics of the aggregates are such that, with the maximum allowable amount of water, the consistency requirements cannot be satisfied, the Contractor may furnish additional aggregates, mineral filler or aggregate of a different character which will produce the desired results. If the Contractor does not provide these materials, the Engineer will modify the mix design with additional cement to produce proper workability. The addition of water to the approved batch design to provide workability is not permitted.

In general, the consistency of concrete mixture shall be such that:

1. The aggregates will not segregate, and mortar will cling to the coarse aggregate.
2. The concrete when dropped from the discharge chute will flatten out at the center of the pile, and the edges will not flow.
3. The concrete will not show free water.
4. The concrete will slide and not flow into place when discharged from metal chutes at an angle of 30 degrees with the horizontal.
5. The surface of the finished concrete will be free of laitance.

Any concrete mix failing to meet the above consistency requirements will be considered unsatisfactory although the concrete meets the required slump test. In cases where the characteristics of the aggregate furnished are such that with the maximum allowable amount of water, the specified slump and consistency requirements are not met, the Contractor may provide aggregates of an improved grading, or the Engineer will modify the mix design to meet the slump and consistency requirements by adding cement.

Unless otherwise permitted or specified, the concrete shall have a slump of 4 inches or less if consolidation is to be by vibration.

0250 CLASSIFICATION

Concrete shall be classified as set forth in the following table. The Plans shall indicate the type of concrete to be used in each structure. If the Plans do not designate the classification to be used in a particular structure, then Class A concrete is required to be used.

TABLE 4: CLASSES OF CONCRETE

Class	Sk. Cement per CY	Minimum Comp. Strength (28 day)	Minimum Beam Strength (7 day)	Maximum W/C Ratio	Coarse Aggregate Grade No.
A	5	3,000	500	6.5	2-3-4*
B	4	2,000	330	8.0	2-3-4*
C	6	3,600	600	6.0	1**2-3
D	3	1,500	250	11.0	2-3-4*
E	6	3,000	500	7.0	2-3

* Must have prior approval from Engineer before Grade 4 aggregate may be used.
** Grade l may be used in foundations only, except in foundations poured in drilled shafts.

0260 TESTING OF CONCRETE

During the progress of the work, the Engineer or designated laboratory shall cast cylinders or test beams for testing of compressive or flexural strength. For small placements, such as manholes, culverts, inlets or small rip-rap placements, the Engineer may waive the testing procedures. For placements of twenty-five cubic yards or more the testing will not be waived. A set of test cylinders will be made for each 20 cubic yards of a pour, at the discretion of the Engineer's representative. If testing is required for removal of forms or falsework, the cylinders or beams shall be cured at the jobsite and in the same method as that concrete which the test represents. Tests made for design strength concrete shall be cured in accordance with THD Bulletin C-ll. Job control shall be done on seven-day compressive strengths which are compatible with the seven-day tests made at the mix design. If these seven-day tests do not meet the requirements, then a new batch design shall be made.

0270 GENERAL PLACEMENT REQUIREMENTS

Unless otherwise provided, the following requirements shall govern for the time sequences in which construction operations may be carried on. Forms and falsework for superstructures shall not be erected on concrete footings until the concrete in the footing has cured at least two curing days. Concrete may be placed in the wall or column as soon as the forms and reinforcing steel placement are approved. A joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set shall be deemed a construction joint. When concrete in a structure or a portion of a structure is specified to be placed monolithic, the term monolithic shall be interpreted to mean that the manner and sequence of concrete placing shall be such that construction joints will not be created. Construction joints will be of the type and at the locations shown on the plans. Additional joints will not be permitted without written authorization from the Engineer. Any additional construction joints shall have details equivalent to those shown on the plans for joints in similar locations. The top surface of a concrete placement which terminates at a horizontal construction joint shall have the surface cement film removed and shall be roughened thoroughly as soon as practicable after the concrete has attained initial set. Before joining plastic concrete to concrete that has already set, the surface of the concrete in place shall be free from all loose material, laitance, dirt or foreign matter, shall be washed and scrubbed clean with stiff brooms and drenched thoroughly with water until saturated, and shall be kept wet until the plastic concrete has been placed. Immediately prior to the placing of additional concrete, all forms shall be drawn tight against the concrete in place, and the surface of the concrete in place shall be flushed with a coating of grout mixed in the proportions of one part cement to two parts sand.

If shown on the plans, construction joints shall be provided with concrete keyways, reinforcing steel dowels, and/or metal flashing strips or plastic waterstop. The method of forming keys in keyed joints shall be to permit the easy removal of forms without chipping, breaking or damaging the concrete in any manner.

All falsework shall be designed and constructed so that no settlement or deformation will occur, so that the necessary rigidity will be provided.

For calculating the loads on falsework, a weight of 150 pounds per cubic foot shall be assumed for concrete, and a live load allowance of 50 pounds per square foot of horizontal surface of the form work shall be included.

All timber used in falsework centering shall be sound, in good condition, and free from defects which will impair its strength. All timber for wedges shall be hardwood.
Upon completion of the structure, all falsework shall be removed to the ground level.

Falsework piling shall be pulled or cut off a minimum of 6 inches below ground level. Falsework in a stream shall be removed completely to a point specified by the Engineer to prevent any obstruction to the waterway.

0280 FORMS

0281 General Requirements: Except where otherwise specified, forms may be constructed of either timber or metal as elected by the Contractor.

Forms for round columns exposed to view shall be of steel except that other materials will be allowed with written permission of the Engineer. Forms shall be built and maintained mortar-tight and of material sufficient in strength to prevent bulging between supports and shall be set and maintained to the lines designated until the concrete is sufficiently hardened to permit form removal. During the elapsed time between the building of the forms and placing of concrete, the forms shall be maintained in a manner to eliminate warping and shrinkage.

Permission to place concrete will not be given until all such work is complete to the satisfaction of the Engineer.

If, at any stage of the work, the forms show signs of bulging or sagging, that portion of the concrete causing such condition shall be removed immediately, if necessary, and the forms shall be reset and braced securely against further movement.

0282 Timber Forms: Lumber for forms shall be seasoned properly and of good quality. It shall be free from loose or unsound knots, knot holes, twists, shakes, decay, and other imperfections which would affect its strength or impair the finished surface of the concrete. If desired by the Contractor, forms may be constructed of plywood not less than one-half inch thickness, with no form lining required. The grain of the face plies on such plywood forms shall be laid parallel to the span between the supporting studs or joists.

Plywood used for forms for surfaces which remain exposed shall be equal to that specified as "Exterior Type," of the grade, "Concrete-Form Exterior," of the U.S. Department of Commerce, National Bureau of Standards, Commercial Standard, latest edition.

Forms or form lumber to be re-used shall be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness, and smoothness of surface. Forms shall be reworked between each use. Any lumber which is split, warped, bulged, marred, or has defects that will produce work inferior to that resulting from using new material shall not be used.

Forms shall be braced rigidly to prevent movement while placing the concrete. Forms on surfaces not to be finished but exposed to view, shall be placed so that the form panels are symmetrical, i.e. long dimensions set in the same direction. Horizontal joints shall be level and continuous. Molding specified for chamfer strips or other uses shall be made of redwood, cypress, or pine materials, of such grade that will not split when nailed, and which can be maintained to a true line without warping. The molding shall be mill cut and dressed on all

faces. Unless otherwise provided, forms shall be filleted at all sharp corners and edges with triangular chamfer strips. The strips shall be three-fourths inch measured on the sides.

All forms shall be constructed to permit removal without damage to the concrete.

Metal form ties of an approved type or a satisfactory substitute shall be used to hold forms in place. Such ties shall be of a type as to permit ease of removal of the metal as hereinafter specified. All metal appliances used inside of forms to hold them in correct alignment shall be removed to a depth of at least one-half inch from the surface of the concrete and shall be so constructed that the metal may be removed without undue injury to the surface by shipping or spalling. Such devices, when removed, shall leave a smooth opening in the concrete surface. Burning off rods, bolts, or ties will not be permitted.

Whenever practicable, forms shall be erected completely before the reinforcement is placed.

For concrete structures which are to contain water, ties shall be removed to 1-1/2" of the surface and the hole grouted to leave a smooth surface. For narrow walls and other locations where access to the bottom of the forms is not readily attainable otherwise, adequate clean-out openings shall be provided.

At the time of placing concrete, the forms shall be clean and free entirely from all chips, dirt, sawdust, and other extraneous matter.

The facing of all forms shall be treated with oil before concrete is placed. In hot weather, both sides of face forms may be required to be treated with oil to prevent warping and to secure tight joints. The oils used for this purpose shall be light clear oil which will not discolor or otherwise injuriously affect the concrete surface.

All forms shall be wetted thoroughly before the concrete is placed therein.

0283 Metal Forms: The foregoing Specifications for timber forms regarding mortar-tightness, filleted corners, alignment, removal, reuse, oiling, and wetting shall apply equally to metal forms.

The metal used for forms shall be of such thickness that the forms will remain true to shape. Forms may be made in sections of such length as will facilitate the placing of concrete and the removal of forms. The fit of joints of sections shall not produce offsets. All bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designated to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or line up properly shall not be used. Metal shall be kept free from rust, grease, or other foreign material that will tend to discolor the concrete.

0290 REINFORCING STEEL

0291 Materials: Except where otherwise designated on the Plans, all bar reinforcement shall be deformed, and shall conform to ASTM Designation: A615, Grade 60 and shall be open hearth, basic oxygen or electric furnace new billet steel.

The reinforcement shall be bent cold and be true to the shapes indicated on the Plans. Bending shall preferably be done in the shop. Irregularities in bending shall be cause for rejection.

0292 Storing: Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports and shall be protected as far as practicable from surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, paint, grease, oil or other foreign materials. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross-sectional area and tensile properties of a hand wire brushed specimen meet the physical requirements for the size and grade of steel specified.

0293 Splices: No splicing of bars, except when provided on the Plans, or specified herein, will be permitted. Splices not provided for on the Plans will be permitted, size No. 8 and smaller, subject to the following:

a. Splices will not be permitted in bars less than 20 feet in plan length. Splices which are not shown on the Plans, but permitted hereby, shall be made in accordance with the following table. The specified concrete cover shall be maintained at such splices and the bars placed in contact and securely tied together.

b. Splices will not be permitted in main reinforcement at points of maximum stress. When permitted in main bars, splices in adjacent bars will be staggered a minimum of two splice lengths.

BAR SPLICING

Horizontal Bars w/12” of concrete or less below	20 Bar Diameters*
Horizontal Bars w/ more than 12” of concrete below the bar	35 Bar Diameters*
Vertical Bars	30 Bar Diameters*

* 12 inches minimum

Welding of reinforcing bars will not be permitted.

0294 Placing: Reinforcement shall be placed as near as possible in the position shown on the Plans. Unless otherwise shown on the Plans, dimensions shown for reinforcement are to the centers of the bars. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than one-twelfth of the spacing between bars. In the plane of steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch. Cover of concrete to the nearest surface of steel shall never be less than one inch.

Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The reinforcing steel shall be spaced its required distance from the form surface by means of approved galvanized metal spacers with plastic coated tips or plastic spacers if enough are used to maintain the required clearance.

All reinforcing steel shall be tied at all intersections, except that where spacing is less than one foot in each direction, alternate intersections only need to be tied. Mats of wire fabric shall overlap each other sufficiently to maintain a uniform strength and shall be fastened securely at the ends and edges. No concrete shall be deposited until the Engineer has inspected the placement of the reinforcing steel and given permission to proceed.

02100 CONCRETE PLACEMENT

The Contractor shall give the Engineer sufficient advance notice before starting to place concrete to permit the inspection of forms and the reinforcing steel placement. No concrete shall be placed prior to the completion of the formwork and the placement of the reinforcement. Concrete mixing, placing, and finishing shall be done in daylight hours. Placement shall not commence when it is evident that the work cannot be completed before dark, unless adequate provisions are made to light up the entire site operations.

Concrete placement will not be permitted when impending weather conditions may result in rainfall or low temperature which will impair the quality of the finished work. In case rainfall should occur after placing operations are started, the Contractor shall provide ample covering to protect the work. The sequence of placing concrete shall be as provided on the Plans or in the Specifications. The operation of depositing and compacting the concrete shall be conducted to produce a compact, dense, impervious mass of uniform texture which shall show smooth faces on all surfaces.

All forms shall be wetted thoroughly before the concrete is placed therein. The method and manner of placing shall be such as to avoid segregation or separation of the aggregate or the displacement of the reinforcement. Concrete shall not have a free fall of more than 3 feet except in the case of thin walls. The splattering of forms or reinforcement bars shall be prevented if the concrete so spattered will dry or harden before being incorporated in the mass.

Each part of the forms shall be filled by depositing concrete directly as near its final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point in the forms and running or working it along the forms will not be allowed.

After the concrete has taken initial set, the forms shall not be jarred or any strain placed on projecting reinforcement. Concrete shall be placed in continuous horizontal layers approximately 12 inches in thickness. Not more than one hour shall elapse between the placing of successive layers of concrete in any portion of the structure included in a continuous placement. The Contractor shall avoid unauthorized construction joints.

Laitance or foreign matter of any kind shall not be permitted to accumulate inside the forms.

All concrete shall be well compacted, and the mortar flushed to the surface of the forms by continuous working with mechanical vibrators of an approved type. Vibrators of the type which operate by attachment to forms or reinforcement will not be permitted except that external vibration will be allowed when the forms are of steel. At least one standby vibrator shall be provided for emergency use in addition to the ones required for placement. The vibrators shall be applied to the concrete immediately after deposit and shall be moved throughout the mass, into the corners and angles of the forms until it has been reduced to a plastic mass. The mechanical vibrator shall not be operated so it will penetrate or disturb previously placed layers which have become partially set or hardened. The vibration shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures but shall not be done to an extent that will cause segregation. Anchor bolts shall be set to exact locations in concrete when it is placed.

02101 Placement Conditions: The concrete shall be mixed in quantities required for immediate use and concrete not in place within the following time limits shall not be used. Concrete delivered to the site shall be between 50° F and 90° F. If concrete is delivered outside of this temperature range, it shall be cause for rejection.

Air Temperature (Degrees F.)	**Maximum Time in Mixer (Minutes)**
40 to 74	90
75 to 89	60
90 or above	45

In threatening weather, which may result in conditions that will affect the quality of the concrete, the Engineer may order the postponement of the work. Where work has been started and changes in weather conditions require protective measures, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall or freezing temperatures. Concreting will not be permitted when the temperature is 40 degrees and falling. All concrete which has not attained an age of 24 hours before the atmospheric temperature falls below 40°F shall be covered with framework and satisfactory covering material, so that the air surrounding the concrete and forms may be heated and maintained at a temperature of not less than 50°F, nor more than 90°F for a total of 5 days.

Concrete shall be placed in the forms without the addition of more water to the concrete than required by the design (slump and consistency) and adequately finished without adding excess water on the surface. Control of the initial set of the concrete and lengthening the time for finishing operations under adverse wind, humidity, and hot weather conditions may be accomplished with the use of an approved cement dispersing agent.

The maximum time interval between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed that set forth in Table 1: Temperature- Time Requirements in Section 420.11(2) of TxDOT Standard Specifications Item 420 - Concrete Structures.

Where the top slab and walls are placed monolithically in culverts or similar structures more than 4 feet in clear height, an interval of not less than one or more than 2 hours shall elapse before placing the top slab to allow for shrinkage in the concrete wall. The base slab shall be finished accurately at the proper time to provide a smooth, uniform surface.

02110 CONCRETE CURING

The Contractor shall inform the Engineer fully of the methods and procedures proposed for curing. The Contractor shall provide the proper equipment and material in adequate amounts, and shall have the proposed method, equipment and material approved by the Engineer prior to placing the concrete.

Inadequate curing, procedures, methods or application thereof shall be cause for the Engineer to stop all construction on the project until remedial action is taken. When the air temperature is expected to drop below 35°F, the water curing mats shall be covered with polyethylene sheeting, burlap, polyethylene blankets, or other protection to prevent any possibility of freezing.

A curing day is defined as a calendar day when the temperature, taken in the shade away from artificial heat is above 50°F for at least 19 hours. The curing period shall begin when all concrete has attained its initial set.

The following methods are permitted or required for each concrete placement:

a. Form Curing - When forms are left in contact with concrete, other curing methods will not be required, except for cold weather protection.

b. Wet Mat Curing - The cotton mats shall be weighed down adequately to provide continuous contact with the concrete surface. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces which cannot be cured by contact shall be enclosed with mats and anchored positively so that air cannot enter the enclosure.

c. Sprinkler Curing - A method consisting of overlapping sprays or sprinklers so as to keep all unformed surfaces continuously wet but without adversely affecting the surface may be used with the authorization of the Engineer.

d. Membrane Curing - Membrane curing shall be applied immediately after the free moisture has left concrete. Formed surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane. When membrane film has been damaged, the Contractor shall repair the damaged portion by immediately applying new film.

02120 REMOVAL OF FORMS AND FINISHING EXPOSED SURFACES

Except as hereinafter provided, forms for surfaces which are required to be surface finished shall, for normal concrete, be removed when the concrete has aged not less than four nor more than seven days.

Forms under slabs, caps or beams shall be left in place seven days plus one day for each ten feet of span.

Any defective work discovered after the forms have been removed shall be repaired immediately. In repairing honeycombed areas, all loose material shall be removed before the repair work is started. Thorite or equal patching mortar shall be used in the patching of defective areas in accordance with the manufacturer's instructions. After stripping forms, cut all tie-wires to a depth of 3/4 inch. Dampen these and all honeycombed areas with clean water and patch flush with Thorite or Tamms equal product. After patching, finish exposed concrete from 6" below grade with one coat of Thoroseal cement based coating mixed with one part of Acryl 60 and three parts of water at two pounds per square yard.

Apply second brush coat at same rate after first coat has set. When finish coat has set, float it to a uniform texture with a sponge float. Do not apply in temperatures below 40 degrees For when temperature is expected to fall below 40 degrees F within 24 hours.

02130 TESTING OF HYDRAULIC CONCRETE STRUCTURES

Concrete structures which are intended to contain liquid shall be tested for water tightness.

Exfiltration testing shall be conducted for large concrete structures. To conduct the test, clean water shall be introduced to the interior of the structure to a level at least one foot above the hydraulic joint to be tested, however, at the discretion of the Engineer, the structure may need to be filled to the operating level. The level of the water shall be measured using a staff gauge, plumb bob, or similar device, by the Engineer or his representative.

After the 24-hour test period the water level shall be remeasured. A calculation of volume change shall be made. The allowable leakage is NONE. If the test does not meet the criteria, repairs shall be made and the structure re-tested.

02140 MISCELLANEOUS

02141 Expansion Joint Material: Preformed fiber expansion joint material shall be of the dimensions shown on the Plans. "Preformed Bituminous Fiber Material" shall be formed from cane or other suitable fibers of a cellular nature securely bound together and uniformly impregnated with a suitable asphaltic binder and shall meet the requirements of the Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction, ASTM Designation: D1751, latest revision.

02142 Waterstop: Waterstops shall be a self-sealing extruding plastic strip approximately one square inch in cross-section which does not require the addition of any compound or plasticizer to function. It shall have protective strips which are easily removed for installation. Waterstop shall be Synko-Flex or equal.

02143 Grout: Where non-shrink grout is indicated on the Plans for plugging holes in concrete and filling concrete pipe sleeves and blockouts, the Contractor shall provide high strength, non-shrink, non-metallic, grout with compressive strength not less than 5,000 psi at 3 days and 8,000 psi at 28 days.

Where grouting is required for anchor bolts, imbedded items, equipment and machinery bases, the Contractor shall provide high strength, high impact resistant, non-shrink, epoxy grout with compressive strength not less than 12,000 psi and tensile strength not less than 2,000 psi.

SECTION 3

PIPE AND VALVES

0310 MATERIAL SPECIFICATIONS

0311 Iron Pipe: Pipe may be either flanged, mechanical or slip-joint except where designated on drawings. The pipe shall have an exterior coating of coal tar enamel, and the inside shall have a cement-mortar lining. Pipe and fittings shall meet the following specifications:

a. Gray Cast Iron shall have physical properties of 21,000 psi bursting tensile strength, 45,000 psi modulus of rupture, and meet the requirements of AWWA specification C106 or C108. Unless otherwise specified or noted, pipe shall be Thickness Class 22, Class 200. Pipe shall be furnished in 18-foot nominal laying lengths.

b. Ductile Iron shall have 60,000 psi tensile strength, 42,000 psi yield strength, 10 percent minimum elongation, and meet the requirements of the latest revision of AWWA specification C151. Unless otherwise noted, pipe shall be Thickness Class 50, Class 200. Pipe shall be furnished in 18-foot nominal laying lengths.

c. Ductile and Cast Iron Fittings shall be mechanical joint or flanged, as shown on the Plans, conforming to AWWA C110. Fittings shall be cement lined and outside coated as specified in the AWWA Specification. Thrust blocks consisting of poured in place concrete shall be provided at all tees, crosses, or bends greater than 22-1/2 degrees.

d. Joint Materials. All gaskets shall be of natural or synthetic rubber conforming to AWWA C111.

   Jointing of slip-joint cast iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of the particular pipe being used. A joint lubricant shall be used, and applicable recommendations of the manufacturer shall be followed. All flanged mechanical joints shall be jointed with T-head bolts and nuts of high-strength, corrosion-resistant, ductile iron, compatible with the fittings used in the installation.

   Angular spacing of all joints shall meet the manufacturer's recommendations for the gasket and/or pipe being used.

e. Flanges shall be cast solid and faced accurately as right angles to the axis of the casting. Dimension and drillings of the flanges shall conform to American Standards Association (ASA) Standard B16.1 for 125 pounds per square inch pressure.

0312 PVC Pressure Pipe and Fittings: All pressure plastic pipe shall be made from plastic which meets the requirements of ASTM Standards D2241 and D2672. All plastic pipe shall be Type 1, Grade 1, with a hydrostatic design stress of 2,000 psi for water at 73.4 degrees F, designated as PVC 1120. All PVC pipe shall have a standard dimension ratio and pressure rating as set forth on the Plans. The plastic pipe used in this contract shall be marked to indicate the nominal pipe diameter, type material used in its manufacture (PVC 1120), pressure rating, the manufacturer's name, and the seal of approval from a National Sanitation Foundation laboratory.

Unless shown otherwise on the drawings, fittings shall be PVC, Type 1, Grade 1, Schedule 40, with NSF seal of approval. Only the pipe primer and cement recommended by the manufacturer shall be used.

PVC water pipe shall be made from Class 12454-A or Class 12454-B PVC compounds as defined in ASTM D1784, with an established hydrostatic design-basis HDB rating of 4,000 psi for water at 73.4F (23C). The standard code designation for compounds meeting both requirements, i.e., class and HDB, is PVC 1120.

Gaskets and lubricants intended for use with PVC pipe and couplings shall be made from materials that are compatible with the plastic material and with each other when used together, will not support the growth of bacteria, and will not adversely affect the potable quality of the water to be transported.

Unless otherwise shown on the drawings, PVC pressure pipe over 4 inches in size shall be DR-18, Class 150 pipe with ductile iron fittings. Provisions shall be made for contraction and expansion at each joint with a gasket and an integral thickened bell as part of each joint. Laying lengths shall be 20 feet plus or minus one (1) inch. Pipe shall be made in nominal sizes 4, 6, 8,10 and 12 inches.

0313 Gravity Flow Pipe: Where shown on the plans, gravity flow sewer lines shall be made of Class 1, PVC material conforming to material classified 12454G, 13364B, or 12164B. Pipe stiffness shall be 46 psi in accordance with ASTM 2412 and gaskets shall conform to ASTM 3212. Pipe shall meet ASTM D3034 (SDR-35) or ASTM F789 (PS46).

Pipe shall be homogeneous throughout, have a smooth barrel, free from cracks and discoloration. Gaskets and lubricants shall be supplied with pipe. Pipe shall be shipped in standard 20 foot plus or minus 1-inch lengths. Each standard- length pipe in compliance with this Specification shall be clearly marked per the following example at intervals of 5 feet or less:

Manufacturer's Name or Trademark

Nominal Pipe Size

PVC Cell Classification

ASTM Specification and Rating

Fittings shall be gasketed PVC fittings.

0314 Steel Pipe and Fittings: All steel pipe and fittings 2 inches and smaller in diameter shall be galvanized threaded pipe, Schedule 40. All screwed fittings for this piping shall be 150 psi malleable iron.

Piping shall be completely water or air tight, installed in vertical or horizontal planes with all bends made with fittings. Sufficient galvanized pipe unions shall be installed to permit future removal of the piping for replacement or repairs.

0315 Gate Valves: Gate Valves shall conform to AWWA Standard for Gate Valves for Water Works Service, AWWA C509. Valves 8 inch and smaller shall be designed for a minimum water working pressure of 200 psi.

All gate valves, 2 inches or over in size, shall be of the resilient seat or resilient wedge type and shall conform to AWWA Standard C509.

All valves smaller than 2 inches shall be 150-pound, full-port, 2-piece stainless steel body, blowout proof stem, ball valves. Ball valves shall be as manufactured by Gemini or A.Y. McDonald, or approved equal.

Gate valves shall be Mueller Company or approved equal. Valves shall be blocked and installed as shown on the plans and according to the manufacturer's recommendations.

0316 Butterfly Valves: Butterfly valves shall be of the tight-closing, rubber seat type with rubber seats that are securely fastened to the valve body. No metal-to-metal seating surfaces shall be permitted. Valves shall be satisfactory for applications involving throttling services and for operation involving long periods of inactivity. Valve discs shall rotate 90° from the fully open position to the right shut position. Valves shall comply with requirements of AWWA C504.

Valve bodies shall be constructed of cast iron ASTM A-126 Class B for flanged end valves or ASTM A-48 Class 40 for wafer type valves. Bodies shall have two hubs for shaft bearing housings cast integrally with the valve bodies. Wafer valve bodies shall be designed for installation between ANSI B16.1, Class 125 cast iron flanges.

Valve discs shall be constructed of cast iron. Valve shafts shall be turned, ground and polished. Valves shafts shall be constructed of Type 316 stainless steel. Valves seats shall be of a synthetic compound corresponding with AWWA C504. Bearings shall be fitted with sleeve-type bearings. Bearings shall be corrosion-resistant and self-lubricating.

The butterfly valves shall be as manufactured by Flomatic, or approved equal, and shall be equipped with handwheel and gear operator if 6 inches or greater. Butterfly valve operator may

be solenoid or electric motor driven on larger valves. See construction drawings for special operator requirements.

0317 Check Valves: Check valves installed in pump discharge piping shall be non-slam, automatically cushioned, straight through flow type, with bronze trim and stainless- s t e e l spring and retaining screws. Valves shall be globe-type. The check valves shall be VAL-MATIC 1800 Series Globe Style silent check valves, or equal.

At locations called out on the plans, check valves may also of the horizontal swing type with material meeting AWWA C508 requirements. The valve shall be iron body and bronze mounted with outside lever and weight shall be Clow Model 5345, List 114, or equal.

Check valves in chlorination piping shall be all PVC and Viton construction of the wye spring check valve style as distributed by Ryan Herco.

0318 Valve Boxes: Valve boxes shall be the two-piece screw type adjusted by screwing the upper section into or rom the lower section. Flanges on both sections shall serve to locate the upper section and hold it in place. The boxes shall be cast iron.

Each valve box shall have a cover designed for easy removal for access to the valve operating nut. Each cover shall be marked WATER for ready identification. The size of the valve box shall depend on the size valve it is used with. It shall be the Contractor's responsibility to use the properly sized box with respective valve.

The valve box shall be set as per the standard details of the plans and per the manufacturer's recommendations. The base of the valve box should rest 2 or 3 inches above the flanged body joint of the valve. The valve box shall not touch the valve in any way.

SECTION 4

INSTALLATION OF PIPING

0410 DESCRIPTION

The basic installation methods and procedures recommended by the pipe and fitting manufacturers shall be followed. The pipelines shall be laid so that a minimum 30" cover (within fenced or enclosed areas) is maintained over the crown of the pipe.

It is the intent and purpose of these specifications to obtain only first-class workmanship and finish of the best grade and quality. If the following Specifications fail to completely cover all details, Contractor is not relieved of full responsibility for a high quality completed project.

0420 MATERIALS

0421 Pipe and Fittings: Piping materials shall be as set forth in these specifications. The Contractor shall be responsible for the receiving of acceptable materials and the storage of all materials furnished by him and shall assume responsibility for the replacement of all such material found damaged in shipping or on job site or defective in manufacture. This shall include the furnishing of all material and labor required for the replacement of installed material discovered to be defective prior to the final acceptance of the work.

Fittings shall be as set forth under Section 0311 of these Specifications.

0422 Storing and Handling: The pipe and fittings shall be stored and handled in such a manner as to prevent damage to the material and to keep the interior surfaces of the pipe and fittings clean. When the material is distributed at the jobsite, each piece shall be unloaded as near as possible to the place where it is to be laid in the trench. The Contractor shall be responsible for the material from the time he receives it until it has been incorporated into the project, and the project has been accepted as complete by the Engineer.

0423 Inspection of Pipe and Fitting:

a. By the Contractor: The Contractor shall be responsible for inspecting the pipe and fittings as to compliance with these specifications when the material is delivered on the site. Any losses or defects noted should be

recorded on the receipt received by the carrier. The Contractor shall reject damaged of defective pipe found during his inspection.

b. By the Engineer: The Engineer or his representative may inspect the material at any time and may reject or require the repair of any damaged or defective materials. Any rejected material shall be removed from the jobsite and replaced by the Contractor. The Engineer or his representative may require the cleaning or flushing of pipe. All repair, cleaning, or replacement of pipe or fittings shall be at the expense of the Contractor.

0430 TRENCH CONSTRUCTION

0431 General: Excavation of trenches shall be unclassified. The cost of this work for all materials encountered, regardless of their nature or method of removal shall be included in the lump sum bid item. Contractor shall satisfy himself as to the materials and conditions to be encountered.

0432 Trench Excavation: Trenches will be excavated as located on the drawings.

The banks of trenches shall be vertical above the top of the pipe. Trench width shall extend 6 to 8 inches beyond each side of the pipe bell. Depth of trench shall provide for furnishing and installing the required thickness of granular material under the pipe.

Pipe shall be laid in all opened trenches and covered at the end of each day's work.

Excavation shall be carried 6 inches below the bottom of the pipe. Granular material, evenly spread and tamped, shall be used for bedding to the grade of the bottom of the pipeline.

After inspection of pipelines has been finished on any completed portion of the work, the trench may be backfilled. Backfilling shall be accomplished in compliance with the applicable portions of these specifications.

0433 Pipe Bedding and Backfill: The trench shall be cut 6 inches below the bottom of the grade of the pipe and the pipe laid on a bed of granular material. The ditch around the pipe and up to 6 inches over the pipe shall be backfilled initially with a minimum thickness of 6-inch granular material thoroughly compacted into place. Granular material is defined as pit run sand or pea gravel. Only that backfill material previously approved by the Engineer or his representative shall be used.

This backfill may be excavated material if no stones larger than 6 inches in their largest dimension are included, and if the backfill material contains less than 25% stones. Broken concrete, rocks, or other lumpy material shall not be used in backfill except when lumps

are small and are dispersed in the upper section of backfill in a manner satisfactory to the Engineer. The top 6 inches of backfill shall be the same as the topsoil removed and shall be mounded slightly above the original ground level to allow for any subsequent settlement. Large loose stones removed by the ditching operation shall not be left on the surface along the ditch line right-of-way but shall be removed from the project site. The top surface or slopes of all backfill shall be neatly graded off in a workmanlike manner.

0434 Disposal of Excavated Materials: Excavated materials, as far as needed and of a suitable character, shall be piled adjacent to the work to be used for backfilling as required. Excavated materials unsuitable for the backfilling or in excess of that required for backfilling shall be disposed of in an approved manner at locations designated on the plans or approved by the Engineer. Desirable top soil and sod shall be carefully piled separately and replaced in its original position when required. Excavated materials shall be handled at all times in such a manner as to cause a minimum of inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the work.

0440 PROTECTION OF WORK IN PROGRESS

Open ends of uncompleted pipelines shall be protected from entry of foreign objects at night and when project is unattended. Earth or other objects that enter the pipe through open or unplugged ends must be removed at Contractor's expense.

0450 FLUSHING AND DISINFECTION

After each pipeline section has been satisfactorily tested, it shall be disinfected using the procedures set forth in AWWA Standard C651.

0451 Flushing: The pipeline section shall be flushed prior to disinfection. Flushing shall be done through a tap on the end of the line which provides a 2-inch orifice. The line shall be flushed for a period of time equal to one minute for each 100 feet of line, or until the water being discharged is no longer transporting visible particles, whichever is longer.

0452· Chlorination:

a. Continuous Feed: The Contractor shall use either the continuous feed or tablet method of chlorination. The chlorine may be added to the water in the new lines by a chlorine gas-water mixture or a chlorine compound-water mixture may be injected as set forth in Section 512 of AWWA Standard C651.

The chlorinating agent selected shall be applied through a tap on the pressure side of the gate valve controlling the flow of water into the new line. The flow of water into the new line shall be limited to approximately 1 foot per second. The chlorinating agent shall be added at a rate such that the application shall be at least 50 ppm.

The application shall be made until the water being discharged at the other end of the new section shows chlorine has reached the length of the new section, then the valves shall be closed and the new section isolated for at least 24 hours. All valves and hydrants shall be operated during the chlorination process.

At the end of the detention period of 24 hours, the water shall indicate at least 25 ppm residual. If this residual is not obtained, a second dosage of 25 ppm shall be applied as before and retained for at least 12 hours, with at least a 10 ppm residual at the end of the 12 hour period.

b. Tablet Method: The tablet method consists of placing calcium hypochlorite granules in the water main as it is being installed and filling the main with potable water when installation is completed.

This method may be used only if the pipes and appurtenances are kept clean and dry during construction. The procedure to follow shall be as set forth in Section 5.1 of AWWA Standard C651.

Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-foot intervals. The quantity of granules shall be as shown below:

Ounces of Calcium Hypochlorite Granules to be Placed at Beginning of Main and at Each 500 Foot Interval

Pipe Diameter	Calcium Hypochlorite Granules
4 inches	0.5 ounces
6 inches	1.0 ounces
8 inches	2.0 ounces
12 inches	4.0 ounces

When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 foot per second. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours.

During all chlorination work, care shall be taken to prevent the highly chlorinated water from flowing back into the line supplying the water to the new line.

0453 Final Flushing and Testing: Following the chlorination of each section, the section shall be thoroughly flushed until the water being discharged has the same chlorine residual as the water being used to feed the system. A sample of water taken at the extremity of the section shall be obtained and submitted to an accredited laboratory for bacteriological examination, and shall be of the same purity and quality as the water in the existing water lines. Samples shall be taken from taps located and installed in such a way as to prevent outside contamination. Results of the laboratory analysis shall be made available to the Owner and the Engineer.

0454 Water for Flushing and Testing: The Contractor shall make the necessary arrangements for all water required in the construction of the lines. In the event of line failure prior to the acceptance by the Corporation, the Contractor shall reimburse to the water purveyor the cost of all water loss. The Owner will provide a reasonable allowance for flushing and testing equivalent to three (3) times the gallonage of water contained within the new construction. All water required over this amount by the Contractor for additional flushing and testing shall be paid by the Contractor to the Owner. Payment shall be at current or construction water rate.

0455 Pressure Testing: Pressure testing of yard line shall be conducted for a four-hour period at a minimum of 150 psi by the Contractor. The testing will be conducted against the closed pump discharge valves.

SECTION 5

MISCELLANEOUS EQUIPMENT, VALVES AND CONTROLS

0510 GENERAL

The work to be performed under this Section of the Specifications shall consist of providing all labor, equipment and materials for the installation of instruments, hypochlorite disinfection feed equipment and accessories, metering and control and communication equipment.

0520 Water Tank Head Gauge: Each water tank shall have a circular head gauge graduated in feet of water at the tank instrument panel of the range shown on the Plans. Gauge shall have brass movement, be oil-filled and have a 6-inch diameter face, minimum, and be installed with cutoff valve.

SECTION 6

PAINTING

0610 DESCRIPTION OF WORK

The work to be performed under this section of the specifications shall consist of furnishing all labor, materials and equipment necessary for painting masonry block, pumps, exposed pipe, valves and fittings, pipe supports, wood trim, and metal work including structural steel and equipment as specified herein. Concrete work shall not be painted, but finished in accordance with the concrete specification.

0620 PAINTING PROCEDURES

0621 General: The following requirement for surface preparation and coating application shall be met whether shop or field coating is used. The recommendations of the coatings manufacturer shall be followed explicitly.

Specific coating materials are selected from those produced by Tnemec Company. Materials from an alternate manufacturer shall only be used after it is demonstrated an equal product and after approval by the Engineer. The interior coating of all equipment in contact with potable water (eg. pump suction vessels) shall meet the requirements of AWWA D102 Interior Paint System No. 1 and NSF Standard 61.

0622 Equipment: The Contractor shall use properly functioning equipment capable of performing the tasks required herein. Paint spray rigs shall have properly functioning regulators and pressure gauges, and clean fluid lines which have not previously been used to spray zinc rich products or water base coating materials.

The Contractor shall also provide the appropriate gauges and test equipment such as wet and dry film thickness gauges and Holiday Inspection devices so as to verify the thickness and integrity of the coating film if requested by the Engineer.

0623 Surface Preparation: All blasting operations shall conform to the latest regulations of the Texas Air Control Board and the cost of conforming to such regulations shall be borne by the Contractor.

Cleaning and painting shall be so programmed that detrimental amounts of dust or other contaminants do not fall on wet, newly painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations.

In order to prevent the degradation or contamination of cleaned surfaces, the first coat of paint shall be applied immediately after the surface has been cleaned. Succeeding coats shall be applied before contamination of the under surface occurs.

Previously applied coatings shall be roughened prior to painting whenever necessary for the development of proper intercoat adhesion.

0624 Painting: All surfaces shall be smooth and free from blisters, rough corners, pits, dents or other imperfections before painting. Pits and dents shall be filled and smoothed where required. All welded seams shall have one coat of primer applied by brush prior to painting the remainder of the surface.

Paints and similar material shall be mixed in vessels of adequate capacity. All paints shall be thoroughly stirred before being taken from the containers, shall be kept stirred while using, and all ready-mixed paints shall be applied exactly as received from the manufacturer without addition of any kind of a drier or thinner except as permitted or directed by the Engineer.

All painting at the site of the work is hereby defined as field painting and shall be under the direction of the Engineer to the extent that he shall determine where and when painting may be done.

Surfaces of exposed members inaccessible after erection shall be cleaned and painted before erection.

No painting shall be done when the temperature is below 50° F, when rain is falling, during fog, or until moisture on the surfaces to be painted has completely disappeared.

Aluminum and galvanized members and concrete structures shall not be painted, unless specifically called for on the Plans.

In the specification below, if an alternate to the manufacturer and type of paint called out is proposed to be used, the Contractor shall submit a data sheet on the alternate paint to the Engineer for acceptance. The designation of a particular type of paint is not intended to eliminate other brands of paint but only to accurately define the type of paint required. Before final acceptance of the project, any damaged painted surfaces shall be touched up or repainted, as directed by the Engineer.

0625 Shop Painting: All structural steel, miscellaneous iron, ornamental iron, equipment, hollow metal doors, louvers, etc., not aluminum or galvanized, shall receive one (1) shop coat of a primer compatible with the field coat specified. Any metals not shop primed, or otherwise coated, shall be prepared to bare metal as specified below prior to field painting.

0626 Field Painting: All metal work, except that which is aluminum or galvanized shall be properly painted whether or not specific mention is made hereinafter of each individual part of the work.

0630 PAINT SYSTEM FOR METALS

0631 Interior or Immersed Service: For shop primed metals to be field painted, remove dirt and grease, wire brush and substitute red universal alkyd primer (Tnemec Series 37H - Chem-prime) for epoxy polyamide primer in System MI below. For metal coat with asphaltic coating, like D.I. pipe, substitute aluminum color rust inhibitive urethane primer (Series 1 - Omnithane) for first coat of epoxy polyamide in System MI.

The pump suction vessels shall be coated as specified.

0632 Exterior Service: Use system ME which has the same surface preparation as MI above, with a prime coat of 4-6 mils of red polyamide epoxy followed by a color intermediate coat of color polyamide epoxy (Tnemec Series 66 – Hi-Build Epoxoline) and a top coat (2-4 mils) of color acrylic polyurethane (Tnemec Series 73 – Endura-Shield). For asphaltic coated metal use prime coats as above (System MI, Section 0931).

0640 PAINT SYSTEM FOR CONCRETE BLOCK

0641 Block Surfaces: Use System BI which may have splashing but not immersion, fill block with 60-80 mils of latex masonry block filler, (Tnemec Series 54 – Masonry Filler) and apply finish coat of color emulsified acrylic coating 2-3 mils (Tnemec Series 6 - Tneme-Cryl). For exterior building surfaces composed of custom or rough face, concrete block shall be left uncoated.

For submersed concrete block or block that needs to be waterproof, like below ground service, use System BW, one coat of latex masonry block filler 60-80 mils (Tnemec Series 54 – Masonry Filler) followed by two coats of polyamide epoxy each coat 3-5 mils, (Tnemec Series 66 - Hi-Build Epoxoline).

0650 WOOD, PLASTIC AND PLASTER BOARD

All wood surfaces shall have a coat of alkyd wood primer, 2-3 mils, (Tnemec Series 36-603 - Undercoater/Primer) prior to applying the system below. All dry wall surfaces shall have a coat of vinyl-acrylic latex wall sealer, 1-2 mils (Tnemec Series 51-792 - PVA Masonry Sealer).

0651 Interior Surfaces, Mild Environment: Use System WI, two coats of color acrylic latex, 2-3 mils (Tnemec Series 6 - Tneme-Cryl).

0652 Interior Surfaces, Harsh Environment or Splashing: System WW, two coats of color epoxy polyamide, 4-6 mils (Tnemec Series 66 - Hi-Build Epoxoline).

0653 Exterior Surfaces: Use System WE, two coats of alkyd enamel, 2-4 mils (Tnemec Series 2H - Hi-Build Tneme-Gloss). System WI may also be used, if approved by Engineer.

0660 PAINT SYSTEMS SUMMARY

SYSTEM	SUBSTRATE	PREPARATION	PRIMER	INTERMEDIATE	TOP COAT
MI	Interior of Inmersed Metal	SSPC SP10, Note 1,2	Red epoxy polymide primer 4-6 mils, Note 1,2	Color epoxy polymide	None
ME	Exterior Metal, Note3	SSPC SP6, SSPC SP3, Note 1, 2 &3	Red epoxy polymide primer 4-6 mils	Color epoxy polymide 3-5 mils	Color acrylic polyurethane semi-gloss 2-4 mils
BI	Interior Concrete Block	Clean &dry	Latex block filler 60-80 mils	Color emulsified acrylic 2-3 mils	None
BE	Exterior Concrete Block	Clean &dry	Color epoxy texture coating 80-100 mils	Color acrylic, optional 2-3 mils	None
BW	Waterproof Concrete Block	Clean &dry	Latex block filler 60-80 mils	Color epoxy polymide 3-5 mils	Color epoxy polymide 3-5 mils
WI	Interior Wood Plastic Dry Wall	Clean &dry	Note 4	Color acrylic, Note 4, latex 2-3 mils	Color acrylic, Note 4, latex 2-3 mils

WW	Interior Wood, Plastic, Metal, Dry Wall, Harsh Environment 2-4 mils 2-4 mils	Clean &dry	Note 4	Color epoxy, Note 4, polymide 4-6 mils	Color epoxy, Note 4, polymide 4-6 mils
WE	Exterior Wood, Metal Siding	Clean &dry	Note 4	Color alkyd, Note 4, enamel 2-4 mils	Color alkyd, Note 4 enamel 2-7 mils

NOTE 1: For shop primed metal, clean only, substitute universal alkyd primer.
NOTE 2: For asphalt coated metal, clean only and substitute aluminum urethane primer.
NOTE 3: For touch up of damaged galvanized metal, use 2 coats of galvanize formulated exterior coating.
NOTE 4: For bare wood use alkyd wood undercoat prior to list prime coat. For bare dry wall use latex wall sealer prior to listed intermediate coat. Previously painted surfaces or plastic or metal, etc. need no primer.

0670 COLOR CODE FOR PIPING

All exposed piping shall have the following colors as prescribed by the Texas Department of Health.

For Water Plants:

SERVICE	**COLOR OF PIPE**	**COLOR OF LETTERS IF LABLED**
Potable Water	Light Blue	Black
Compressed Air	Light Green	Black
Instrument Air	Light Green w/Dark Green	Black
Chlorine (gas, liquid, or vent)	Yellow	Black
Chlorine (solution0	Yellow w/Red Bands	Black
Liquid Alum	Yellow w/Orange Bands	Black
Alum (solution	Yellow w/Green Bands	Black
Ammonia	Yellow w/Brown Bands	Black

Settled Water	Green	Black
Filter Effluent	Light Blue	Black
Backwash	Light Blue	Black
Drain	Dark Gray	White
Raw Water	Tan	Black

Where scheduled, bands shall be six inches wide and spaced along the pipe at five-foot intervals.

0680 INSPECTION

The Engineer shall be sufficiently notified in advance of work performed in order to perform the examination of an approval of each coat prior to application of next coat. Runs, overspray, roughness, and/or abrasives in the coating, or other indications of improper application, shall be re-coated or repaired in accordance with the coating manufacturer's and the engineer's instructions.

0690 MEASUREMENT AND PAYMENT

No direct measurement or payment will be made for the labor, materials, or equipment to be furnished under this item, all being considered as included in the various bid items set forth in the Bid Proposal.

SECTION 7

CHAIN LINK FENCING

0710 DESCRIPTION

This item covers the furnishing of materials and construction of new chain-link fence in accordance with the details included herein. The fence is to have an overall height of about 7 feet, using 6 feet of fabric and 1 foot of barbed wire.

The Contractor shall include all supplementary parts necessary and required for a complete and satisfactory installation within the true meaning and intent of the drawings. All runs of the fence shall present the same general appearance and be the product of one manufacturer.

0720 MATERIALS

0721 Fabric: The chain-link fence fabric shall have a width of 6 feet, be no. 9 ASW gauge, woven in a 2-inch mesh. The fabric shall be galvanized after weaving. Galvanizing shall be 1.2 oz. per sq. ft. of area. The bottom of the fabric shall be secured to line and end posts with a No. 7 gauge tension wire woven through the bottom diamond of the fabric and secured to the posts.

0722 Line Post: Posts shall be galvanized 2-3/8" O.D.,3.11 lb. per foot, high-tensile strength tubing SS-40, CMl-40, or equivalent. Each post shall be fitted with a heavy malleable iron arm extending at about 45 degrees toward the exterior to support three (3) strands of 12 gauge galvanized 4-point barbed wire.

0723 End, Corner, Pull, and Brace Posts: Pull and brace posts shall be 2-3/8" O.D., 4.69 lb. per foot SS-40 or equivalent. End and corner posts shall be 2-7/8" O.D. steel pipe weighing 5.79 pounds per foot (Schedule 40).

0724 Gate Posts: All posts shall be galvanized steel. The following posts shall be required for the given maximum gate openings.

6' single or 12' double	2-7/8" O.D. (Sch. 40) galvanized 5.79 lbs. per ft.
12' single or 24' double	4" O.D. steel pipe weighing 9.11 lbs. per ft.
18' single and 36' double	6-4/8" O.D. steel pipe weighing 18.97 lbs. per ft.

0725 Horizontal Rails: Top rails or other horizontal rails shall be 1-5/8" O.D., 1.84 lbs. per foot galvanized high strength SS-40, or equivalent steel pipe. Fabric shall be tied to all horizontal rails every 24 inches with No. 9 gauge galvanized tie wires. The top rail shall pass through the line post tops and form a continuous brace from end to end of each run of fence. Couplings shall be outside sleeve type.

0726 Accessories: Each pipe post shall have a cast iron or malleable iron steel cap of the manufacturer's standard design. Fabric is to be attached to line post with #6-gauge galvanized clips placed at 14" centers. Fabric shall be attached to end, corner, and pull posts with 1/4" X 3/4" tension bars laced to the post every 14" with 11 gauge 1" wide steel bands using 3/8-inch diameter galvanized carriage bolts and nuts.

0727 Gates: Gate frames shall be 2" O.D. (SS-40, or equivalent) galvanized steel pipe with pressed steel or malleable iron corner ells riveted with 4 rivets per corner. Internal bracing shall be 1-5/8" O.D. pipe with 3/8" adjustable truss rods. Welded steel gate frames are acceptable provided welded areas are brushed, primed and painted with a rust inhibitive zinc oxide paint. Gates shall be covered with fabric as specified above and shall include the barbed wire. Hinges shall be ball and socket type, allowing a gate to swing back to a position nearly parallel with the fence line, and shall be made of high-grade malleable iron. Three hinges shall be provided.

A heavy semi-automatic catch, anchored in concrete, shall be provided for each gate frame. A malleable iron gravity type latch, which will automatically engage a pin welded in the gate frame, with provision for padlocking in closed position, shall be provided. Locks shall be new, heavy duty padlocks of best quality, with four (4) keys provided for each lock.

0730 INSTALLATION

0731 Fabric: Rolls shall be spliced when necessary by bringing the ends of separate rolls together and weaving a picket in such a way that it will engage both of the roll ends and catch with each twist each mesh of the end pickets and each roll.

Line posts shall be set in not less than 24 inches of concrete embedment of not less than 8" in diameter. Gate and end posts shall be set in not less than 36 inches of concrete not less than 12" in diameter. Line posts shall be set at not more than 10' on centers.

End and gate posts shall be braced with the same material as the top rail and trussed to line posts with 3/8" rods and tighteners.

The fence shall be stretched at intervals of about 100 feet. After stretching is completed, the fabric shall be tied to the top rails with No. 9 gauge galvanized tie wire at 24 inches on center. The bottom selvage of the fabric shall be placed to provide a gap of 1 to 1-1/2 inches above the final grade of the ground.

The fabric shall be attached to line posts with No. 6 gauge galvanized wire clips at 14 inches on centers. The topmost clip shall be placed on the line post as near the top of the fabric as possible, the lowest clip as near the bottom of the fabric as possible.

At terminal (end, corner, and pull) and gate posts, the fabric shall be fastened with stretcher bars and bands as set forth above.

Standard chain-link fence stretching equipment shall be provided for stretching the fabric before tying it to the rails and posts. Sufficient stress shall be applied to the fabric to take up all slack and present a smooth, uniform surface.

Prior to beginning fence work, the alignment shall be graded to provide a uniform ground line without high and low areas.

0732 Installing Gates: The lower hinge shall be placed on top of concrete footing in which the gate post is set. The socket for the center plunger pin shall be set in concrete and located so that the pin will fit perfectly in the socket when the gate is in the closed position. All hardware shall be thoroughly secured, adjusted, and left in perfect working order. Hinges and diagonal bracing shall be adjusted so that gates hang level.

0740 PAYMENT

Separate payment for chain link fencing shall not be made but shall be considered incidental to the work covered by applicable lump sum payment(s).

SECTION 8

WELDED STEEL GROUND STORAGE TANK

0810 GENERAL

The work covered by this specification shall consist of the fabrication, erection, painting, disinfecting, and testing of a new nominal 100,000-gallon ground storage tank as called for in the Bid Schedule.

The Contractor shall submit shop drawings and other descriptive data to the Engineer for approval. The drawings show dimensions, thickness, and materials, and any other information necessary to show that the work conforms to these specifications. A basic sketch of the new tank showing general dimensions, plate thickness, and appurtenances shall accompany the bidder's Bid Proposal.

Included in the scope of this contract is radiographic testing by a professional testing firm of welds on the tank and appropriate holiday testing of structural welding.

The ground storage tank shall comply with the latest revision of the AWWA Standard Specification AWWA D100. The tank shall have a self-supporting elliptical umbrella-type roof with reinforcing angle rolled to correspond with the shell perimeter. The design criteria shall be as follows:

Tank	Capacity (Gallons)	Nominal Height (Feet)	Shell Diameter (Feet)
Ground Storage Tank Volume	100,000	20'-0"	31'-6"
Minimum Plate Thickness	1/4" inclusive of corrosion allowance		
Corrosion Allowance	1/16"		
Wind Load	110 mph		
Earthquake Zone	0		

The Contractor is not responsible for delivery of water to fill the tank; however, the Contractor shall be responsible for coordinating scheduling of water for testing of the tank.

0820 MATERIAL

0821 Plates: The roof shall be designed and erected so that no water ponds at any point on the roof and no area of the roof shall have a slope of not less then 3/4 inch in 12 inches. Plate material shall be open-hearth or electric furnace steel conforming to the latest revision of the ASTM Specification A283, Grade C, or ASTM Specification A36.

0822 Structural Shapes: Structural materials shall be open-hearth or electric-furnace steel conforming to the latest revisions of ASTM A36.

0823 Bolts and Anchor Bolts: All bolts and anchor bolts, if required, shall conform to the latest revision of ASTM 307, Grade B.

0824 Pipe: Any pipe used as structural members shall conform to the latest revision of ASTM A-53, Grade B.

0830 TANK APPURTENANCES

The tanks shall be furnished with the following appurtenances:

0831 Vent: Vent shall be removable with a 24-inch diameter opening minimum into the tank. A vent covered with 16 mesh polyethylene screen shall be provided at the apex of the tank roof. The vent shall be of adequate size to safely vent the tank during periods of maximum pumping or withdrawal and shall be based upon 1,200 gpm.

0832 Roof Manways: A roof manway, 30-inch minimum opening, with hinged rainproof cover, and padlock hasp shall be installed on the tank roof. A second similar roof manway, 24 inch minimum opening shall be installed over the overflow weir box for maintenance access purposes. The hatch opening shall have a curb at least 4 inches high and the cover shall have a downward overlap of at least 2 inches. The cover shall seal to the curb with a neoprene gasket placed over the edge of the curb. The cover shall uniformly seal against the gasket.

0833 Overflow to Ground: The tank shall have an overflow pipe with flap-valve sized same as overflow pipe. The flap valve shall be a flanged manufactured unit, Clow F3012, Waterman PF-25, or equal. Fabricated valves shall not be allowed.

0834 Shell Manway: The tank shall each have two shell manways in the first ring of the tank wall with hinged manhole cover and gasket. Gaskets shall be among those listed under category 14 of the "List of Accepted Equipment for Interstate Carriers Use" as published by the U.S. Public

Health Service. Each manway shall have a minimum 30-inch diameter opening with shell plate reinforcing around opening in accordance with Section 7 of AWWA Specification D100.

0835 Ladders: The tank shall have a ladder with safety cage on the outside of the shell beginning near the bottom of the tank and in alignment with the roof manway. Roof perimeter railing with foot plate shall be provided beginning each side of the ladder safety cage. Ladder rungs shall be welded both inside and outside of both vertical stringers. Exterior ladder shall have a lockable ladder gate. The interior of the tank shall also have a ladder with OSHA approved safety climbing device. Ladders shall be vertical with no backward slope.

0836 Inlet/Outlet Nozzle: A flanged inlet nozzle of the size shown on the Plans shall be provided on the tank with shell plate reinforcing and discharge near the top of the tank as shown on the Plans. A flanged outlet nozzle shall be provided near the bottom of the tank as shown on the Plans.

0837 Overflow/Drain: The tanks shall be provided with a flanged drain opening located near the bottom of the tank. The drain shall be incorporated with the overflow as shown on the Plans. The drain shall be of the size shown on the Plans and provided with a handwheel-operated AWWA C 515 resilient wedge gate valve.

0838 Roof and Shell Nozzles: A 4-inch diameter black steel pipe nozzle with flange and attached companion flange with 2-1/2" I.P.T. tap and a 2 $^{1}/_{2}$-inch pipe nipple with a cap shall be welded in the roof plate near the manway for future transducer holder. A similar 3-inch diameter steel pipe nozzle with flange and 1" I.P.T. tapped companion flange shall be welded in the tank shell near the bottom of the tank as shown on the Plans. A 2 inch long 1" PVC Sch. 80 pipe nipple with threaded bronze gate valve and $^{3}/_{4}$" pipe nipples shall be installed for water sampling bib. The sampling nozzle shall also be equipped with a pressure gauge with $^{1}/_{4}$" brass pipe nipples, shut-off and bypass valve cocks. The gauge shall have a 6-inch diameter dial with brass lower stem mounting and all brass internals and stainless steel case. The gauge shall have 0-15 psi range and 0.2 psi graduations, U.S. Gauge Series 171968A.

0839 Float and Level Gauge: A float and level gauge shall be provided on the tank with float, target wire and pulleys shall be located near the tank ladder.

0840 TESTING AND DISINFECTION

0842 Disinfection: Disinfection of tank shall be done no sooner than seven (7) days after the final coat of any required interior painting touch up has been finished.
The disinfecting agent shall be chlorine, either supplied in a liquid form or in the form of a hypochlorite powder.

Whichever chlorine source is selected shall be applied in sufficient quantity to produce a concentration in the filled tank as provided in AWWA C652.
The three acceptable methods under AWWA C652 are:

a. Chlorination of the full storage facility with uniformly-mixed chlorine gas or hypochlorites such that at the end of 24 hours the water will have a free chlorine residual of not less than 10 mg/L.

b. Spraying or painting of all storage facility water-contact surfaces with a solution of 200 mg/L available chlorine. The tank will then be filled and the water shall have a 2 mg/L concentration of available chlorine after 24 hours.

c. Chlorination of full storage facility with water having a free chlorine residual of 2 mg/L after 24 hours. This method requires the introduction of water having a 50 mg/L chlorine concentration and filling the tank up to 5 percent total volume. This solution shall be held in the tank for a minimum 6 hours, then the tank will be filled with potable water. The water must have a free chlorine residual concentration of at least 2 mg/L at the end of 24 hours.

0850 WARRANTY

Manufacturer shall warrant tank against any defect in workmanship and materials for a period of one year from the date of acceptance. The tank shall be inspected near the end of the one year warranty period and in the event any defect(s) should appear, it shall be corrected by the manufacturer.

0860 MEASUREMENT AND PAYMENT

No direct measurement or payment will be made for the work to be furnished under this Section, but shall be considered subsidiary to the tank bid item to be paid for by lump sum as set forth in the Bid Schedule.

SECTION 9

EROSION CONTROL AND SITE RESTORATION

0910 GENERAL

This Section shall govern the installation, maintenance and removal of temporary erosion and sedimentation controls required during construction and the final site restoration of disturbed areas as required on the Plans. In general, the controls shall be in accordance with the City of Austin Standard Details as reflected on the Plans. The erosion and sedimentation controls are required to be in place until the site restoration is complete, which includes final grading and establishing permanent vegetative cover, i.e. grass growth.

0920 EROSION SEDIMENTATION CONTROLS

All erosion and sedimentation controls shown in the Plans shall be installed at the work location prior to preparation of the site or any excavation.

0921 Stone Rip Rap: Stone rip rap is used in areas of concentrated drainage water flow or to protect areas from vehicle traffic. The stone shall be comprised of durable individual pieces of the size range called out on the Plans and shall be generally open graded. At a minimum, the depth of stone shall be twice the average stone dimension, and the larger stones shall be at least half embedded into natural ground.

0922 Diversion Berm, Swale or Dike: A diversion berm can be both a temporary erosion control and a permanent site feature. A diversion berm is used to divert drainage water to a detention or water quality control facility or to divert drainage off-site or away from a site feature or improvements. The size of the berm shall be as called out on the Plans; however, generally, the inside berm or ditch slopes shall be no steeper than 3:1 and the backslope shall be not steeper than 4:1, horizontal to vertical. The flow line grade of the berm shall be wide, even and mild to avoid high flow velocities and concentration of the flow. The berm shall be constructed of on-site material or sandy loam soil, if called for, to achieve a water quality performance goal. The berm shall be constructed in lifts of not over 12 inches of loose material and shall be compacted in place by ordinary compaction methods using dirt moving machinery. The surface of the berm shall be prepared in the same way as the remainder of the rest of the site (e.g. topsoil and seeding) unless otherwise designated.

0923 Silt Fence: Silt fence consists of a filter fabric barrier installed across areas of drainage flow to trap sediment in drainage runoff. The fabric is a non-woven geotextile fabric with

minimum weight of 4.5 ounces per yard, 24 inches high, supported on a wire mesh backing on steel posts driven 12 inches into the ground on 6-foot centers. The top of the fabric shall be buried in a shallow backfilled trench in areas with good loose topsoil. In areas with sparse or rocky topsoil, the toe may be laid on the surface and weighted down with 4 to 12 inches size rocks placed about 18 inches on center.

0930 SITE RESTORATION

After the plant improvements and structures are complete, clean-up and site restoration can proceed. This process includes final grading of the site to conform to the drainage plan, topsoil, seeding and establishing permanent erosion controls typically grass cover. Final grading shall ensure that all surface water drains away from tank foundation.

0931 Topsoil and Seeding: Topsoil shall consist of insuring that a 4-inch thickness of fertile soil is in place over the developed area of the site in a smooth and evenly contoured placement which conforms to the final site grades and discourages the concentration of drainage runoff, except in areas designated to transport flows such as berms or swales. The topsoil material shall have no rocks or other contaminants, such as sticks or trash, over 1 inch. If topsoil is brought in from off-site, it shall be of a similar soil type of naturally occurring soil on-site. However, a 4-inch final thickness is required, even if natural soils are less than 4 inches deep.

Seeding shall consist of broadcasting grass seed of the type and at the minimum rate called for on the Plans. Not much or fertilizer shall be used on this project. No herbicides or pesticides shall be applied on this project.

The Contractor shall be responsible for providing any watering required to establish acceptable grass growth, defined as grass with length of 1 ½ inch covering 95 percent of the developed site area with no bare spots over 16 square feet in area. This criteria must be met before the temporary E/S control (usually silt fences) are allowed to be removed.

0932 Excelsior Matting: Where called for on the plans, on steep slopes, or on areas with significant drainage water flow, excelsior matting shall consist of curled wood fibers, 80 percent of which are over 6 inches in length in a 4-foot-wide mat weighing at least 0.80 pounds per square yard and held together with a nylon mesh. The material shall be American Excelsior Curlex Blanket, or equivalent.

The excelsior shall be held in place by U-shaped wire staples with each leg a minimum of 6 inch long spaced 6 feet apart along the edges of the blanket and a third row of staples along the middle of the blanket at 6-foot intervals offset 3 feet from the edge staples. Blankets may be butted against each other and stapled together or overlapped 6 inches.

0940 MEASUREMENT AND PAYMENT

Erosion and sedimentation controls and site restoration shall not be measured or paid for separately but shall be considered incidental to the site work required for the completion of the project.