CLASS I WATER WELL

DESCRIPTION

2501.1 General: The work consists of furnishing all materials, labor, equipment, tools, transportation and services for the complete construction, including developing and production of one (1) gravel envelope well approximately 720 feet deep.

2501.2 The well shall be constructed by the reverse circulation rotary method with the equipment being capable of drilling a 36-inch diameter hole to a minimum depth of 50 feet and capable of drilling a 30-inch diameter hole to a minimum depth of 720 feet.

2501.3 The well shaft shall be drilled at the location designated by the owner.

QUALIFICATIONS OF CONTRACTORS

2502.1 Only qualified drillers with five years of experience in drilling water wells by reverse circulation rotary shall be employed on the drilling work. The contractor shall certify the number of years of experience that he has been successfully engaged in the business of drilling and developing this type of gravel envelope well.

2502.2 The contractor shall be a water well drilling contractor and shall have a current Class C-57 license as issued by the State of California.

MATERIALS

2503.1 Well and Conductor Casings: The well and conductor casings shall be fabricated of new, prime quality hot-rolled steel plates conforming to applicable parts of A.S.T.M A139, Grade B, or A.S.T.M. A211 and shall contain not less than 0.20% copper by ladle analysis.

2503.2 Welding shall be done by the automatic submerged arc process using at least one pass on the outside and for spiral weld at least one additional pass on the inside. After welding the seam, the casing shall have been sized in a hydraulic press and lathe trimmed and beveled so that each butt joint will form a continuous smooth surface.

2503.3 All welding shall be performed in accordance with standard methods and processes recognized by the American Welding Society.

2503.4 Well and conductor casing shall have 5/16-inch wall thickness and shall have 16-inch and 30-inch inside diameters, respectively. The casings shall be factory assembled in not less than 24-foot lengths and shall contain not more that one longitudinal seam parallel to the axis of the casing.

2503.5 Ends of casing sections shall have a 5-inch collar attached of the same thickness, physical and chemical properties as the casing. Collars shall be rolled to fit the outside di-

ameter and shall extend two and one-half inches (2-1/2") onto the pipe and welded completely around the circumference of the casing with the remaining two and one-half inches (2-1/2") projecting to accept the end of the succeeding section to the full depth of two and one-half inches (2-1/2"). The inside edge of the collars shall be ground or sufficiently scarfed to remove sharp edges or burrs. Collars shall contain three elongated slotted opening spaced at 120 degrees around the circumference for inspection of section makeup.

2503.6 Well Screen: The well screen shall be manufactured in accordance with the casing specifications contained herein. The openings in the screen casing shall be machine made, horizontal to the axis of the casing and of a louver form with the aperture facing downward. The perforation shall form a free opening of two and three-eights inch (2-3/8") by three thirty-seconds inch (3/32") and shall be spaced two and two-thirds inches (2-2/3") apart in the vertical direction. There shall be ten holes (10) per circle and forty-five holes (45) per linear foot having a minimum open area of eleven point one square inches (11.1 sq inches) per linear foot. Other types of perforations may be considered, but advance approval of the Engineer shall be required prior to it being considered for bid.

2503.7 Rounded bottom: A rounded tank bottom of five-sixteenth inch (5/16") plate, of the same material as the well casing, shall be welded to the end of one of the perforated sections for the starter joint of the well.

2503.8 Clamps: Casing clamps shall be sixteen and five-eights inches (16-5/8") internal diameter x ten inches (10") x one inch (1") manufactured from new rectangular steel bars that conform to A.S.T.M. A283, Grade A or better.

2503.9 Guides: Casing guides shall be provided by the contractor to center and hold the casing in proper position in the reamed hole until the gravel envelope is placed. A set of guides shall consist of 4 individual guides, spaced at 90 degrees around the circumference of the well casing. A set of guides shall be located at approximately 60-foot intervals along the pipe.

2503.10 Miscellaneous Metal: Material for the 4-inch gravel fill pipe, caps, and miscellaneous plates shall be of new material and fabricated from steel conforming to A.S.T.M. A283, Grade A or better.

2503.11 Gravel Envelope: All gravel shall first be approved by the Engineer and shall be a natural, well rounded, clean washed gravel. The use of crushed rock will not be permitted. Gravel purchased from a supplier shall be washed at the pit or plant prior to delivery to the well site. The exact size and nature of the gravel shall be determined by the existing conditions.

2503.12 It is anticipated that one of the following well gravels will be used:

Sieve Size	5/16 x 4	5/16 x 16
3/8	100%	
5/16	99	100%
1/4	74	87
No. 4	16	51
No. 8	2	17
No. 16		3
No. 30		2

2503.13 Samples of gravel to be used in the well shall be submitted by the contractor, in a quantity sufficient to make a sieve analysis, and shall be approved by the Engineer before use.

2503.14 Grout: The sealing material used in the sealing of the conductor casing shall be neat cement grout composed of Portland Cement conforming to A.S.T.M. C150, Type III. Use of calcium chloride will not be allowed. The grout shall weigh a minimum of 120 pounds per cubic foot, containing 4.5 gallons of mixing water per 94-pound sack of cement, yielding 1.1 cubic feet of grout slurry per sack of cement. Exact mix proportions are subject to the approval of the Engineer. Water used for sealing mixtures shall be clean and of potable quality. Materials used as additives for Portland cement mixtures in the field shall meet the requirements, and latest revision thereof, of A.S.T.M. C494, Standard Specification for Chemical Admixtures for Concrete.

2503.15 The manufacturer or supplier shall submit Certificates of Compliance to the Engineer in duplicate for all materials supplied.

CONSTRUCTION

2504.1 Well construction details shall conform to Figure A or as specified in the Special Provisions.

2504.2 Plumbness and Alignment: The well shall be drilled as nearly vertical as possible, with a variation from a vertical line of not more than three inches (3") for every one hundred feet (100') of depth for the first four hundred feet (400'). Below four hundred feet (400') in depth, the well shall be drilled as straight as possible. The contractor shall immediately report any inaccuracy or deviation to the Engineer.

2504.3 To demonstrate the compliance with this requirement, the contractor may be required to make an alignment in accordance with AWWA A100-84, Subsection 8.2.2.1 through 8.2.2.5. The tests for plumbness and alignment shall be made at the completion of the construction of the well, and before acceptance. The contractor, however, shall make periodic check tests, during the performance of the work, as directed. The cost of alignment tests or caging shall be included in the unit price bid for drilling the well.

2504.4 Casing sections shall be continuously field welded together for the full circumference.

2504.5 Drilling and Installing Conductor Casing: The Conductor casing shall be set in a reamed hole not less than thirty-six inches (36") in diameter. It shall be securely anchored at the ground surface to prevent dropping. It is estimated that the setting will be approximately fifty feet (50') below ground surface, however, the Engineer may order the setting to a greater or lesser depth if found advisable after examining the log of the bore.

2504.6 After the thirty inch (30") internal diameter conductor casing with sufficient guides is placed and approved, filling the annular space between the reamed bore and the conductor casing with a neat cement grout pumped under pressure from the bottom of the hole shall seal it.

2504.7 Before placing the seal, all loose cuttings and other obstructions shall be removed from the annular space by flushing. Before sealing commences, a packer or similar retaining device or a small quantity of sealant may be placed and permitted to set at the bottom of the interval to be sealed to form a foundation for the seal. The sealing material shall be applied, when possible, in one continuous operation from the bottom of the interval to be sealed to the top. Where the seal is to be very deep (i.e., greater than one hundred feet (100')) a short segment at least ten feet (10') in length may be installed first, allowed to "set" or partially "set" and then the remainder of the seal placed in one continuous operation.

2504.8 The placing of the grout shall be done in a manner such that the conductor casing is entirely sealed against infiltration of water. Upon completion of grouting, grout shall be visible above the surface of the ground outside the conductor casing. After grouting operations are completed, the grout shall be left undisturbed for a period of not less forty-eight hours (48 hours).

2504.9 Drilling and Installing Casing: A thirty inch (30") diameter bore-hole shall be drilled with reverse circulatory rotary equipment approved by the Engineer. The viscosity of the drilling solution, if used, will be subject to approval by the Engineer at all times. The construction of the well may be a continuous twenty-four hour (24 hour) per day operation.

2504.10 The well casing shall be set as soon as possible after the hole has been bored. Suitable guides or spacers at not greater than 60 feet on centers shall be provided in order to center and hold the casing in its proper position until the gravel is in place. The casing shall be suspended from the ground surface. The bottom of the casing shall be at a sufficient distance above the bottom of the drilled hole to insure that none of the casing will be supported from the bottom.

2504.11 It is estimated that the setting will be to the approximate depth specified, however the Engineer may order the setting to a greater or lesser depth if found advisable after examining the log of the bore.

2504.12 Installing Gravel Envelope: The annular ring or space between the casing and the side wall of the bored hole and/or conductor casing shall be filled with gravel of a type and gradation as specified herein after the drilling solution has been thinned to the proper consistency.

2504.13 During placement of the gravel in the annular space, disinfectants (usually calcium hypochlorate in tablet or granular form) shall be added to the gravel at a uniform rate (two tablets per cubic foot or one pound of the granular form per cubic yard).

2504.14 During the time the gravel is being placed, a sounding line shall be kept suspended in the well to determined the position of the gravel at all times and a "bailer" shall be "worked" to firmly settle the gravel so that the space will be completely filled throughout the entire depth of the well.

2504.15 The contractor shall make every reasonable effort to prevent the gravel from bridging. After the gravel has been brought up to the ground surface, the contractor shall remove any material that may have settled to the bottom of the casing.

2504.16 The gravel shall be slowly deposited through a chute around the periphery of the casing displacing the water in the annular space. The contractor shall furnish and install temporary pipe to thin the drilling mud by circulating clear water continuously from the bottom of the casing to the top of well during the placement of the gravel.

2504.17 When placing the gravel in the annular space, a suitable devise approved by the Engineer shall be used in sounding the gravel level. When the gravel is all placed, a swab shall be opposite all perforated sections of the casing. As the gravel settles, more shall be added. This operation shall be continued until there is no further settling of the gravel and all sand and mud has been washed out. At the completion of this operation and upon removal of the swab, all rock, sand, and foreign materials shall be bailed or pumped out of the casing. The gravel, after development of the well, shall reach the top of the conductor casing. Continual checks shall be made to insure against voids or bridging of the gravel envelope. The contractor shall guarantee that the gravel envelope will be a continuous unbroken column surrounding the casing from bottom to top and completely filling the annular space between the casing and the reamed wall of the bore hole and/or conductor casing.

2504.18 The contractor shall keep an accurate record of the tons of gravel placed in the well and the exact quantity shall be entered in the log.

2504.19 If it is determined that the quantity of gravel introduced into the gravel envelope is less than the computed amount, it may be deemed a sign of voids in the gravel envelope and corrective measures shall be undertaken by the Contractor as ordered by the Engineer.

2504.20 Temporary Cover: Whenever there is an interruption in work on the well such as an overnight shutdown, during inclement weather, waiting periods required for the setting up of sealing materials, for tests, for installation of the pump, etc., the well

opening shall be closed with a cover to prevent the introduction of undesirable material into the well and to insure the public safety. The cover shall be held in place or "weighted-down" in such a manner that it cannot be removed except with the aid of equipment or through the use of a tool.

2504.21 Semi-permanent Cover: During prolonged interruptions of one week or more, and at the end of the work contained herein, a semi-permanent steel cover shall be tack-welded to the top of the casing to prevent the introduction of undesirable material into the well and to insure the public safety.

DEVELOPMENT AND TESTING

2505.1 Development: The contractor shall furnish a deep well turbine pump and prime mover with a capacity of 3000 gallons per minutes against a total head of 350 feet at an impeller bowl setting of 325 feet below the ground surface. The contractor shall furnish and install discharge piping for the pumping unit of sufficient size and length to conduct water to the point designated by the owner, together with acceptable orifices, meters or other devices that will accurately measure the flow rate. An airline complete with properly calibrated gauge and air pressure shall be provided to measure the elevation of water in the well.

2505.2 The quantity of water being pumped at the commencement of development shall be limited and gradually increased as the water clears. From time to time, the pump shall be stopped and the water in the pump column allowed to flow back through the impeller bowls and through the casing perforations into the aquifers. These operations, with increasing pumping rates, shall be repeated as development of the well continues until the water being pumped is clear of sand and silt and the maximum gallonage per foot of draw-down is obtained.

2505.3 The contractor utilizing contractor's furnished equipment shall measure the rate of sand production.

2505.4 During cleaning, developing and turbine pump testing of the well, the contractor shall dispose of all waste waters in such a manner as to cause the least inconvenience or disrupt farming or construction operations.

2505.5 Test Pumping: The contractor shall perform a complete pumping test of the well, with the deep well pump used for development. Approved measuring devices furnished by the contractor and satisfactory to the Engineer shall measure the rate of pumping. The contractor shall perform yield tests at a sufficient number of rates to determine the shape of the draw-down curve from zero gallons per minute to the maximum capacity of the well obtainable under the specified impeller bowl setting. Pumping shall continue at each rate for a sufficient length of time to bring about a stable water level in the well, but in no event less frequent than every 30 minutes. The contractor will, upon completion of testing, deliver a certified copy of the testing and development record to the owner. At the completion of test pumping all sand and debris shall be removed from the bottom of the well.

MISCELLANEOUS

2506.1 Logs and Records: The contractor shall keep an accurate daily log and the Engineer may call for record of all formations encountered and the depths at which changes in the formation occur together with such other information as. Samples of the formations found in various strata shall be taken by the contractor, dried and preserved in one-quart sealed glass jars furnished by the contractor. The jars shall be permanently labeled with the well identification, date, the depth below the ground surface from which they were taken and the approximate thickness and description of the stratum in which the sample was contained. The log of the well shall show all material penetrated with full descriptive notes made of all conditions encountered while drilling. The log of the well shall show the method of completing the well, amount of material removed during development and all other pertinent data. The contractor shall furnish the original and not less than three copies of the log to the Engineer.

2506.2 Sterilization: The well shall be sterilized in accordance with Section 11 – Well Disinfection of AWWA A100.

2506.3 Final Clean Up and Grading: Upon completion of all construction, the contractor shall remove all temporary structures, fences, equipment, and drillings from the site. All excavation or pits dug by the contractor shall be backfilled with dirt. The premises shall be graded to original elevation and left with a neat appearance.

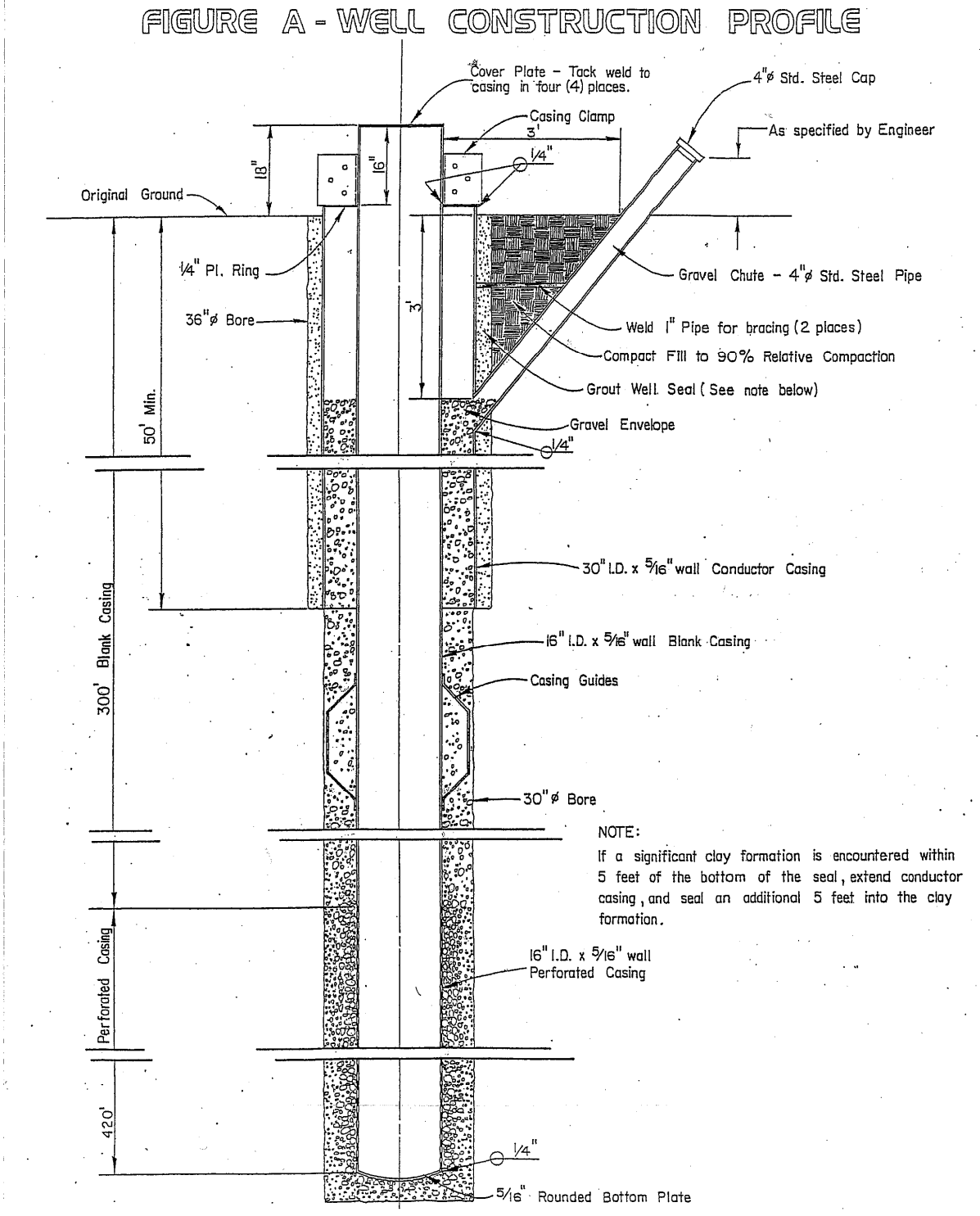
MEASUREMENT AND PAYMENT

2507.1 Measurement: The work performed under "Water Wells" and paid for by contract items will be measured by the linear foot, or by the number of items or by other methods specified on the plans or in the Special Provisions.

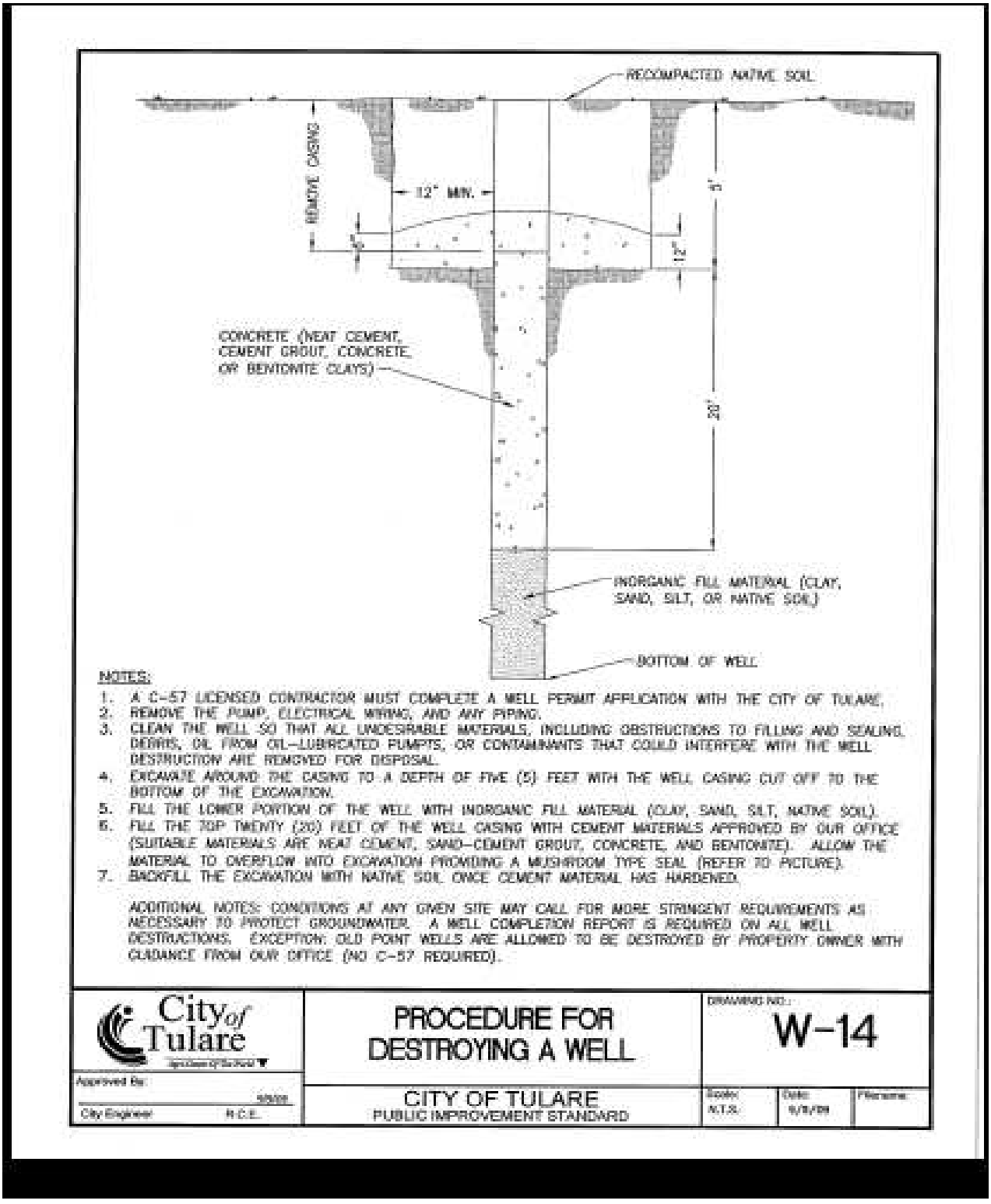
2507.2 Payment: Items of work, measured as specified above, will be paid for at the unit price per linear foot or number of items installed, or as otherwise provided by the plans or Special Provisions.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in installation of water well or fittings, or other items being installed as specified in these specifications and the Special Provisions and as directed by the Engineer.

Figure A Well Construction



Std Requirements for destroying abandoned well



NOTES:

1. A C-57 LICENSED CONTRACTOR MUST COMPLETE A WELL PERMIT APPLICATION WITH THE CITY OF TULARE.
2. REMOVE THE PUMP, ELECTRICAL WIRING, AND ANY PIPING.
3. CLEAN THE WELL SO THAT ALL UNDESIRABLE MATERIALS, INCLUDING OBSTRUCTIONS TO FILLING AND SEALING DEBRIS, OIL FROM OIL-LUBRICATED PUMPTS, OR CONTAMINANTS THAT COULD INTERFERE WITH THE WELL DESTRUCTION ARE REMOVED FOR DISPOSAL.
4. EXCAVATE AROUND THE CASING TO A DEPTH OF FIVE (5) FEET WITH THE WELL CASING CUT OFF TO THE BOTTOM OF THE EXCAVATION.
5. FILL THE LOWER PORTION OF THE WELL WITH INORGANIC FILL MATERIAL (CLAY, SAND, SILT, NATIVE SOIL).
6. FILL THE TOP TWENTY (20) FEET OF THE WELL CASING WITH CEMENT MATERIALS APPROVED BY OUR OFFICE (SUITABLE MATERIALS ARE NEAT CEMENT, SAND-CEMENT GROUT, CONCRETE, AND BENTONITE). ALLOW THE MATERIAL TO OVERFLOW INTO EXCAVATION PROVIDING A MUSHROOM TYPE SEAL (REFER TO PICTURE).
7. BACKFILL THE EXCAVATION WITH NATIVE SOIL ONCE CEMENT MATERIAL HAS HARDENED.

ADDITIONAL NOTES: CONDITIONS AT ANY GIVEN SITE MAY CALL FOR MORE STRINGENT REQUIREMENTS AS NECESSARY TO PROTECT GROUNDWATER. A WELL COMPLETION REPORT IS REQUIRED ON ALL WELL DESTRUCTIONS. EXCEPTION: OLD POINT WELLS ARE ALLOWED TO BE DESTROYED BY PROPERTY OWNER WITH GUIDANCE FROM OUR OFFICE (NO C-57 REQUIRED).

City of Tulare

Approved By: _____ 9/8/09
City Engineer R.C.E.

PROCEDURE FOR DESTROYING A WELL

CITY OF TULARE
PUBLIC IMPROVEMENT STANDARD

DRAWING NO.: **W-14**

Scale: N.T.S. | Date: 9/8/09 | Filename:

Well application

CITY OF TULARE WELL APPLICATION

DEVELOPMENT SERVICES - ENGINEERING DIVISION
411 East Kern Avenue, Tulare, CA 93274-4257
(559) 684-4207 - (559) 685-5631 Fax

Owner:_____ Telephone:_____

Site Address:_____

Nearest Cross Street:_____

Assessor's Parcel Number:_____

Contractor:_____ Telephone:_____

Address:_____ State License No.:_____

City/State/Zip:_____ Worker's Comp. Exp.:_____

Type of Work	Method Used	Type of Well		Casing Information
____ Deepen	___ Air Rotary	___ Agricultural	___ Monitoring	Casing Material:_____
____ Destroy	___ Cable Tool	___ Cathodic	___ Public Domestic	Diameter:_____
____ Drilling	___ Hollow Auger	___ Individual	___ Remediation	Gauge:_____
____ Recondition	___ Reverse Rotary	___ Industrial	___ Soil Boring	Perforation:____Yes ____:No
____ Other	___ Rotary	___ Other	___ Other	Slot Size:_____Inches

For monitoring or remediation wells, a copy of this form is to be sent to Hazardous Materials Unit, Tulare County Environmental Health.

WELL INFORMATION

Depth of Well:_____ Annular Seal _____: Yes _____: No

Gravel Packed:_____ Yes _____: No Depth of Seal _____: Feet

Conductor Casing:_____ Yes _____: No Seal of Material :_____inches

A Site Plan is required showing the Location of each Well and Boring.

I hereby certify that I have prepared this application and that the work will be done in accordance with Sections 13800 to 13806 of the Water Code of the State of California.

Date work will begin :_____

_____ _____
Signature Date

In accordance with the provision of the City of Tulare Resolution No. 396, permission is _____: Granted,

_____: Denied to perform the work as set forth in this application.

_____ _____
J. Kenneth Ramage, City Engineer Date

Instructions: Wells shall be abandoned only within normal work hours of City employees. The applicant shall contact the Water Division to schedule the abandonment of the well. Inspections of wells to be abandoned shall be performed by the Water Division. Contact Dan Boggs at (559) 684-4324.

cc: Dan Boggs, Water Utility Superintendent