

**PUBLIC WORKS STANDARDS
AND
TECHNICAL SPECIFICATIONS**

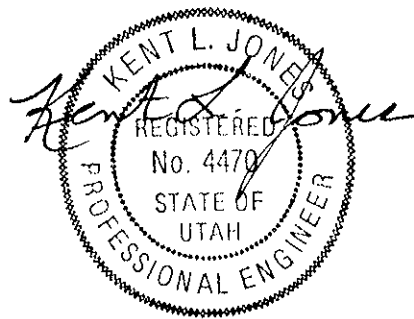


WEBER COUNTY, UTAH

**PUBLIC WORKS STANDARDS
AND
TECHNICAL SPECIFICATIONS**

for

Weber County, Utah



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for
PUBLIC WORKS STANDARDS
and
TECHNICAL SPECIFICATIONS
Weber County, Utah

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SECTION 1.1

GENERAL IMPROVEMENT REQUIREMENTS

1.1.01 SCOPE: This section defines the general requirements for improvements to be built by a subdivider.

The improvements shall include all street improvements in front of all lots along all dedicated streets to a connection with existing improvements of the same kind or to the boundary or the subdivision nearest existing improvements. Design must provide for future extension to adjacent development and to be compatible with the contour of the ground for proper drainage. All water lines, sewer lines, and any other buried conduit shall be installed to the boundary lines of the subdivision.

1.1.02 CONSTRUCTION DRAWINGS: Complete and detailed construction plans and drawings of improvements shall be submitted to the County Engineer for his review prior to receiving final plat approval from the County Engineer and commencing construction. No construction shall be started until plans have been checked and approved by the County Engineer.

1.1.03 STANDARDS FOR CONSTRUCTION DRAWINGS: The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size, and style.

These plans and designs shall meet the standards defined in the specifications and drawings hereinafter outlined. The minimum information required on drawings for improvements is as follows:

All drawings and/or prints shall be clear and legible and conform to good engineering and drafting room practice drawn with ink on approved mylar sheets. Size of drawings shall be 22" x 34" with 1/2-inch border on top, bottom and right sides, left side 1-1/2 inches. Approved standard sheets may be purchased from the County Engineer's office.

A. In general, the following shall be included on drawings:

- (1) North arrow (plan)
- (2) Scale and elevations referenced to an approved datum
- (3) Stationing and elevations for profiles
- (4) Title block, located in lower right corner of sheet to include:
- (5)
 - (a) Name of County
 - (b) Project title (subdivision, etc.)
 - (c) Specific type and location of work
 - (d) Space for approval signature of County Engineer and date
 - (e) Name of engineer or firm preparing drawings with license number, P.E. stamp and signature

B. Curb and gutter, drains and drainage structures, sidewalks and street surfacing drawings shall show:

- (1) Scale: 1" = 20' or 50' horizontal; (on simple rural subdivisions, scale may be 100') 1" = 2', 5', or 10' vertical

- (2) Both plan view and centerline profile must be shown. On urban subdivisions along steep cross slopes, profiles for each side of the street should be shown.
- (3) Stationing and top of curb elevations with curve data must be shown.
- (4) Flow direction and type of cross drainage structures at intersections with adequate flow line elevations
- (5) Bench Mark (B.M.) location and elevation (use approved datum)
- (6) Typical cross-section for all street sizes and variations
- (7) Street survey monument locations.

C. Sewer drawings shall show:

- (1) Scale: 1" = 20' or 1" = 50' horizontal; 1" = 2', 1" = 5', or 1" = 10' vertical (may be shown on street drawings)
- (2) Location, size and slope of mains
- (3) Manhole size, location and flow line elevation
- (4) Type of pipe
- (5) B.M. location and elevation (use approved datum)

D. Culinary water drawings shall show:

- (1) Scale: 1" = 20' or 1" = 50' horizontal (may be shown on street drawings)
- (2) Size and location of water mains, valves and hydrants
- (3) Type of pipe

E. Each set of plans shall be accompanied by a separate sheet of details for special structures which are to be constructed and are not covered by the County Standards. All structures shall be designed in accordance with the minimum Weber County Standards.

The blueprint construction plans shall be submitted in duplicate (minimum) with one (1) set to be retained by the County Engineer and one set returned to the Subdivider. This approved set shall be kept available at the construction site. A reproducible copy of all drawings shall be submitted to the County Engineer at the time of the preconstruction conference. Prior to final acceptance by the County, the subdivider shall submit to the County Engineer information showing the "as construction" locations of the improvements.

1.1.04 PRECONSTRUCTION CONFERENCE: A preconstruction conference shall be held before any excavation or other work is begun in the subdivision. The meeting will be held in the County Engineer's Office and will include: (a) County Engineer; (b) developer; (c) subdivision engineer; (d) all contractors and subcontractors involved with installing the subdivision improvements; (e) a representative of Weber County Inspection Department; (f) a representative from the County Surveyor's Office and (g) representatives of local utility companies as required. Items pertaining to the construction and inspection of the subdivision improvements will be discussed.

1.1.05 INSPECTION: All construction work involving the installation of improvements in subdivision shall be subject to inspection by the County. It shall be the responsibility of the person responsible for construction to insure that inspections take place where and when required. Certain types of construction shall have continuous inspection, while others may have only periodic inspections. Individual water and/or sewer districts may also perform inspection of their respective improvements. A letter certifying acceptance of sewer and/or water systems shall be submitted by the individual districts to the County Engineer.

A. Continuous inspection may be required on the following types of work:

- (1) Laying of street surfacing
- (2) Placing of concrete for curb and gutter, sidewalks, and other structures
- (3) Laying of sewer pipe, drainage pipe, water pipe, valves, hydrants and testing

B. Periodic inspections shall be required on the following:

- (1) Street grading and gravel base
- (2) Excavations for curb and gutter and sidewalks
- (3) Excavations for structures
- (4) Trenches for laying pipe
- (5) Forms for curb and gutter, sidewalks and structures

On construction requiring continuous inspection, no work shall be done except in the presence or by permission of the County Engineer.

1.1.06 REQUESTS FOR INSPECTION: Requests for inspections shall be made to the County by the person responsible for the construction. Requests for inspection on work requiring continuous inspection shall be made three (3) working days prior to the commencing of the work. Notice shall also be given one day in advance of the starting of work requiring periodic inspection, unless specific approval is given otherwise.

1.1.07 CONSTRUCTION COMPLETION INSPECTION: An inspection shall be made by the County Engineer after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work within a period of thirty (30) days of the date of the County Engineer's Inspection Report defining the faulty or defective work.

1.1.08 CONSTRUCTION TESTING: All in-place density testing shall be performed by the County, the cost of which will be covered by the Subdividers processing fee. The cost of obtaining necessary soil "proctors", asphalt extractions, gradations, "Marshall" asphalt densitites, and concrete test cylinders shall be billed to and paid directly by the Subdivider.

SECTION 1.2

EARTHWORK

1.2.01 GENERAL: This section defines the requirements for excavation and backfill for structures, construction requirements for embankments and fills, and subgrade preparation for pavements and other surface improvements.

1.2.02 EXCAVATION FOR STRUCTURES: All structures shall be founded on undisturbed original subsoil. All unauthorized excavation below the specified structure subgrade shall be replaced with concrete monolithic with that of the slab above or with coarse gravel thoroughly compacted into place.

Subgrade soil for all concrete structures, regardless of type or location, shall be firm, dense, thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen engaged in subgrade surfacing laying reinforcing steel, and depositing concrete. Coarse gravel or crushed stone may be used for subsoils reinforcement if satisfactory results can be obtained thereby. Such material shall be applied in thin layers, each layer being embedded in the subsoil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone, and the finished elevation of any subsoil reinforced in this manner shall not be above the subgrade elevation.

1.2.03 BACKFILL AROUND STRUCTURES: Backfill around structures shall be placed to the lines shown on the approved drawings, or as directed. After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of excavated material or borrow of sand, gravel, or other suitable material, and shall be placed in layers not exceeding ten (10) inches in uncompacted thickness. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density equal to 95% of maximum dry density as measured by AASHTO T-99.

1.2.04 CONSTRUCTION OF EMBANKMENTS AND FILLS: Unsuitable materials that occur in the foundations for embankments and fills shall be removed by clearing, stripping, and/or grubbing. Where suitable materials occur, after stripping, the foundation shall be scarified to a depth of not less than six inches, and the loosened material shall be moistened and compacted as hereinafter specified for each layer. All materials in embankments and fills shall be placed, moistened, and compacted as provided in the following paragraphs.

When the embankment or fill exceeds the amount of excavation, sufficient additional material shall be obtained from borrow pits provided by the Contractor. All material proposed to be imported shall be subject to the review and approval of the County Engineer prior to start of hauling operations.

The materials used for embankment and fill construction shall be free from sod, grass, trash, rocks larger than four inches in diameter, and all other material unsuitable for construction of compacted fills.

Grading of completed embankments and fills shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1 foot of the design grade.

1.2.05 COMPACTING EARTH MATERIALS: The material shall be deposited in horizontal layers having a thickness of not more than 10 inches after being compacted as hereinafter specified; provided that, when mechanical equipment is used for placing and compacting the material on a sloping foundation, the layers may be placed parallel to the foundations. The distribution of materials shall be such that the compacted material will be homogeneous and free from lenses, pockets, or other imperfections.

Prior to and during compaction operations the material shall have the optimum moisture content required for the purpose of compaction, and the moisture content shall be uniform throughout the layers, insofar as is practical. Moistening of the material shall be performed at the site of excavation, but such moistening shall be supplemented as required by sprinkling at the site of construction. If the moisture content is more than optimum for compaction, the compaction operations shall be delayed until such time as the material has dried to the optimum moisture content. When the material has been conditioned as specified, the backfill or embankment shall be compacted as follows:

A. Under Roadways and extending one foot beyond the proposed curb line the fill or embankment material shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO T-99.

B. Under Sidewalk and Drive Approaches the fill or embankment material (to at least one foot each side of the edge of the slab) shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO T-99.

C. Other Fills and Embankments not listed above shall be compacted to a density equal to not less than 85% of maximum dry density as measured by AASHTO T-99.

1.2.06 ROAD SUBGRADE PREPARATION: In both cut and fill areas the paving subgrade shall be scarified to a depth of eight inches and compacted to the equivalent of 95% of maximum dry density as measured by AASHTO T-99. No rocks larger than two inches in diameter, organic material, soft clay, spongy material, or other deleterious material will be permitted in this scarified subgrade layer. Rough subgrades shall be shaped and graded to within a tolerance of 0.10 foot of design grade, and drainage shall be maintained at all times.

During the rolling operation moisture content of the subgrade layer shall be maintained at not less than 97% or more than 105% of optimum moisture content. Rolling shall be continued until the entire roadbed is compacted to the specified density to a minimum depth of eight inches.

1.2.07 DENSITY TESTING: All in-place soil densities shall be tested by County personnel. If densities do not comply with the required values, the Contractor shall be required to correct any deficiencies as directed by the County Engineer. Cost of obtaining necessary soil "proctors" shall be the responsibility of the Subdivider/Developer.

SECTION 1.3
ASPHALT PAVING

1.3.01 GENERAL: This section covers the requirements for bituminous surface paving on roads. All streets shall be surfaced in accordance with the following specifications, unless otherwise specified by the County Engineer:

- A. 8-inch crushed gravel base course over prepared subgrade
- B. 2-1/2-inch minimum compacted thickness plant mix asphalt surfacing on streets
- C. Chip and seal coat

1.3.02 BASE COURSE: Base for all streets shall consist of select material, either natural or crushed, and shall be graded to either one of the following:

1 Inch Gradation

<u>Sieve Size</u>	<u>Ideal Gradation</u> (Percent Passing)	<u>Ideal Gradation</u> (Tolerance)
1 inch	100	0
1/2-inch	85	+6
No. 4 sieve	55	+6
No. 16 sieve	31	+4
No. 200 sieve	9	+2

3/4 Inch Gradation

3/4 Inch	100	0
3/8 Inch	85	+7
No. 4	61	+6
No. 16	33	+5
No. 200	9	+2

The material shall be deposited and spread in a uniform layer, without segregation of size, with such depth that when compacted the layer will have the required thickness as stated above.

Each layer shall be compacted for the full width and depth. Alternate blading and rolling will be required to provide a smooth even and uniformly compacted course true to cross section and grade. Places inaccessible to rolling shall be compacted with mechanically operated hand tampers.

The gravel base shall be compacted to not less than 95% maximum dry density as determined by AASHTO T-99. Surfaces shall be true to the established grade with the thickness being not less than 1/4 inch from the required layer thickness and with the surface elevation varying not more than 3/8 inch in ten feet from the true profile and cross section.

1.3.03 BITUMINOUS SURFACE COURSE: Over the dry, dust-free compacted course the Contractor shall place and compact a bituminous surface course. The surface course shall consist of a mixture of mineral aggregate and binder. Gradation of aggregate shall conform to the following:

3/4 Inch Gradation

<u>Sieve Size</u>	<u>Ideal Gradation</u> (Percent Passing)	<u>Ideal Gradation</u> Tolerance
3/4-inch	100	0
3/8-inch	80	+11
No. 4	50	+8
No. 16	24	+7
No. 50	15	+6
No. 200	6	+2

The Contractor shall establish a mix gradation, and the amount of bituminous material shall be subject to the approval of the County Engineer and shall meet the requirements of the gradation selected. Regardless of the bituminous content, there shall not be more than 3% voids in the aggregate.

The bituminous material for the surface course shall be AC-10 asphalt cement conforming to the requirements of AASHTO M-226.

The bituminous surface course shall be mixed at a mixing plant and spread and compacted on the prepared base in conformance with the lines and dimensions shown on the plans and in accordance with these Specifications.

1.3.04 BITUMINOUS SEAL COAT: Following installation of surface course, all completed asphalt areas shall receive a bituminous seal coat. Bituminous material shall be an approved emulsified asphalt used for seal coating. Cover material shall consist of clean, hard, rough, durable, and sound fragments of broken stone, crushed gravel, or crushed slag conforming to the following requirements:

(a) The dry mineral aggregate shall be uniformly graded to the gradation limits specified below, when tested in accordance with AASHTO Designation T-27.

Percentage Passing Sieves

<u>Sieve Size</u>	<u>% Passing</u>
1/2-inch	100
3/8-inch	85-100
No. 4	5-20
No. 8	0-5
No. 200	0-1

Acceptance of cover material with respect to gradation shall be based on the average gradation of five samples taken from a test lot of 5,000 tons. The samples shall be obtained from the stockpile prior to use. A test lot shall be obtained when the average gradation of the five samples is within the specified gradation band and when the number of individual samples in each test lot outside the gradation band does not exceed two and when they are not outside the band by more than two percentage points on any one sieve.

The total amount of material passing the No. 200 sieve shall be determined by washing with water in accordance with AASHTO Designation T-11.

(b) That portion of the aggregate retained on the No. 4 sieve shall be clean and free of clay coatings and shall have not less than 80 percent by weight, of particles with at least one clean mechanically fractured face, when tested in accordance with UDOT Department Test Procedure 8-929.

(c) The aggregate shall have a percentage of wear not exceeding 30 when tested in accordance with AASHTO Designation T-96.

(d) The crushed mineral aggregate shall have a weighted percent of loss not exceeding 10 percent by weight when subjected to five cycles of sodium sulfate and tested in accordance with AASHTO Designation T-104.

(e) The aggregate shall be of such nature that when the particles are thoroughly coated with the bituminous material specified for the project not less than 90 percent of the coating shall be retained when tested in accordance with UDOT Department Test Procedure 8-945.

(f) The maximum dry unit weight of material shall not exceed 100 pounds per cubic foot when measured according to the loose weight determination as described in AASHTO Designation T-19 and the moisture content shall be determined according to ASTM D-2216.

1.3.05 SURFACE PREPARATION: Seal coat operations shall not be started until the surface to be sealed has been thoroughly compacted. In no event shall seal coat be placed on newly constructed bituminous surfaces within seven days after such surfaces are laid.

Prior to placing the seal coat, the existing surface shall be cleaned of all dirt, sand, dust, or other objectionable material.

1.3.06 APPLICATION OF BITUMINOUS MATERIAL: The material shall be sprayed over the prepared surface by means of a pressure distributor. The material shall be applied in such a manner that an inspection of the spread can be made and any defects corrected before the cover material is applied. The rate of application shall be determined by the Engineer. Application of bituminous material shall not be more than 1,000 feet in advance of the placing of cover material.

Joints between applications shall be made by starting and stopping the distributor on building paper. Valve action shall be instantaneous, both in starting and cut off. The distributor shall attain the proper application speed at the time the spray bar is opened.

The temperature range of the bituminous material at the time of application shall be such that the viscosity will be between 50 and 100 centistokes as determined in accordance with ASTM Designation D-2170. The exact temperature range shall be designated by the Engineer.

1.3.07 SPREADING AND COMPACTING OF COVER MATERIAL: The cover material shall be spread immediately after applying the bituminous material by means of an approval spreader which can be adjusted to uniformly spread the required amount of aggregate. Provisions shall be made so that the larger particles will be deposited first. The rate of cover material application, in pounds per square yard, shall be determined by the Engineer. Immediately after spreading, the cover material shall be hand broomed, if necessary, to distribute the aggregate uniformly over the surface.

After the cover material has been satisfactorily spread, the surface shall be rolled in a longitudinal direction. Rolling performed with pneumatic-tire rollers shall adequately seat the cover material and shall consist of at least two complete coverages. Rolling shall be complete the same day the bituminous material and cover material are applied.

On completion of final rolling, traffic shall be permitted to travel over the seal coat. Between 7 - 30 days following application of the seal coat, the contractor shall return to the site and broom clean any excess chips from the roadway and curb and gutter.

1.3.08 WEATHER AND SEASONAL LIMITATIONS: Seal coat shall be applied only between June 1 and September 15 and when the air temperature in the shade and the roadbed temperature are above 70°F. Seal coat shall not be applied during rain, fog, or other adverse weather conditions. Seal coat placed after September 15 shall be placed only upon written authorization from the Engineer, and then only when the air temperature in the shade and the roadbed temperature are above 70°F.

1.3.09 BITUMINOUS PLANT MIX SEAL COAT: Where determined by the County Engineer that the bituminous surface course is unacceptable due to material or construction defects, the Contractor shall place and compact a bituminous plant mix seal coat over the bituminous surface course. The seal coat shall consist of a mixture of mineral aggregate and bituminous binder. Gradation of the aggregate shall conform to the following:

<u>Sieve Size</u>	<u>% Passing</u>	
	<u>Type A</u>	<u>Type B</u>
1/2-inch	100	100
3/8-inch	95-100	95-100
No. 4	30-50	30-50
No. 8	10-25	22-37
No. 16		15-28
No. 50		8-16
No. 200		5-10

The Contractor shall establish a mix gradation, and the amount of bituminous material shall be subject to the approval of the County Engineer and shall meet the requirements of the gradation selected. Regardless of the bituminous content, there shall not be more than 3% voids in the mix.

The bituminous material shall be AC-10 asphalt cement conforming to the requirements of AASHTO M-226.

A tack coat shall be applied to all existing pavement prior to pouring the plant mix seal coat. The bituminous material shall be Grade CS-1 Emulsion applied at the rate of 0.08 gallons per square yard.

The bituminous plant mix seal coat shall be mixed at a mixing plant and spread and compacted on the prepared pavement in accordance with the lines and dimensions shown on the plans and in accordance with these specifications.

1.3.10 CONSTRUCTION METHODS AND EQUIPMENT: The methods employed in performing the work, all equipment, tools and machinery, and other appliances used in handling the materials and executing the work shall be the responsibility of the Contractor. The Contractor shall make such changes in the methods employed and in the equipment used as are necessary whenever the bituminous material being produced does not meet the specifications herein established.

1.3.11 SPREADING AND COMPACTION: The bituminous mixtures shall be spread with self-propelled, mechanical spreading and conditioning equipment capable of distributing at least a 12-foot width. The mixture shall be spread and struck off in such a manner that the finished surface shall result in a uniform, smooth surface. The longitudinal joints in succeeding courses shall be offset at least six inches transversely to avoid a vertical joint through more than one course.

The temperature of the bituminous mix shall be between 250°F. and 325°F. when being placed.

After the mixture has been spread, the surface shall be rolled in a longitudinal direction, commencing at the outside edge or lower side and proceeding to the higher side. Each pass of the roller shall overlap the preceding pass at least one-half the width of the roller. Rolling shall continue until 95% of the laboratory density, as determined in accordance with ASTM Designation D-1559 (Marshall Test), for the bituminous mixture being used has been obtained.

Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller.

The surface of the pavement, after compaction, shall be uniform and true to the established crown and grade. When tested with a ten (10) foot straight-edge placed parallel to the centerline of the pavement, the surface of the pavement at any point shall not deviate from the lower edge of the straight-edge by more than one-eighth of an inch. All high and low spots shall be remedied immediately by removing the wearing course material over the affected areas and replacing it with fresh, hot wearing course and surface finish material and immediately compacting it to conform with surrounding area.

All traffic shall be kept off the completed surface for a minimum period of 24 hours.

1.3.12 WEATHER LIMITATIONS: No bituminous surface course shall be placed when the temperature of the air or roadbed is 50oF. or below, during rainy weather, when the base is wet, or during other unfavorable weather conditions as determined by the County Engineer. No bituminous plant mix seal coat shall be placed when the temperature of the air or roadbed is less than 69oF., during rainy weather, when the pavement surface is wet, or during other unfavorable weather conditions as determined by the County Engineer. The air temperature shall be measured in the shade.

1.3.13 ASPHALT TESTING: All in-place road base and asphalt pavement density testing shall be performed by County personnel. If densities do not comply with the required values, the Contractor shall be required to correct any deficiencies as directed by the County Engineer. Cost of obtaining necessary soil "proctors", asphalt Marshall densities, and/or asphalt extraction testing, shall be the responsibility of the Subdivider/Developer.

SECTION 1.4

PORTLAND CEMENT CONCRETE

1.4.01. SCOPE: This section of the specifications defines materials to be used in all portland cement concrete work and requirements for mixing, placing, finishing, and curing.

1.4.02. MATERIALS: Materials used in portland cement concrete and reinforcing of portland cement concrete shall meet the following requirements:

(a) Cement: Portland cement shall be Type II and shall comply with the Standard Specification for Portland Cement, ASTM C-150.

(b) Aggregates: Concrete aggregates shall conform to Tentative Specifications for Concrete Aggregates, ASTM C-33.

(c) Water: Water used in mixing concrete shall be clean and free from oil, acid, salt, injurious amounts of alkali, organic matter or other deleterious substances.

(d) Entraining Agent: An air-entraining agent shall be used in all concrete exposed to the weather. The agent shall conform to ASTM Designation C-175 and C-260.

(e) Admixtures: No admixture (except calcium chloride) will be permitted to be used in portland cement concrete unless such use is specifically authorized by the County Engineer. Calcium chloride shall conform to ASTM Standard Specification D-98.

(f) Reinforced Steel: All bar material used for reinforcement of concrete shall be intermediate grade steel conforming to the requirements of ASTM Designation A-615 and shall be deformed in accordance with ASTM Designation A-305.

(g) Welded Wire Fabric: Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A-185.

1.4.03. CONCRETE MIX: For the purpose of practical identification, concrete has been divided into three classes: Class A, B, and C. Basic requirements and use for each class are as defined below:

<u>Class</u>	<u>Minimum Cement (sacks/c.y.)</u>	<u>Minimum 28-day Comp. Strength (psi)</u>	<u>Primary Use</u>
A	6-1/2	4000	Reinforced structural concrete
B	6	3500	Sidewalks, curbs & gutters, cross gutters, pavements and unreinforced footings and foundations
C	5	2500	Thrust blocks, anchors, mass concrete

All concrete shall also comply with the following requirements.

(a) Aggregates: The maximum size of the aggregate shall be not larger than one-fifth of the narrowest dimension between forms within which the concrete is to be cast, nor larger than three-fourths of the minimum clear spacing between reinforcing bars or between reinforcing bars and forms. For unreinforced concrete slabs, the maximum size of aggregates shall not be larger than one-fourth the slab thickness.

(b) Water: Sufficient water shall be added to the mix to produce concrete with the minimum practicable slump. The slump of mechanically vibrated concrete shall not exceed four inches. No concrete shall be placed with a slump in excess of five inches.

The maximum permissible water-cement ratio (including free moisture on aggregates) shall be 5 and 5-3/4 gallons per bag of cement respectively for Class A and B air entrained concrete.

(c) Air-Entraining: Air content for air-entrained concrete shall comply with the following:

Course Aggregate Size (in.)	Air Content (%)
1-1/2 to 2-1/2	5 ± 1
3/4 or 1	6 ± 1
3/8 or 1/2	7 ± 1

The air-entraining agent shall be added as liquid to the mixing water by means of mechanical equipment capable of accurate measurement and control.

(d) Calcium Chloride: Calcium chloride may be added as an accelerator during cold weather, with maximum amount being two pounds per sack of cement.

1.4.04. FORMS: Forms shall be substantially built and adequately braced so as to withstand the liquid weight of concrete. All linings, studding, walling and bracing shall be such as to prevent bulging, spreading, or loss of true alignment while pouring and displacement of concrete while setting.

Metal forms shall be used for curb and gutter work except at curves. All edge forms for sidewalk pavements, curbs, and gutters shall be of sufficient rigidity and adequately braced to accurately maintain line and grade.

Forms for curbed sections shall be so constructed and placed that the finish surface of walls and edge of sidewalks, curbs and gutters will not deviate appreciably from the arc of the curve.

Exposed vertical and horizontal edges of the concrete in structures shall be chamfered by the placing of mouldings in the forms.

1.4.05. JOINTS: Joints shall be provided for sidewalk and curb and gutter as follows:

(a) Sidewalks: Shall have scribed joints at intervals of 4 feet which joints shall be approximately 3/16" wide and be approximately 1/3 of the total slab thickness. In addition, 1/2-inch expansion joints shall be provided at 32-foot intervals and at locations where sidewalks adjoin curbs or existing sidewalks. Slabs shall be ruled at 4-foot intervals.

(b) Curb and Gutter: Shall be cut into lengths of 10 feet by the use of 1/8-inch steel division plates of the exact cross section of the curb and gutter or shall be scribed when installed by a laydown machine. Also, 1/2-inch expansion joints shall be provided at curb and gutter radii, where the curb and gutter abuts a solid object and at intervals not to exceed 50 feet, unless otherwise specified by the County Engineer.

Material for 1/2-inch expansion joints shall be as defined in AASHTO M-33, and shall be installed with its top approximately 1/4-inch below the concrete surface.

1.4.06. REINFORCEMENT AND EMBEDDED ITEMS: Reinforcing steel shall be clean and free from rust, scale, paint, grease, or other foreign matter which might impair the bond. It shall be accurately bent and shall be tied to prevent displacement when concrete is poured. Reinforcing steel shall be held in place by only metal or concrete ties, braces and supports. No steel shall extend from or be visible on any finished surface.

The Contractor shall use concrete chairs for holding the steel away from the subgrade, and spreader or other type bars for securing the steel in place. The spreader bars shall be not less than 3/8-inch in diameter.

1.4.07. PREPARATIONS: Before batching and placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the places to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry filler units that will be in contact with concrete shall be well drenched (except in freezing weather), and the reinforcements shall be thoroughly cleaned of ice or other coatings. Water shall be removed from spaces to receive concrete.

When placing concrete on earth surfaces, the surfaces shall be free from frost, ice, mud, and water. When the subgrade surface is dry soil or pervious material, it shall be sprayed with water immediately before placing of concrete or shall be covered with waterproof sheathing paper or a plastic membrane. No concrete shall be placed until the surfaces have been inspected and approved by the County Engineer or County Inspector.

1.4.08. CONCRETE MIXING: The concrete shall be mixed until there is a uniform distribution of the materials. Sufficient water shall be used in mixing concrete to produce a mixture which will flatten and quake when deposited in place, but not enough to cause it to flow. Sufficient water shall be used in concrete in which reinforcement is to be embedded, to produce a mixture which will flow sluggishly when worked and which, at the same time, can be conveyed from the mixer to the forms without separation of the coarse aggregate from the mortar. In no case shall the quantity of water used be sufficient to cause the collection of a surplus in the forms or exceed the maximum allowable slump as specified in 1.4.03(b).

1.4.09. DEPOSITING: Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. The concrete placing shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the corners of forms and reinforcing bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall retempered concrete be used. No concrete shall be dropped more than 3 feet.

All concrete in structures shall be vibrator compacted during the operation of placing, and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms.

1.4.10. PLACING CONCRETE IN COLD WEATHER: No concrete shall be poured where the air temperature is lower than 40 degrees Fahrenheit, at a location where the concrete cannot be covered or protected from the surrounding air. When concrete is poured below a temperature of 35 degrees Fahrenheit the ingredients of the concrete shall be heated so that the temperature of the mixture shall not be less than 50 degrees or more than 100 degrees Fahrenheit. Before mixing, the heated aggregates shall not exceed 125 degrees Fahrenheit and the temperature of the heated water shall not exceed 175 degrees Fahrenheit. Cement shall not be added while the temperature of the mixed aggregates and water is greater than 100 degrees Fahrenheit. When there is likelihood of freezing during the curing period, the concrete shall be protected by means of an insulating covering and/or heating to prevent freezing of the concrete for a period of not less than 7 days after placing. Concrete shall not be placed on frozen soil.

Equipment for protecting concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing. In the event heating is employed, care shall be taken to insure that no part of the concrete becomes dried out or is heated to temperatures above 90° F. The housing, covering, or other protection used shall remain in place and intact at least 24 hours after the artificial heating is discontinued. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

1.4.11. FINISHING: After the concrete for slabs has been brought to the established grade and screened it shall be worked with a magnesium flat and then given a light broom finish. In no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface to absorb moisture or hasten hardening. Surface edges of all slabs shall be rounded to a radius of 1/2-inch.

After concrete has been poured in curb and gutter forms it shall be puddled and spaded so as to insure a thorough mixture, eliminate air pockets, and create uniform and smooth sides. Before the concrete has thoroughly set, and while the concrete is still green the forms shall be removed and the front and top sides shall be finished with a flat or steel trowel to make a uniform finished surface. Wherever corners are to be rounded, special steel trowels shall be used while the concrete is workable and the corners constructed to the dimensions specified.

The top and face of the curb and also the top of the apron on combined curb and gutter must be finished true to line and grade and without any irregularities of surface noticeable to the eye. The gutter shall not hold water to a depth of more than one fourth (1/4) of an inch, nor shall any portion of the surface or face of the curb or

gutter depart more than one-fourth (1/4) of an inch from a straight edge ten (10) feet in length, placed on the curb parallel to the center line of the street nor shall any part of the exposed surface present a wavy appearance.

1.4.12 CURING AND PROTECTION: As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be protected for curing one of the following ways:

- (a) Ponding of water on the surface or continuous sprinkling.
- (b) Application of absorptive mats such as 3-inch of cured hay, clean straw or fabric kept continuously wet.
- (c) Application of two inches of moist earth or sand uniformly distributed on the surface and kept saturated by spraying with water.
- (d) Application of light colored waterproof plastic materials, conforming to "Specifications for Waterproof Sheet Materials for Curing Concrete" ASTM C-171, placed and maintained in contact with the surface of the concrete.
- (e) Application of a curing compound, conforming to "Specifications for Liquid Membrane - Forming Compounds for Curing Concrete" ASTM C-309. The compound shall be light in color and shall be applied in accordance with the manufacturers recommendations immediately after any water sheen, which may develop after finishing has disappeared from the concrete surface.

The freshly finished surface shall be protected from hot sun and drying winds until it can be sprinkled or covered as above specified. The concrete surface must not be damaged or pitted by rain. The contractor shall provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the preceeding twelve (12) hours.

The Contractor shall erect and maintain suitable barriers to protect the finished surface. Any section damaged from traffic or other causes occurring prior to its official acceptance, shall be repaired or replaced by the Contractor at his own expense in a manner satisfactory to the County Engineer.

1.4.13 CONCRETE TESTING: In the event that the concrete placed or delivered to the job site appears to have questionable quality, the County Engineer may order the taking of concrete test cylinders to check required compressive strengths. In-place concrete may be cored for testing. Cost of all required laboratory testing shall be the responsibility of the Subdivider/Developer.

SECTION 1.5

EXCAVATION AND BACKFILL FOR PIPELINES

1.5.01 GENERAL: The work covered by this specification consists of furnishing all labor, tools, materials, equipment, and in performing all operations in connection with the excavation, trenching, and backfilling for underground pipelines and appurtenances.

1.5.02 CONTROL OF GROUNDWATER: Trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe embedment operations in an adequate and acceptable manner. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater, and in all cases where the static groundwater elevation is above the bottom of any trench or bell hole excavation, such groundwater shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. The discharge from trench dewatering shall be conducted to natural drainage channels, gutters, or drains. Surface water shall be prevented from entering trenches.

1.5.03 EXCAVATION FOR PIPELINES: Excavation for pipelines shall follow lines parallel to and equidistant from the location of the pipe centerline. Trenches shall be excavated to the depths and widths required to accommodate the construction of the pipelines, as follows:

(a) Except in ledge rock, cobblerock, stones, or water-saturated earth, mechanical excavation of trenches shall not extend below an elevation four inches above the bottom of the pipe after placement in its final position. All additional excavation necessary for preparation of the trench bottom shall be made manually. Excavation shall not be carried below the grade shown on the Drawings. Any unauthorized excavation made below grade for any reason shall be backfilled in accordance with these Specifications.

(b) Excavation for trenches in ledge rock, cobblerock, stones, mud, or other material unsatisfactory for pipe foundation shall extend to a depth of at least four inches below the bottom of the pipe. A bedding of special material shall be placed and thoroughly compacted with pneumatic tampers in four-inch lifts to provide a smooth, stable foundation. Special foundation material shall consist of suitable earth materials free from roots, sod, or organic matter. Trench bottoms shall be hand-shaped as specified in paragraph (a) above.

Where unstable earth or muck is encountered in the excavation at the grade of the pipe, a minimum of twelve inches below grade will be removed and backfilled with crushed rock or gravel to provide a stable subgrade.

(c) The maximum width of trench, measured at the top of the pipe, shall be as narrow as possible but not wider than twelve inches on each side of sewer pipe and fifteen inches on each side of water pipe.

1.5.04 GRAVEL FOUNDATION FOR PIPE: Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, where water must be drained to maintain a dry bottom for pipe installation, and at other locations as previously defined, the subgrade shall be excavated to the specified depth and replaced with crushed rock or gravel.

Gravel for pipe foundation shall be clean crushed rock or gravel conforming to the following gradation:

<u>Screen</u>	<u>% Passing</u>
1-1/2"	100
No. 4	5

The gravel material shall be deposited over the entire trench width in six-inch maximum layers; each layer shall be compacted by tamping, rolling, vibrating, spading, slicing, rodding, or by a combination of two or more of these methods. In addition, the material shall be graded to produce a uniform and continuous support for the installed pipe.

1.5.05 BLASTING: Blasting will not be allowed except by special permission of the County Engineer. When the use of blasting is necessary, the Contractor shall use utmost care not to endanger life or property. The Contractor shall comply with all laws, ordinances, and applicable safety code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property, and he shall be fully responsible for all damage attributable to his blasting operations. Signals warning persons of danger shall be given before any blast. Suitable weighted plank coverings of timber mats shall be provided to confine all materials lifted by blasting within the limits of the excavation or trench.

Excessive blasting or overshooting will not be permitted, and any material outside the authorized cross section which may be shattered or loosened by blasting shall be removed at the Contractor's expense. The County Engineer shall have authority to order any method of blasting discontinued which leads to overshooting or is dangerous to the public or destructive to property or to natural features.

1.5.06 SHEETING, BRACING, AND SHORING OF EXCAVATIONS: Excavation shall be sheeted, braced, and shored as required to support the walls of the excavations to eliminate sliding and settling and as may be otherwise required to protect the workmen and existing utilities, structures, and improvements. All such sheeting, bracing, and shoring shall comply with the requirements of the Utah State Industrial Commission and OSHA.

All damage resulting from lack of adequate sheeting, bracing and shoring shall be the responsibility of the Contractor, and the Contractor shall effect all necessary repairs or reconstruction resulting from such damage.

1.5.07 BACKFILLING: Backfill shall be carefully placed around and over pipes and shall not be permitted to fall directly on a pipe from such a height or in such a manner as to cause damage. In these specifications the process of preparing the trench bottom to receive the pipe and the backfilling on each side of the pipe to a level over

the top of the pipe is defined as bedding. Bedding requirements are as defined on the Drawings and in the Specifications for each pipe type.

Trench backfilling above the level of the pipe bedding shall normally be accomplished with native excavated materials and shall be free from rocks larger than eight inches in diameter.

The backfill in all utility trenches shall be either compacted or consolidated according to the requirements of the materials being placed. Under pavements or other surface improvements the in-place density shall be a minimum of 90% of laboratory standard maximum dry density, as determined by AASHTO T-99. In shoulders and other areas the in-place density shall be a minimum of 85% of laboratory standard maximum dry density, as determined by the same laboratory method.

1.5.08 CONSOLIDATION OF BACKFILL: Consolidation of backfill shall be accomplished by those methods in which water is used as the essential agent to produce the desired condition of density and stability. Consolidation of backfill by water shall be limited to free draining granular soils. Water shall be applied by jetting unless flooding is specifically authorized by the County Engineer. Authorization by the County Engineer to use any consolidation method does not relieve the Contractor of his responsibility to meet the specified density requirements. Water for consolidation shall be furnished by the Contractor at his expense.

In the jetting procedure the jets shall be inserted at not more than four-foot intervals (staggered) throughout the length of the backfilled area and shall be slowly forced down to the bottom of the trench or top of previously jetted lift and held until the trench backfill is completely saturated with water. Depth of jetted lift shall not exceed five feet.

The minimum size of hose and equipment shall be such as to provide a minimum pressure of 35 pounds per square inch at the discharge. The jet shall be rigid iron pipe with a minimum diameter of one inch.

After the water-settled trench has set for several days, any depression in the trench shall be filled, mounded over, and wheel rolled to compact the material thus placed.

All precautions necessary shall be taken by the Contractor to prevent damage and movement (including floating) of the pipeline, structures, and existing adjacent improvements and utilities. The allowance of the use of consolidation methods will not be construed as guaranteeing or implying that the use of such methods will not result in damage to adjacent ground. The Contractor shall make his own determination in this regard and shall assume all risks and liability for settlement or lateral movement of adjacent ground or improvements or utilities, either on the surface of the ground or underground.

1.5.09 COMPACTION OF BACKFILL: Compacted backfill shall be placed by means of sheepfoot rollers, pneumatic tire rollers, or other mechanical tampers of a size and type approved by the County Engineer.

Where compaction methods are used, the material shall be placed with a moisture content such that after compaction the required relative densities will be produced; also, the material shall be placed in lifts which, prior to compaction, shall not exceed twelve inches.

Prior to compaction each layer shall be evenly spread, moistened, and worked by disk harrowing or other means approved by the County Engineer.

Approval of equipment, thickness of layers, moisture content, and compactive effort shall not be deemed to relieve the Contractor of the responsibility for attaining the specified minimum relative densities. The Contractor, in planning his work, shall allow sufficient time to permit the County Engineer to make tests for relative densities.

1.5.10 IMPORTED BACKFILL MATERIAL: In the event the native excavated materials appear to be very difficult to compact or consolidate to the required densities, or are unacceptable as backfill, the Contractor may elect to provide imported granular material. This granular material shall pass a 1-inch square sieve and shall not contain more than 15% of material passing a 200-mesh sieve, and shall be free from sod, vegetation, and other organic or deleterious materials.

1.5.11 SOIL TESTING: All in-place density testing of backfill shall be performed by County personnel. If densities do not comply with the required values, the Contractor shall be required to correct any deficiencies as directed by the County Engineer. Cost of obtaining necessary soil "proctors" shall be the responsibility of the Subdivider/Developer.

SECTION 1.6

CONCRETE PIPE AND CORRUGATED METAL PIPE

1.6.01 GENERAL: This section covers the requirements for pipe materials and installation in sanitary sewer and storm drain construction.

1.6.02 PIPE: Pipe used in sewer line and storm drain line construction shall be either reinforced or non-reinforced concrete pipe as required by design loadings and fill heights or corrugated metal pipe as follows:

(a) Reinforced Concrete Pipe: All reinforced concrete pipe used in the construction shall be of the rubber gasket type, bell and spigot joint design, conforming to the requirements of the latest revision of ASTM Designation C-76. Pipe class shall be as shown on the approved drawings. If pipe class is not shown, Class III pipe shall be used. The minimum joint length of all pipe provided shall be 7-1/2 feet, or as approved by the County Engineer.

(b) Bell and Spigot Joints: Bell and spigot joints, including rubber gaskets, shall conform to the requirements of the latest revision of ASTM Designation C-443. The pipe joint shall be so designed as to provide for self-centering, and when assembled, to compress the gasket to form a watertight seal. The gasket shall be confined in a groove on the spigot, so that pipe movement or hydrostatic pressure cannot displace the gasket.

(c) Corrugated Metal Pipe: CMP shall conform to AASHTO M36 and shall have a minimum plate thickness of No. 14 gage. Pipe shall be galvanized.

1.6.03 PIPE LAYING: All pipe installation shall proceed upgrade on a stable foundation, with joints closely and accurately fitted. Rubber gaskets shall be fitted properly in place, and care shall be taken in joining the pipe units to avoid twisting of gaskets. Joints shall be clean and dry, and a joint lubricant as recommended by the pipe supplier shall be applied uniformly to the mating joint surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and rejointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

1.6.04 GRAVEL FOUNDATION FOR PIPE: Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for concrete pipe foundation shall be clean crushed rock or gravel with 100% passing a 1-1/2-inch screen and 5% passing a No. 4 sieve.

1.6.05 INSTALLATION REQUIREMENTS FOR LINE AND GRADE: All concrete pipe shall be installed accurately to the defined line and grade with the following limits:

Variance from established line and grade shall not be greater than one-sixteenth (1/16) inch per inch of pipe diameter in ten feet, and not to exceed one-half inch in ten feet, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (1/64) inch per inch of pipe diameter, or one-half (1/2) inch maximum.

1.6.06 PIPE BEDDING: All pipe sewers and drains shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

A groove shall be excavated in the bottom of the trench to receive the bottom quadrant of the pipe. Before preparing the groove, the trench bottom shall be excavated or filled and compacted to an elevation sufficiently above the grade of the pipe so that, when completed, the pipe will be true to line and grade. Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the mid-point of the pipe shall be deposited and compacted in layers not to exceed 10 inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials shall be placed in the trench with hand tools or other approved method in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall be loose earth, free from lumps; sand or gravel, free from rocks larger than two-inch diameter; with all materials free from roots, sod, or other vegetable matter.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12 inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a 1-1/2-inch screen and 5% passing a No. 4 sieve.

1.6.07 TESTS: The Contractor will be required to conduct an infiltration and/or air test and displacement test in the presence of the County Engineer or his representative. If these tests prove to be inconclusive, any or all of the other required tests shall be conducted in the presence of the County Engineer or his representative. Tests shall be performed as follows:

A. Displacement Test: In conducting the displacement test a light will be flashed between manholes or, if the manholes have not as yet been constructed, between the locations of the manholes by means of a flashlight or by reflecting

sunlight with a mirror. If the illuminated interior of the pipe shows broken, misaligned, or displaced pipe or other defects, the defects designated by the County Engineer shall be remedied at the Contractor's expense.

B. Infiltration Test: The Contractor shall furnish labor, equipment and materials, including pumps, and shall assist the County Engineer in making infiltration tests of the completed sewer before it can be placed into service. The Contractor shall furnish and install the measuring weirs or other measuring devices. The length of line to be tested at any time shall be subject to the approval of the County Engineer. The maximum allowable infiltration shall not exceed 150 gallons per inch diameter per mile per 24 hours for all installed sewer pipe. If the quantity of infiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the County Engineer at the expense of the Contractor.

C. Exfiltration Test: In areas where groundwater does not exist, exfiltration tests may be required in lieu of infiltration tests.

(1) Each section of the sewer shall be tested between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers. The pipe and manhole shall be filled with water to a point approximately four feet above the invert of the sewer at the center of the upper manhole.

(2) The allowable leakage will be computed by the formula:

$$E = 0.25 D \sqrt{H}$$

Where: E is the allowable leakage in gallons per minute per 1000 feet of sewer tested

D is the internal diameter of the pipe in inches

H is the difference in elevation in the water surface in the upper manhole and the invert of the pipe at the lower manhole (feet)

(3) If the leakage from the sewer, as shown by the test, exceeds that allowed by the formula, the Contractor shall make the necessary corrections to reduce the exfiltration to within permissible limits.

(4) Where the difference in elevation between inverts of adjacent manholes exceeds 10 feet, no exfiltration leakage tests will be required.

(5) House service laterals shall be considered part of the main line sewer to which they are connected and shall be tested with the main line sewer.

D. Air Testing: The Contractor or his representative (a qualified firm or individual agreed upon by the County Engineer and the Contractor) shall furnish labor, equipment, and materials, including pumps and compressors, and shall perform, in the presence of the County Engineer, air tests of the completed pipe before it can be placed in service. Each section of sanitary sewer pipeline between manholes shall be tested after all the four-inch service laterals (and plugs) have been installed. Each

test section shall be pressurized to 4.0 psi. For the purpose of stabilizing the air pressure in each test section, the 4.0 psi pressure shall be maintained for a two-minute period. Each test section shall then be repressurized to 4.0 psi for a period of four minutes. The test section shall be accepted if, after four minutes, the pressure gauge indicates 3.5 psi or greater. Failure of the Contractor's testing equipment to properly function shall render the test unacceptable. All faulty sections of pipeline shall be repaired and retested until the minimum air testing requirements have been met.

1.6.08 SEWER LATERAL CONNECTIONS: All sewer lateral connections into new sewer mains shall be through pre-formed wyes. All connections into existing sewer line shall be done with a sewer tapping machine and as shown on the County Standard Drawings.

SECTION 1.7

DUCTILE IRON PRESSURE PIPE

1.7.01 GENERAL: This section covers the requirements for ductile iron pressure pipe materials and installation.

1.7.02 MATERIALS: Ductile iron pipe shall conform to all requirements of ANSI A-21.51, "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids." Minimum thickness shall be Class 50.

1.7.03 JOINTS:

(a) Mechanical Joints: All mechanical joints shall meet requirements of ANSI A-21.6 and ANSI 21.11. All gasket surfaces shall be smooth and free from imperfections. Gaskets shall conform to tests in accordance with specifications and shall be less than one year old.

Bolts shall meet all requirements of the above specification, honoring all characteristics, tolerances and tests.

(b) Push-on Joints: All push-on joints shall meet the requirements of ANSI 21.11. Gaskets shall be free from defects and not over one year old.

Lubricants shall be non-toxic and have no deteriorating effects on gasket materials. It shall not impart taste to water in a pipe. It shall conform in every way to ANSI 21.11.

(c) Flanged Joints: Flanged joints shall be bolted firmly with machine, stud or cap bolts of proper size. Flanges may be cast integrally with the pipe or may be screwed on threaded pipe. Flanges shall be faced and drilled and of proper dimensions for size and pressure required. All flanges shall meet requirements of ANSI A 21.10, "American Standard for Cast Iron Fittings."

Bolts and nuts, unless otherwise specified, shall be made of the best quality refined iron or metal steel and have clean, well-fitting threads. Bolts will be provided with standard hexagonal nuts and standard hexagonal heads. Bolts shall be of the diameter required for each flange and, when installed, shall be of length so that no more than 3/8-inch or less than 1/8-inch extends past face of nut.

Gaskets shall be 1/16-inch thick, made of best quality asbestos sheet gasket material or equal. A gasket for each flanged joint of proper size, ring type or full face as shown on the drawings.

(d) Compression Joints: Compression joints shall be mechanical joint sleeve, Smith Blair 441 or Flange adaptor Smith Blair Type 900 or approved equal.

1.7.04 FITTINGS:

(a) Mechanical Joint Fittings: Mechanical joint fittings shall conform to ANSI A 21.10, "American Standard for Cast Iron Fittings."

(b) Push-on Fittings: Push-on fittings shall conform to ANSO A 21.10 with bells, sockets, and plain ends per ANSI A 21.11.

(c) Flanged Fittings: Flanged fittings shall conform to ANSI A 21.10, "American Standard for Cast Iron Fittings."

All flanges shall be faced and drilled. Where cap screws or stud bolts are needed, flanges shall be tapped to support cap screws or stud bolts.

1.7.05 LAYING PIPE: Cast iron pipe shall be laid as specified in AWWA Standard for "Installation of Cast Iron Water Mains" C-600, except as modified herein and in Special Conditions.

Tees, elbows, crosses, and reducers shall be used for changes in direction and outlets, as shown on the drawings.

Anchors and thrust blocks shall be placed at valves, elbows, tees, etc., as shown on the drawings and as directed by the County Engineer.

All ductile iron pipe installation shall proceed on a stable foundation, with joints closely and accurately fitted. Joints shall be clean and dry, and a joint lubricant, as recommended by the pipe supplier, shall be applied uniformly to the mating joint surfaces to facilitate easy, positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and rejoined as for new pipe. In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with adjoining pipe and to prevent sudden offsets to the flow line. As work progresses, the interior of the pipe shall be cleared of dirt and superfluous materials of every description. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after jointing has been completed. Trenches shall be kept free from water until pipe jointing has set, and pipe shall not be laid when condition of the trench or weather is unsuitable for such work. At all times when work is not in progress, all open ends of the pipe and fittings shall be securely closed to the satisfaction of the County Engineer so that no water, earth, or other substance will enter the pipe or fittings.

1.7.06 GRAVEL FOUNDATION FOR PIPE: Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for ductile iron pipe foundations shall be clean crushed rock or gravel with 100% passing a 1½-inch screen and 5% passing a No. 4 sieve.

1.7.07 PIPE BEDDING: All pipes shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

A groove shall be excavated in the bottom of the trench to receive the bottom quadrant of the pipe. Before preparing the groove, the trench bottom shall be excavated or filled and compacted to an elevation sufficiently above the grade of the pipe so that, when completed, the pipe will be true to line and grade. Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the midpoint of the pipe shall be deposited and compacted in layers not to exceed 10 inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials shall be placed in the trench with hand tools or other approved method in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall be loose earth, free from lumps; sand materials free from roots, sod, or other vegetable matter.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12 inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a 1-inch screen and 5% passing a No. 4 sieve.

1.7.08 POLYETHYLENE WRAPPING: Ductile iron pipe materials placed may be wrapped, at the direction of the County Engineer, with a polyethylene plastic wrap the entire length of the pipeline materials, including all fittings and valves, in accordance with the manufacturer's specifications. This shall be completed in order to provide the necessary cathodic protection.

Polyethylene encasement wrap shall consist of one or more wraps of sheet polyethylene plastic to produce a minimum thickness of 8 mils over all surfaces. The wrap shall be sufficiently loose so that it will contact all surfaces without tension after backfilling. The wrap shall extend one foot over adjacent surfaces. The overlap at edges of the plastic shall be a minimum of one foot, and the laps shall be secured in place. Ends of the wrap shall be secured by circumferential bands on one-inch wide polyethylene plastic tape applied under light tension.

Where polyethylene wrap is specified, all compression couplings, mechanical joints, flanged joints, and valves exposed to soil shall be wrapped with 8-mil thick polyethylene film adhesive tape equal to Polyken No. 900 or Scotchrap No. 50. The tape shall be installed to adhere securely to both the pipe and polyethylene. Enough film shall be used to overlap the adjoining pipe a minimum of one foot.

Valves shall be wrapped by bringing the wrap on the adjacent pipe over the bells or flanges of the valve and sealing with the adhesive tape. The valve bodies are then wrapped with a flat sheet of the film passed under the valve bottom and brought up around the body to the stem and fastened in place with the adhesive tape.

All fittings that require concrete blocking should be completely wrapped prior to pouring the concrete backing block.

Polyethylene wrap shall be protected from the sun and weathering prior to use. Care shall be exercised during backfilling of the protected areas to prevent puncturing the film. The bottom of the trench shall be shaped to give substantially uniform circumferential support of the lower third of each pipe.

1.7.09 PIPE SIZES: If the size of any piping is not clearly evident in the drawings, the Contractor shall request instructions from the County Engineer as to the proper sizing. Any changes resulting from the Contractor's failure to request clarification shall be at his expense.

1.7.10 CLEANING AND FLUSHING: The Contractor shall take every precaution to remove dirt, grease, and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be thoroughly cleaned to remove rocks, dirt, and other foreign matter by washing, sweeping, scraping, or other method that will not harm the lining or pipe.

Water required for flushing shall be furnished by the Contractor. All temporary connections for flushing and drainage shall be furnished, installed, and subsequently removed by the Contractor.

All open ends of pipes shall be bulkheaded or plugged when workmen are not on the job or in the immediate area to prevent rocks or other foreign matter from entering the pipe.

1.7.11 SERVICE CONNECTIONS: Service connections to ductile iron pressure pipe shall be through either tapped couplings (AWWA thread) with teflon tape to be spirally wrapped completely around the thread area prior to insertion of the corporation stop, or by bronze double strap service saddles. Reducing bushings shall be of nylon.

SECTION 1.8

CAST IRON PIPE AND FITTINGS

1.8.01 SCOPE: This section applies to the furnishing and installation of cast iron pipe and fittings.

1.8.02 CAST IRON PIPE: Cast iron pipe shall be of thickness Class 50 meeting the requirements of ANSI Specification 21.6 and shall have joints conforming to ANSI A 21.11 of the push-on rubber gasket type or the mechanical type with plain rubber gaskets. Cast iron pipe shall be of 18/40 iron. Thickness Class 50 21/45 iron will be accepted as an alternate to the 18/40 iron.

1.8.03 CAST IRON FITTINGS: Fittings shall be of the short body design and shall meet ANSI Specification A 21.10 and shall have mechanical or push-on rubber gasket type joints. Fittings inside structures or where otherwise noted on the drawings shall be ASA Class 125 flanged design with full face rubber gaskets.

1.8.04 COATINGS FOR CAST IRON PIPE AND FITTINGS: All exterior surfaces of pipe and fittings shall be coated with hot coal tar as specified in the Proposed American Standard Specifications for Coal Tar Dip Coatings for Cast Iron Pipe and Fittings.

1.8.05 HANDLING CAST IRON PIPE AND FITTINGS: Pipe and fittings shall be handled in such a manner as to insure installation in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating.

All damaged pipe coating shall be repaired prior to laying the pipe or placing the backfill. Repair shall be accomplished by removing all damaged coating, wire-brushing to exposed metal, and applying two coats of coal tar coating of a type and quality equal to that used originally in coating the pipe.

1.8.06 CUTTING, CLEANING AND INSPECTION: Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method which will not damage the pipe. Before installation, each pipe shall be inspected for defects and rung with a light hammer to detect cracks. All defective, damaged, or unsound pipe shall be rejected.

1.8.07 PIPE INSTALLATION: Superseding data to the contrary, all cast iron pipe fittings, valves, and appurtenances shall be of a class equal to or exceeding that designated for pipe in each area. Pipe installation shall be as specified in Section 1.7 of these specifications.

All cast iron pipe materials placed may be wrapped, at the direction of the County Engineer, with a plastic liner the entire length of the pipeline materials, including all fittings and valves, in accordance with Section 1.7.08 of these specifications. This shall be completed in order to provide the necessary cathodic protection.

1.8.08 SERVICE CONNECTIONS: Service connections to cast iron pressure pipe shall be through either tapped couplings (AWWA thread) with teflon tape to be spirally wrapped completely around the thread area prior to insertion of the corporation stop, or by bronze double strap service saddles. Reducing bushings shall be of nylon.

SECTION 1.9

PVC PLASTIC SEWER PIPE

1.9.01 GENERAL: This section covers the requirements for PVC plastic sewer pipe to be used in sewer mains and sewer laterals.

1.9.02 PIPE: PVC plastic sewer pipe shall be made of compound conforming to ASTM D-1784 with a cell classification of 13364-B with a minimum tensile modular of 500,000 psi. PVC sewer pipe must meet all the dimensional, chemical, and physical requirements outlined in ASTM D-3034, shall have a SDR of 35.0 and shall be supplied in 20-foot laying lengths. Pipe shall carry the IAPMO UPC Seal of Approval.

PVC sewer pipe shall be installed according to the requirements of ASTM D-2321 and the manufacturer's requirements.

1.9.03 JOINTS: Joints for PVC plastic sewer pipe shall be of the rubber gasket bell and spigot type, and the rubber gaskets shall conform to ASTM D-1869.

1.9.04 FITTINGS: Fittings shall be made of PVC plastic conforming to ASTM D-1784, have a cell classification as outlined in ASTM D-3034, and carry the IAPMO UPC Seal of Approval.

1.9.05 PIPE LAYING: All pipe installation shall proceed up grade on a stable foundation with joints closely and accurately fitted. Installation requirements of the manufacturer shall be rigidly adhered to.

Rubber gaskets shall be fitted properly in place and care shall be taken in joining the pipe units to avoid twisting of gaskets. Joints shall be clean and dry and a joint lubricant, as recommended by the pipe supplier, shall be applied uniformly to the mating jointing surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and rejointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

In addition to the above requirements, all pipe installation shall comply to the specific requirements of the pipe manufacturer.

1.9.06 GRAVEL FOUNDATION FOR PIPE: Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, it shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place. Gravel foundation material for pipe shall be placed only when, and to the depth, requested by the Engineer or specified on the Drawings.

Gravel for concrete pipe foundations shall be clean crushed rock or gravel with 100% passing a 1-inch screen and maximum of 5% passing a No. 4 sieve.

1.9.07 INSTALLATION REQUIREMENTS FOR LINE AND GRADE: All sewer pipe shall be installed accurately to the defined line and grade with the following limits:

Variance from established line and grade shall not be greater than one thirty-second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (½) inch, provided that such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (1/64) inch per inch of pipe diameter, or one-half (½) inch maximum.

1.9.08 PIPE EMBEDMENT: All pipe shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded in suitable embedment material.

The bottom of the trench shall be of stable materials. In general, coarse-grained soils, free of rocks and stones, such as graded crushed rock, gravel, sand, and other granular materials, are considered stable materials. A stable material shall be placed and compacted under the pipe haunches and up to the springline in uniform layers not exceeding 10 inches in depth. When bedding is required, the same material should be used for both bedding and haunching. Stable material, free of rocks and stones, shall be used to backfill the trench from the springline of the pipe to a point at least 12 inches above the top of the pipe. Each 10-inch layer of bedding, haunching and initial backfill shall be placed, then carefully and uniformly compacted to 90% of AASHTO T-99 density. Extra-fine sand, clay, silt, or large soil lumps shall not be allowed as bedding, haunching or initial backfill material. The remaining backfill over the top of the initial backfill shall be placed in accordance with Section 1.5.

No bedding material shall be used unless accepted by the County Engineer. Samples of the materials shall be submitted by the Contractor a sufficient time in advance of intended use to enable its inspection and testing. Bedding material shall be one of the following, at the Contractor's option:

Sand: Sand bedding shall be a clean sand-gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D-422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Wt.</u>
3/4"	100
3/8"	70-100
#4	55-100
#10	35-95
#20	20-80
#40	10-55
#100	0-10
#200	0-3

Pea Gravel: Pea gravel bedding shall be a clean mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D-422.

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Wt.</u>
1½"	100
¾"	30-75
½"	15-55
¼"	0-5

Gravel-Sand:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Wt.</u>
1½"	100
¾"	30-75
½"	15-55
¼"	0-40
#200	0-3

Crushed Rock: Crushed rock bedding shall be a clean mixture free from organic material and conforming to the following gradation when tested in accordance with ASTM D-422

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Wt.</u>
5/8"	100
¼"	50-65
#40	8-23
#200	0-10

1.9.09 TESTS: The Contractor will be required to conduct an infiltration and/or air test and displacement tests in the presence of the County Engineer or his representative. If these tests prove to be inconclusive, any or all of the other required tests shall be conducted in the presence of the County Engineer or his representative. Tests shall be performed as specified in Section 1.6.07.

1.9.10 SEWER LATERAL CONNECTIONS: All sewer lateral connections into new sewer mains shall be through pre-formed wyes. All connections into existing sewer lines shall be done with a sewer tapping machine and all required fittings and materials. Connections shall be as shown in the County Standard Drawings.

SECTION 1.10

PVC WATER PIPE

1.10.01 SCOPE: This specification applies to the furnishing and installation of PVC plastic pressure pipe.

1.10.02 PIPE: All PVC plastic pressure pipe with integral bell and spigot joints shall be made from clean, virgin, Type 1, Grade 1, unplasticized polyvinyl chloride (PVC) and shall meet the requirements of the latest revision of ASTM D-1784, ASTM D-2241, with standard dimension ratio (SDR) of 21 (Class 200 psi) for all pipe, unless otherwise stated. All pipe and fittings shall be NSF approved.

1.10.03 JOINTS: The bell shall consist of an integral wall section with a solid cross-section rubber ring which meets the requirements of ASTM D-1869. The bell section shall be designed to be at least as strong as the pipe wall.

1.10.04 FITTINGS: Fittings shall be short body cast iron or ductile iron, iron pipe size for PVC application, and in accordance with AWWA C-110. They shall be capable of withstanding, without bursting hydrostatic tests of three times the rated water working pressure. The fittings shall be furnished with mechanical, bell and spigot, or flange joints and shall conform to the dimensions and weights given in AWWA C-110 and AWWA C-111.

1.10.05 SERVICE CONNECTIONS: Service connection to PVC plastic pressure pipe shall be by bronze service saddles specifically designed for plastic pipe (equal to Christy) or polypropylene saddles with stainless steel reinforcing caps (equal to Smith-Blair); reducing bushings shall be of nylon.

1.10.06 PIPE LAYING: All PVC plastic pipe installation shall proceed on a stable foundation, with joints closely and accurately fitted. Joints shall be clean and dry, and a joint lubricant, as recommended by the pipe supplier, shall be applied uniformly to the mating joint surfaces to facilitate easy, positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and rejointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

Service lines and laterals must be assembled so that no strain is placed on the pipe during or after backfill operations. After laying of the pipe is completed, it shall be center loaded with backfill and bedding to prevent arching and whipping under pressure. Center loading should be done carefully so that joints will be completely exposed for examination.

In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

1.10.07 GRAVEL FOUNDATION FOR PIPE: Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for PVC plastic pipe foundations shall be clean crushed rock or gravel with 100% passing a one-inch screen and 5% passing a No. 4 sieve.

1.10.08 PIPE BEDDING: All pipes shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

A groove shall be excavated in the bottom of the trench to receive the bottom quadrant of the pipe. Before preparing the groove, the trench bottom shall be excavated or filled and compacted to an elevation sufficiently above the grade of the pipe so that, when completed, the pipe will be true to line and grade. Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the midpoint of the pipe shall be deposited and compacted in layers not to exceed 10 inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials shall be placed in the trench with hand tools or other approved method in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compacted masses. Bedding materials shall be loose earth, free from lumps; sand or gravel, free from rocks larger than one-inch diameter; with all materials free from roots, sod, or other vegetable matter.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12 inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a one-inch screen and 5% passing a No. 4 sieve.

SECTION 1.11

SUBSURFACE DRAIN PIPE MATERIALS

1.11.01 GENERAL: Buried drain pipe with open joints or perforated pipe shall be provided for the drains in the locations shown on the drawings. The Contractor shall furnish and lay the drain pipe.

1.11.02 MATERIAL: Drain pipe may be perforated PVC pipe (ASTM D-1784), perforated or non-perforated, clay or concrete sewer pipe. Corrugated polyethylene piping per ASTM F-405-77a may also be used if installed with direct burial laser grade control equipment.

Non-perforated pipe shall be extra-strength vitrified clay pipe or extra-strength non-reinforced concrete pipe. The pipe may be furnished with either bell-and-spigot or tongue-and-groove joints. Laying lengths of the pipe shall not exceed four feet. To insure open joints between lengths of pipe, spacer lugs approximately 1/8-inch high located on the 1/3 or 1/4 points around the perimeter shall be provided at each joint between lengths of drain pipe. The lugs may be cast on one end of the pipe during manufacture and similar to the details shown on the drawings, or may be gasket-type lugs of plastic, metal, or other suitable material cemented to the pipe by the Contractor and approved by the County Engineer.

Perforated pipe shall be extra-strength vitrified clay pipe with 1/4-inch diameter perforations, extra-strength non-reinforced concrete pipe, or reinforced concrete pipe, and may be furnished with bell-and-spigot or tongue-and-groove joints. Laying lengths of pipe shall not exceed five feet.

The clay pipe shall be in accordance with the most recent ASTM Designation: C-700, C-13, and C-498. Concrete pipe shall be in accordance with the most recent ASTM Designation: C-14 and C-444, modified as follows:

- (a) A minimum of 7.5 sacks of Type V low alkali cement per cubic yard of concrete.
- (b) A minimum of 48 hours steam curing between 110o and 140oF. or seven days moist curing, with the entire concrete surface continuously moist during the period of either type of curing.
- (c) Maximum absorption of 6 percent.
- (d) Pipe to be air cured for not less than 15 days prior to being placed in the ground.
- (e) No calcium chloride to be used in the concrete.

1.11.03 LAYING PIPE: Gravel backfill shall be placed under the pipe to the minimum depth as shown on the drawings. The pipe shall be laid carefully on the gravel in a workmanlike manner and to the lines and grades shown on the drawings or established by the Engineer. The joints for unperforated pipe shall be covered with asphalt-saturated felt strips placed to extend over the upper half of the

circumference of the pipe and to not less than 4-1/2 inches in each direction from the joint.

The maximum allowable departure from grade shall not exceed 10 percent of the inside diameter of the drain pipe, and in no case shall the departure exceed 0.1 foot. Where departures occur, the rate of return to established grade shall not exceed 2 percent of the pipe diameter per joint of pipe. The maximum allowable departure from alignment shall not exceed 20 percent of the inside diameter of the drain pipe, with a rate of return to the established line not to exceed 5 percent per joint of pipe.

The finished bed for all pipe shall be made smooth, including removal of material under the bell, so that the full length of pipe will be evenly and uniformly supported. The pipe shall be laid and completed with adjacent ends closely abutted and with the bell ends upgrade. Where necessary, as determined by the County Engineer, mechanical means shall be used to hold the pipe in place. Any pipe which is broken, cracked, or otherwise unsuitable, as determined by the County Engineer, shall be removed and replaced at no additional cost to the County. The water level in the trench area where the pipe is being laid shall be held to a minimum. During placement of the pipe, the water level in the trench shall not exceed 50 percent of the diameter of the pipe above the invert of the pipe. Water may be removed by permitting the water in the trench to flow down the previously installed drain pipe, provided that a screen cover is kept continuously in place over the exposed end of the pipe at all times, except when additional pipe is actually being placed. The screen used for this purpose shall be approved by the Engineer and shall have maximum mesh openings of 1/8-inch. The pipe shall not be covered with backfill until it has been inspected and approved by the Engineer. Unless otherwise approved by the Engineer, the pipe shall not be covered with backfill except in the presence of a duly authorized County Inspector. After approval, the trench shall be backfilled as prescribed in Section 1.5.

The Contractor shall keep the pipe drain and manholes free from deposits of mud, sand, gravel, or other foreign matter and in good working condition until the construction is complete and accepted. Upon completion of the drain, if a clear and unobstructed view of the whole bore of the pipe cannot be obtained between manholes by use of a light or sun reflector, a device approved by the Engineer, having a diameter one inch less than the drain tile to be tested, shall be pulled through the drain between manholes. Any obstruction found in the drain shall be removed by the Contractor without cost to the County. Any methods used by the Contractor to remove deposits of mud, sand, gravel, or other foreign matter from the drains, such as use of water or air pressure, shall be subject to the approval of the Engineer.

1.11.04 CONCRETE CULVERT PIPE: Concrete culvert pipe shall be furnished and installed as shown on the drawings. Concrete culvert pipe shall be in accordance with ASTM Designation C-76, Class III. All pipe shall be circular, and reinforcement in pipe may be circular or elliptical. Joints shall be bell-and-spigot with no gaskets required.

SECTION 1.12

MANHOLES

1.12.01 GENERAL: This section covers the requirements for manhole materials and installation.

1.12.02 CONCRETE BASES: Manhole bases may be either precast or cast-in-place unless otherwise specified. Precast manhole bases shall have pipe inverts, a neoprene boot with strap for each pipe connecting to the manhole, and a minimum of six inches of compacted gravel base under the manhole.

Where sewer lines enter manholes, the invert channels shall be smooth and semi-circular in cross section, conforming to the details shown on the Drawings. Changes of direction of flows within the manholes shall be made with a smooth curve with as long a radius as possible. The floor of the manhole outside the channels shall be smooth and slope toward the channel at not less than 1/2-inch per foot.

The connecting boots shall be made of neoprene compound meeting ASTM C-443 Specifications. The boot shall have a wall thickness of 3/8-inch. The boot shall either be "cast-in-place" in the precast base or attached to the precast base by means of an internal expanding band. When the boot is attached to the precast base, a watertight seal between the boot and the precast base must be accomplished.

An external band shall be supplied and used to clamp and seal the boot to the pipe. The band shall be made of 300 series non-magnetic corrosion-resistant steel. After the band has been placed, it shall be completely coated with a bituminous material approved by the Engineer.

Manholes with three or more pipes entering the base or pipes larger than 30 inches in diameter shall be 60-inch inside diameter; all others shall be 48-inch inside diameter.

Concrete for manhole bases shall comply with the requirements of Section 1.4 of these Specifications.

1.12.03 WALL AND CONE SECTIONS: All manholes shall be precast, sectional, reinforced concrete pipe of either 48- or 60-inch I.D., as specified. Both cylindrical and taper sections shall conform to all requirements of ASTM Designation C-76 for Reinforced Concrete Culvert Pipe with the following exceptions:

(a) The throat section of the manhole shall be adjustable, by use of pipe sections, up to 18 inches in height.

(b) The taper section shall be a maximum of three feet in height, shall be of eccentric conical design, and shall taper uniformly to 30 inches inside diameter.

(c) The pipe used in the base section shall be furnished in section lengths of 1, 2, 3, and 4 feet as required.

(d) Reinforcing steel shall consist of a circular cage with a minimum cross sectional area of 0.25 square inch of steel per foot for cylindrical sections and 0.20 square inch per foot for cone sections.

All joint surfaces of precast sections and the face of the manhole base shall be thoroughly cleaned and wet prior to setting precast sections. Joints shall be set in mortar consisting of 1 part cement and 1½ parts sand with sufficient water added to bring the mixture to workable consistency.

Bituminous jointing material may be used in lieu of cement mortar and shall be installed in accordance with manufacturer's recommendations. All joints shall be watertight and free from appreciable irregularities in the interior wall surface.

1.12.04 IRON CASTINGS: All iron casting shall conform to the requirements of ASTM Designation A-48 (Class 30) for grey iron castings.

Rings and covers shall be 30" diameter as supplied in "D&L Supply" Model A-1181 or any approved equal. Each cover shall contain one (1) pick hole but shall not contain air vent holes. In addition to the foundry name and year of manufacture, the cover shall be marked "SEWER" or "STORM DRAIN," as appropriate.

All manhole rings shall be carefully set to the grade shown on the Drawings or as directed by the County Engineer. Manholes placed in asphalt surfacing shall be flush with the existing pavement.

SECTION 1.13

VALVES HYDRANTS AND MISCELLANEOUS ITEMS

1.13.01 GENERAL: This section covers valves, hydrants, and meter boxes required, together with other miscellaneous items to be installed.

1.13.02 GATE VALVES: Gate valves shall conform to AWWA Specification C-500. Valves shall be of cast iron body, bronze mounted, double disc, parallel seat, non-rising stem design with O-ring seals. Unless otherwise shown or specified, valves shall be of mechanical joint connection design for buried service or push-on joint for PVC pipe, and flanged connection design for installation in structures. Buried valves shall have 2-inch operating nuts, and valves in structures shall have handwheels.

1.13.03 VALVE BOXES: All buried valves shall be installed complete with two-piece, cast iron, screw type, 5-1/4-inch shaft valve box with locking lid.

1.13.04 FIRE HYDRANTS: Fire hydrants shall be "traffic model" type designed to conform to AWWA Specification C-502 and shall be "Pacific States Model 2", "Mueller Centurion" or an approved equal.

Hydrant valves shall be a minimum of 6-inch size. Hydrants shall be supplied complete with two 2-1/2-inch hose nozzles and one 4-1/2-inch pumper nozzle. All nozzles shall be provided with National Standard threading. A 1/2-cubic yard gravel sump shall be provided at each hydrant. All hydrants shall be supplied complete with a flanged by mechanical joint end auxiliary gate valve and box. Each hydrant shall also be supplied with O-ring seals, a National Standard pentagon operating nut which is designed for clockwise rotation closing, and a 6-inch ANSI 150-pound flanged inlet.

1.13.05 COUPLINGS: Couplings shall be equal to the product of Smith-Blair or Dresser with cast iron couplings being used on all cast iron and asbestos cement pipe and steel couplings on steel pipe. Couplings shall be of the straight, transition, or reducing style as required by the specific installation. Buried steel couplings shall be protected from corrosion with an approved coating.

1.13.06 WATER SERVICES: Pipe for water services shall be 160 psi 3/4-inch iron pipe size high molecular weight polyethylene tubing or 3/4-inch Type K soft copper tubing.

Connection to main lines shall be made as specified for the various types of mainline materials.

All materials used shall be coordinated with the local water company having jurisdiction.

1.13.07 WATER METER BOXES AND LIDS: Meter boxes and lids shall be as specified in the following paragraph and shall be installed in accordance with the drawings.

Meter boxes shall be round 18-inch inside diameter precast concrete boxes. The lids for meter boxes shall be cast iron with a locking lid operated by a pentagon head, and shall have a 12-inch minimum opening diameter.

1.13.08 CATCH BASIN GRATES: Grates for catch basins shall be shop fabricated and galvanized from ASTM A-36 steel as shown on the drawings. In lieu of fabricated grates, standard 48" long, galvanized UDOT grates may be used.

SECTION 1.14

TESTING AND DISINFECTION OF WATERLINES

1.14.01 GENERAL: All water lines shall be tested, flushed, and disinfected as outlined in this section.

1.14.02 TESTING: Tests shall be made upon completion of system installation or any valves portion thereof. All tests shall be made at the expense of the Contractor and in the presence of the County Engineer or his representative.

Lines shall be slowly filled with water, venting off all air. If required, taps shall be provided at line high points to bleed off the air, and after testing these shall be plugged. The line shall be pressurized to an amount equal to 150% of the normal static pressure of the system. This pressure shall remain steady for a period of two hours for waterline approval.

1.14.03 FLUSHING: After both pressure testing and chlorination, all pipelines shall be flushed. Flushing shall be accomplished through hydrants or, if a hydrant does not exist at the end of the line, the Contractor shall install a tap sufficient in size to provide for a 2.5 foot per second flushing velocity in the line. The following is the flow quantity required to provide a 2.5-foot per second flushing velocity:

Pipe Size (in.)	Flow (gpm)
2	26
4	100
6	220
8	390
10	610
12	880

1.14.04 DISINFECTION: After flushing, all culinary water lines shall be disinfected by chlorination. Chlorination shall provide a minimum of 25 ppm residual after 24 hours contact in the pipeline. This may be expected with an application of 50 ppm, although some conditions may require more. Chlorine in the form of a 1% slurry of high-test calcium hypochlorite (HTH, Perchloron, Pittchlor, etc. which are 70% available chlorine by weight) shall be fed into the pipeline, in the presence of the County Engineer or his representative, in such a manner as to mix with the water flowing in the pipeline. (A 1% slurry - 10,000 ppm - result from mixing one pound of calcium hypochlorite with 8.40 gallons of water.)

The following table provides information as to the required quantity of slurry to be used per 100 feet of pipe to provide a chlorine concentration of 50 ppm:

Pipe Size (in)	Vol. of 100 ft. Length (gal)	Req'd Amount of 1% Chlorine Solution/100 ft. of Pipe (gal)
1-1/2	9.18	0.07
2	16.32	0.12
2-1/2	25.50	0.18
3	36.73	0.26
4	65.28	0.47
6	146.90	1.05
8	261.10	1.87
10	408.10	2.92
12	587.60	4.20

During the process of chlorinating the pipeline, all valves and other pipeline appurtenances shall be operated several times to provide sufficient contact with the chlorinating agent. Following chlorination, the water line shall be drained and thoroughly flushed and, if necessary, rechlorinated until a satisfactory bacteriological test is obtained.

SECTION 1.15

CONSTRUCTION AND PLACEMENT OF THRUST BLOCKS

1.15.01 SCOPE: This section of the Specifications defines the placement and the construction of thrust blocks where required. It also gives the mix design required for the Portland Cement Concrete required in the construction of the thrust blocks.

1.15.02 PLACEMENT: Thrust blocks are required at points where the pipe changes direction such as: at all tees, elbows, wyes, caps, valves, hydrants, reducers, etc. Thrust blocks should be constructed so that the bearing surface is in direct line with the major force created by the pipe or fitting. The earth bearing surface should be undisturbed. See Drawings for typical thrust block details.

1.15.03 CONCRETE MIX DESIGN: The Portland Cement Concrete mixture is one part cement, two parts washed sand, and five parts gravel. The concrete mixture shall have a minimum 28-day compressive strength of 2,500 pounds per square inch.

SECTION 1.16

RESTORATION OF SURFACE IMPROVEMENTS

1.16.01 GENERAL: The Contractor shall be responsible for the protection and the restoration or replacement of any improvements existing on public or private property at the start of work or placed there during the progress of the work.

Existing improvements shall include but are not limited to permanent surfacing, curbs, gutters, sidewalks, planted areas, ditches, driveways, culverts, fences, and walls. All improvements shall be reconstructed to equal or better, in all respects, the existing improvements removed.

1.16.02 GRAVEL SURFACE: Where trenches are excavated through gravel surfaced areas such as roads and shoulders, parking areas, unpaved driveways, etc., the gravel surface shall be restored and maintained as follows:

(a) The gravel shall be placed deep enough to provide a minimum of eight inches of material.

(b) The gravel shall be placed in the trench at the time it is backfilled. The surface shall be maintained by blading, sprinkling, rolling, adding gravel, etc., to maintain a safe, uniform surface satisfactory to the County Engineer. Excess material shall be removed from the premises immediately.

(c) Material for use on gravel surfaces shall be obtained from sound, tough, durable gravel or rock meeting the following requirements for grading:

	<u>Ideal</u>	<u>Tolerance</u>
Passing 1-inch sieve	100	0
Passing 1/2-inch sieve	85	+6
Passing No. 4 sieve	55	+6
Passing No. 16 sieve	31	+4
Passing No. 200 sieve	9	+2

1.16.03 BITUMINOUS SURFACE: Where trenches are excavated through bituminous surfaced roads, driveways, parking areas, etc., the surface shall be restored and maintained as follows:

(a) A temporary gravel surface shall be placed and maintained as required in Paragraph 3 above after the required backfill and compaction of the trench has been accomplished.

(b) The gravel shall be placed to such depth as to provide eight inches below the bottom of the asphalt pavement and shall be brought flush with the paved surface.

(c) The area over trenches to be resurfaced shall be graded and rolled to provide a subgrade which is firm and unyielded. Density of the subgrade materials shall be 90% of AASHTO T-99. Mud or other soft or spongy material shall be removed and the void filled with gravel and rolled and tamped thoroughly in layers not exceeding six

inches in thickness. The edges of trenches which are broken down during the making of subgrade shall be removed and trimmed neatly before resurfacing.

(d) Before any permanent resurfacing is placed, the Contractor shall trim the existing paving to clean, straight lines as nearly parallel to the centerline of the trench as practicable. Said straight lines shall be thirty feet minimum length and no deviations from such lines shall be made except as specifically permitted by the County Engineer.

(e) Existing bituminous paving shall be cut back a minimum of six inches beyond the limits of any excavation or cave-in along the trench so that the edges of the new paving will rest on at least six inches of undisturbed soil.

(f) As soon as is practical, weather permitting, the bituminous surface shall be restored by standard paving practices to the thickness shown on the Drawings and/or defined in the Proposal, or matching the existing pavement cut during excavation.

(g) Pavement restoration shall include priming of pavement of edges and sub-base with Type MC-70 bituminous material and placing and rolling plant hot mix bituminous material to the level of the adjacent pavement surfaces.

1.16.04 CONCRETE SURFACES: All concrete curbs, gutters, sidewalks and driveways shall be removed and replaced to the next joint or scoring line beyond the actually damaged or broken sections; or in the event that joints or scoring lines do not exist or are three or more feet from the removed or damaged section, the damaged portions shall be removed and reconstructed to neat, plane faces. All new concrete shall match, as nearly as possible, the appearance of adjacent concrete improvements. Where necessary, lamp black or other pigments shall be added to the new concrete to obtain the desired results.

All concrete work shall conform to the requirements of Section 1.4 of these specifications.

SECTION 1.17

SECONDARY WATER

1.17.01 **SUPPLY:** Each secondary water system shall originate from a reliable water source capable of delivering a minimum annual supply of 3.0 acre-feet per acre of irrigable property. Prior to approval of the system, the developer shall submit sufficient evidence that the newly created irrigation company has water rights to the minimum required supply. In the case where the supply is provided by a local irrigation company or a water conservancy district, the developer shall obtain a written agreement from the irrigation company or water district committing themselves to providing the required supply. This agreement shall be reviewed and approved by the County prior to recording of the subdivision.

1.17.02 **DISTRIBUTION AND DELIVERY:** Each secondary water system shall provide a complete pressure distribution system with minimum 3/4-inch diameter service connections to the property line of each lot. Service connections larger than 3/4-inch shall be required on service areas exceeding 1/2-acre, as approved by the County Engineer. A pressure system shall be required unless approved otherwise (in writing) by the Secondary Water Committee and County Engineer. Pressure within the system shall range from 40 psi to 100 psi. If the supply is provided by a newly created irrigation company, the delivery system shall include a water storage facility of sufficient size to supply the peak demands on the system as approved by the County Engineer. All facilities including reservoirs, pump stations, distribution systems, and miscellaneous structures, shall be constructed in recorded easements, dedicated streets, or on property which has been conveyed to the water company or water district. The pressure distribution system shall be constructed at the standard location shown on the County Public Works Drawings. Distribution systems shall be complete with sufficient gate valves and drains.

1.17.03 **MATERIAL:** Secondary water systems shall comply with the following minimum material specifications:

- (a) Pipe: The system may use any one of the following types of piping materials:

Ductile Iron: AWWA Spec. C-151-76 - minimum thickness Class 50 with rubber gasket push-on joints.

PVC: ASTM D-2241 - 200 psi class with rubber gasket push-on joints.

Polyethylene pipe: ASTM D-2239 - SDR 7 - PE 3406

- (b) Gate Valves: Gate valves shall conform to AWWA Specification C-500. Valves shall be of cast iron body, bronze mounted double disc, parallel seat, non-rising stem design, provided with o-ring packing. Valves shall be of flange or mechanical design and shall be of the non-rising stem design with a two-inch square operating nut.

- (c) Valve Boxes: All buried valves shall be installed complete with two-piece, cast iron, crew type, 5-1/4- inch shaft valve boxes.

- (d) Concrete: All concrete used within the system shall conform to the requirements of Section 1.4
- (e) Reinforcing Steel: All reinforcing steel shall be deformed bars conforming to the requirements of ASTM A-615-68, Grade 40. Any welded wire fabric used shall conform to ASTM A-185. Bar chairs, spaces, and other supports shall be as stipulated in ACI-315.
- (f) Drain Valves: Air/vacuum release valves shall be provided at high points in the distribution system and at all pump stations in accordance with County-approved construction drawings. Drainage valves must be provided in the system to prevent freezing. Drains shall be constructed in accordance with County-approved construction drawings.
- (g) Pump Stations: Pump Stations shall be constructed in accordance with County-approved construction drawings and shall be capable of delivering sufficient flow and pressure to meet all peak demands on the system.

1.17.04 INSTALLATION, CLEANING, FLUSHING, AND PRESSURE TESTING: These items shall be in accordance with preceding sections on culinary water systems under the same headings. (Section 1.7, 1.8, 1.10, 1.14 and 1.15)

1.17.05 APPROVAL AND ACCEPTANCE: Prior to construction of the secondary water system, all construction plans shall be approved by the County Engineer. In the event that the secondary system will be an extension or a part of a local irrigation company or water district, the plans shall also be approved by these entities. The secondary water system shall be considered as a required subdivision improvement and shall be under the same construction guarantees, release of funds procedures, and acceptance as the regular subdivision improvements. Weber County shall not release funds or grant formal acceptance until both the County and the irrigation company or water district have conducted final inspections and can certify that the completed system conforms to plans and specifications. Following final approval and acceptance, ownership, operation and maintenance of the completed system shall be the responsibility of the irrigation company or water district.

SECTION 1.18

FENCING SPECIFICATIONS

1.18.01 GENERAL: This Section shall cover the requirements for temporary construction fencing and permanent fencing along boundaries, property lines or open ditches as required by Weber County.

1.18.02 CHAIN LINK FENCE SPECIFICATIONS:

(a) Material:

(1) Fabric to be chain link which has been galvanized after weaving with a minimum of 1.2 oz. per square foot of wire surface. Six (6) foot high of two (2) inch mesh, 11-1/2 gauge.

(2) Tension wire for bottom only, No. 7 gauge spring coil.

(3) Top Rail: 1-3/8-inch tubular rail.

(4) Corner, Gate, or End Posts: Minimum diameter 2-3/8-inch O.D. galvanized pipe at 2.65 lbs. per foot.

(5) Line Posts: Minimum diameter of 1-7/8-inch O.D. galvanized pipe at 2.72 lbs. per foot.

(6) Braces: For all corner and gate posts - 1-5/8-inch O.D. galvanized pipe and adjustable 3/8-inch truss rods.

(b) Concrete: Shall conform to the provisions of Section 1.4.03 Class C.

(c) Construction Methods: The steel posts shall be set true to line and grade in concrete bases.

The distances between posts in any section shall be uniform, but shall not exceed the following spacing:

Tangent sections and curves down to 500-foot radius: not more than 10 feet;

Curves 500-foot radius to 200-foot radius: not more than 8 feet;

Curves 200-foot radius to 100-foot radius: not more than 6 feet;

Curves 100-foot radius: not more than 5 feet.

A minimum of six inches of concrete shall be provided below the bottom of each post. End posts, pull post, corner post, and gate posts shall have a concrete base at least 10 inches in diameter. Bases for line posts shall be at least 8 inches in diameter.

Pull posts shall be provided at 500-foot maximum intervals. Changes in line of 30 degrees or more shall be considered as corners.

Fence fabric shall be placed on the roadway side of posts unless otherwise specified. The fabric shall be placed approximately one inch above the ground, and on a straight grade between posts by excavating high points of the ground. Filling depressions will be permitted only upon approval of the County Engineer.

The fabric shall be stretched taut and securely fastened to the posts. Fastening to end, gate, corner, and pull posts shall be with stretcher bars and metal bands spaced at one-foot intervals. The fabric shall be cut and each span fastened independently at all pull and corner posts. Fastening to line posts shall be with tie wire, metal bonds, or other approved methods at 14-inch intervals. The top edge of fabric shall be attached to the top rail at approximately 24-inch intervals. The bottom tension wire shall be attached to the fabric with tie wires at 24-inch intervals and shall be secured to the end or pull posts with brace bands.

1.18.03 WOOD FENCE SPECIFICATIONS:

(a) Materials:

(1) Slats: Redwood, cedar, combed spruce, or other wood covering acceptable to the County Engineer or his representative.

(2) Bottom and Top Rail: Minimum 2-inch x 4-inch x 8-foot cedar stud.

(3) Corner, Gate, End, or Line Posts: Minimum size 4-inch x 4-inch cedar wood post.

(b) Concrete: All corner, gate, end, or line wood posts shall be set in concrete. All concrete used for post bases shall conform to the provisions of Section 1.4.03 (Class C)

(c) Construction Methods: The cedar posts shall be set true to line and grade in concrete bases at least two (2) feet in depth. All posts shall be sound and free from all decay, splits, multiple cracks, or any other defect which would weaken the posts or otherwise cause them to be structurally unsuitable for the purpose intended.

The maximum distance between posts in any section shall not exceed eight (8) feet. The top and bottom railings shall be securely fastened to the posts with galvanized nails or other acceptable means. Changes in line of 30 degrees or more shall be considered as corners. A minimum of six (6) inches of concrete shall be provided below the bottom of each post. End posts, corner posts, and gate posts shall have a concrete base at least twelve (12) inches in diameter. Bases for line posts shall also be twelve (12) inches in diameter.

Fence slats shall be placed on the roadway side of posts unless otherwise specified. The slats shall be placed approximately one (1) inch above the ground, and on a straight grade between posts by excavating high points of the ground. Filling depressions will be permitted only upon approval of the County Engineer.

The slats shall be sound and free from all major decay or defects which would weaken or otherwise cause them to be unsuitable for fence slats. Fastening to top and bottom railings shall be done with two (2) galvanized nails at both the top and bottom rail.

1.18.04 CONSTRUCTION FENCE SPECIFICATIONS - TYPE "D":

(a) Material:

(1) Fabric to be wire mesh which shall conform to ASTM Designation A-116, nominal 0.9999-inch Farm Grade with standard six (6) inch graduated spacing. The wire mesh shall have a Class 1 zinc coating.

(2) Corner, gate, end or line posts shall be painted metal tee, U or Y channel, angular, or other approved shapes, 6'6" in length.

(b) Construction Methods: Metal fence posts shall be spaced a maximum interval of sixteen (16) feet. Post spacing measurements shall be made parallel to the ground slope. All posts shall be placed in a vertical position. Metal posts may be installed by driving, if this can be done without damage to the post. Otherwise, they shall be installed to the specified depth (2'6") in larger drilled or dug holes and backfilled and compacted.

Corner posts shall be braced in two directions. End and gate posts shall be braced in one direction.

Wire mesh fabric shall be drawn tight enough to eliminate all sag without causing the "tension crimps" to fail to function.

Any high points along the ground surface which interfere with the placing of wire mesh shall be excavated to provide at least two (2) inches of ground clearance.

Every alternate lateral wire in the mesh fabric shall be fastened to each post by means of a clamp.

PUBLIC WORKS STANDARDS
FOR
WEBER COUNTY, UTAH



AUGUST 1982

SUBMITTED & RECOMMENDED

Kent L. Jones
KENT L. JONES, P.E.
JAMES M. MONTGOMERY
WEBER COUNTY CONSULTING ENGINEER

8/19/82
DATE

APPROVAL

Wayne L. Wahlquist
WAYNE L. WAHLQUIST
CHAIRMAN, WEBER COUNTY PLANNING COMM.

8-25-82
DATE

Boyd K. Storey
BOYD K. STOREY
CHAIRMAN, WEBER COUNTY COMMISSION

8/24/82
DATE

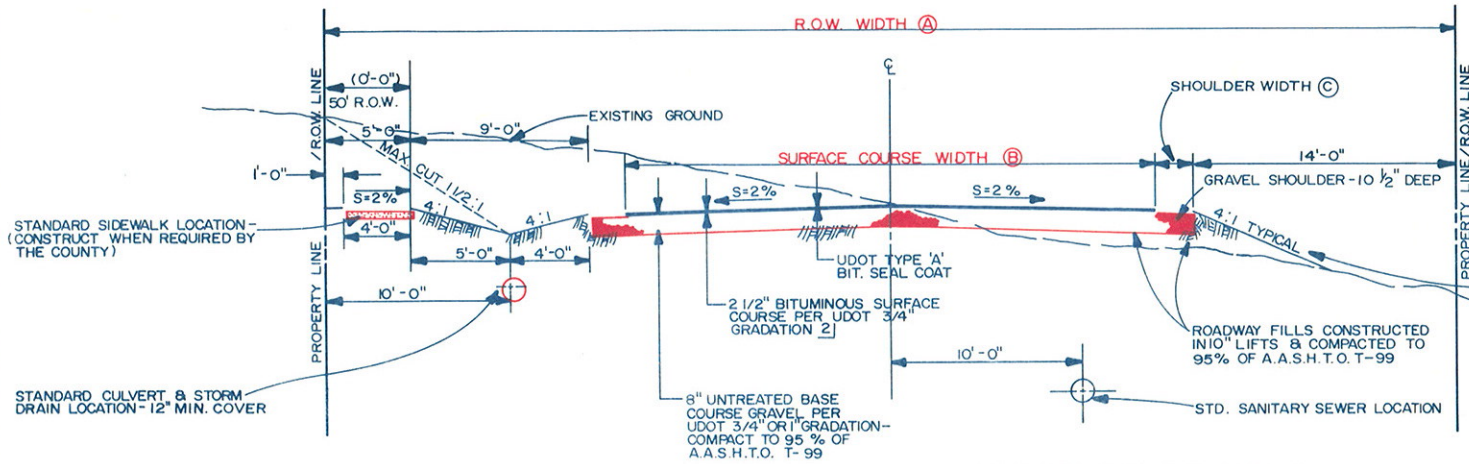
NOTE: THESE STANDARDS HAVE BEEN PREPARED BY
JAMES M. MONTGOMERY CONSULTING ENGINEERS,
ACTING AS WEBER COUNTY ENGINEER
UNDER THE DIRECTION OF THE WEBER COUNTY
COMMISSION.

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REV	DATE	BY	DESCRIPTION	SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>Kent L. Jones</i>	PROJECT ENGINEER 4470 RCE NO.	8/20/82 DATE	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.	APPROVED _____ DATE	APPROVED _____ DATE	WEBER COUNTY PUBLIC WORKS STANDARDS	SHEET 1 OF 17 SHEETS
CHECKED <i>SW</i>					RECOMMENDED <i>Wayne L. Wahlquist</i>		2781 RCE NO.	8/23/82 DATE	3901 WASHINGTON BLVD. OGDEN, UTAH 84403			TITLE PAGE & INDEX OF DRAWINGS	

STANDARD RURAL ROADWAY SECTION

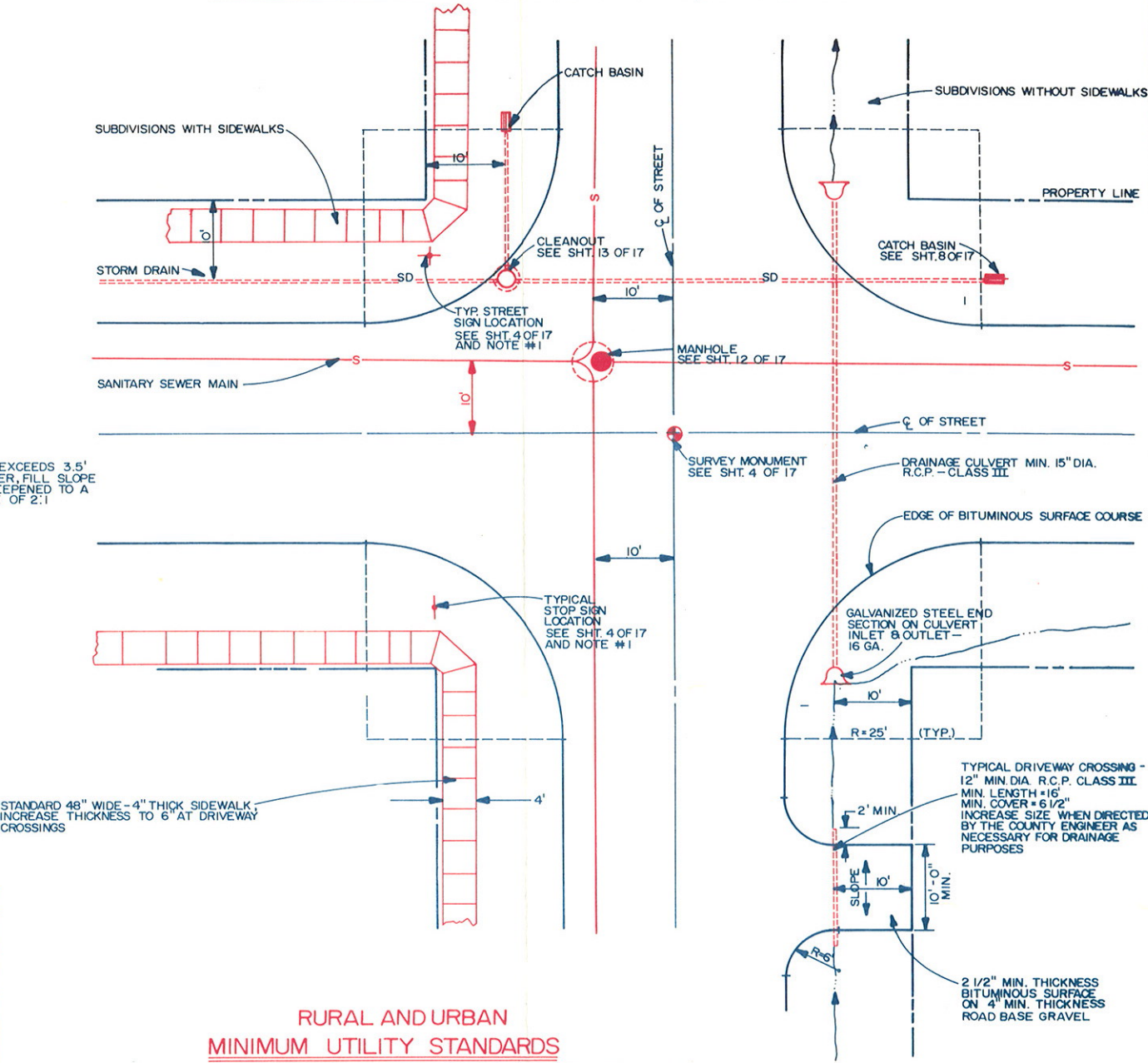


NOTE: THESE PAVEMENT THICKNESSES SHALL BE CONSIDERED AS MINIMUMS AND MAY BE INCREASED BY THE COUNTY ENGINEER WHEN SUBGRADE CBR IS LESS THAN 10 OR WHEN A GREATER DEPTH IS NECESSARY TO PROVIDE SUFFICIENT STABILITY. DESIGNER MAY SUBMIT AN ALTERNATIVE PAVEMENT DESIGN BASED ON A DETAILED SOILS ANALYSIS FOR APPROVAL BY THE COUNTY ENGINEER.

STREET DESIGNATION	R.O.W. WIDTH (A)	SURFACE COURSE WIDTH (B)	SHOULDER WIDTH (C)
1] MINOR AND/OR PRIVATE ROADWAYS	50'	24'	4'
STANDARD RESIDENTIAL	60'	24'	4'
COLLECTOR	66'	28'	5'
2] MINOR ARTERIAL	80'	44' (30') 3]	4' 3]
2] MAJOR ARTERIAL	100' (CONSULT	COUNTY ENGINEER FOR SPECIFIC	REQUIREMENTS)

- 1] MINOR STREET PERMITTED UPON SPECIAL PERMISSION BY THE COUNTY PLANNING COMMISSION. WHERE SIDEWALK IS NECESSARY, MUST HAVE 60' ROW.
- 2] COUNTY ENGINEER SHALL PROVIDE PAVEMENT DESIGN ON ARTERIAL STREETS - WIDTH MAY VARY PER CO. ENGINEER.
- 3] THIS WIDTH MAY BE USED AT THE DIRECTION OF THE COUNTY ENGINEER WHEN FULL WIDTH ASPHALT PAVING IS NOT NECESSARY.

RURAL INTERSECTION DETAILS & UTILITY LOCATIONS



RURAL AND URBAN MINIMUM UTILITY STANDARDS

SYSTEM	MIN. DIAMETER	STANDARD MATERIAL
CULINARY WATER	SEE SHEET 7 OF 17	
SANITARY SEWER	8"	CONCRETE PIPE (C-14) OR P.V.C. ASTM. D-3034 SDR 35
STORM DRAINS	15"	REINFORCED CONC. PIPE 6] CLASS III (A.S.T.M. C-76)
DRIVEWAY CROSSING	12" 5]	REINFORCED CONC. PIPE 6] CLASS III (A.S.T.M. C-76)
SECONDARY WATER	4" 4]	DUCTILE IRON CL-51 OR ASTM. PVC-CLASS 200 PSI

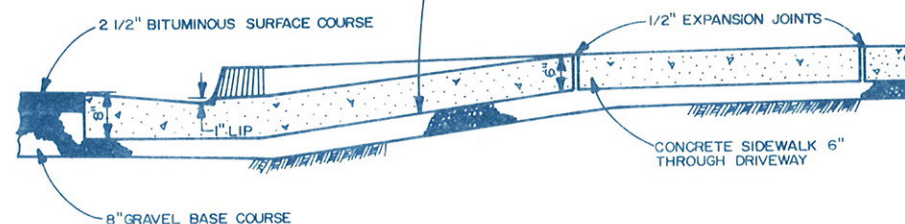
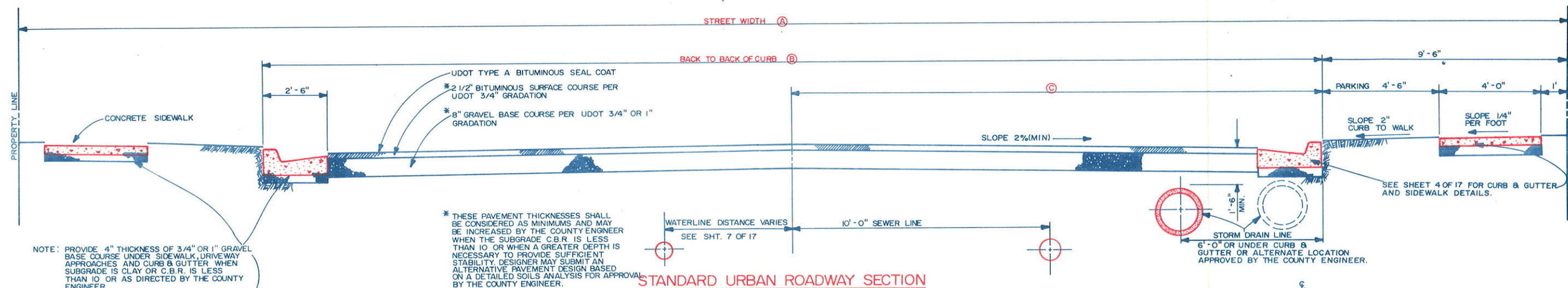
- NOTES
1. ALL STREET AND TRAFFIC SIGNS SHALL BE PLACED AT LOCATIONS SHOWN IN THE CURRENT EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" PUBLISHED BY THE U.S. FEDERAL HIGHWAY ADMINISTRATION.
2. SECONDARY WATER MAINS AND LAND DRAINS TO BE LOCATED IN FRONT OR REAR YARD EASEMENTS.
3. SEE SHEET 7 OF 17 FOR CULINARY WATER LOCATION DETAILS.

- 4] REFER TO INDIVIDUAL WATER DISTRICT STANDARDS FOR SPECIFIC MIN. SIZE & MATERIAL STANDARD.
- 5] INCREASE SIZE WHEN DIRECTED BY THE COUNTY ENGINEER AS NECESSARY FOR DRAINAGE PURPOSES
- 6] CORRUGATED METAL PIPE ACCEPTABLE UPON APPROVAL BY THE COUNTY ENGINEER

SCALE	DESIGNED <i>R. Jones</i>	SUBMITTED <i>R. Jones</i>	4470	8/20/82
	DRAWN <i>G. Benford</i>	PROJECT ENGINEER	R.C.E. NO.	DATE
	CHECKED <i>John</i>	RECOMMENDED <i>David Thompson</i>	2781	8/23/82
			R.C.E. NO.	DATE

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. 3901 WASHINGTON BLVD. OGDEN, UTAH 84403

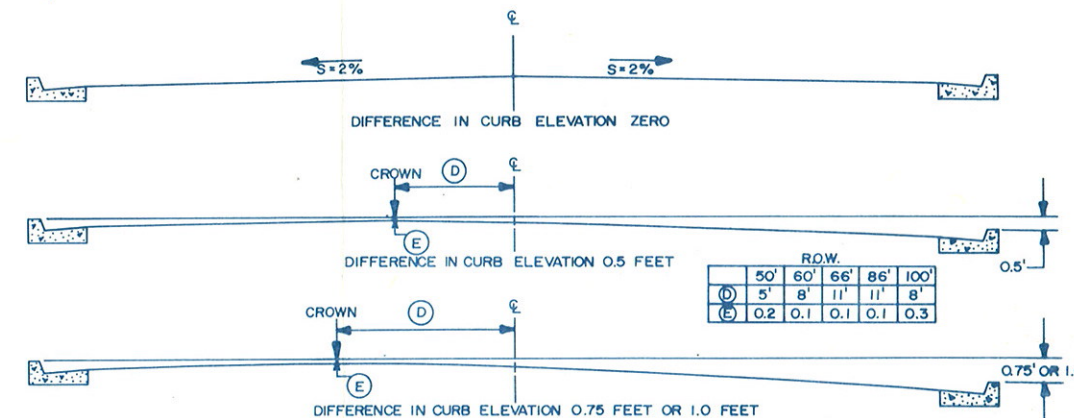
APPROVED	DATE
APPROVED	DATE



SECTION A-A

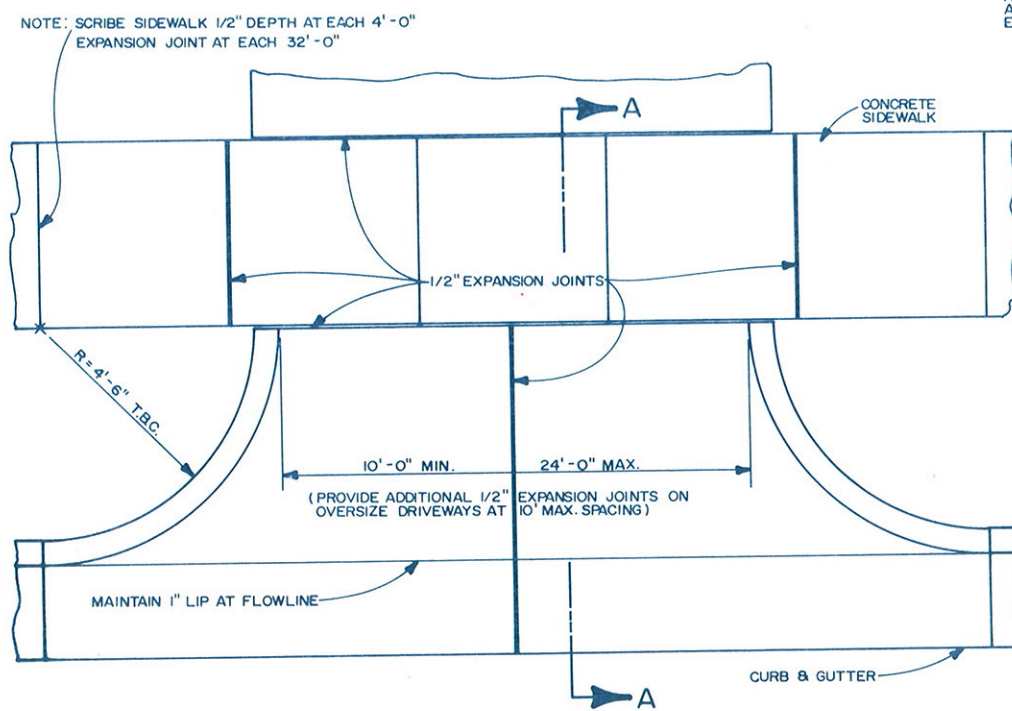
STREET DESIGNATION	R.O.W. WIDTH (A)	T.B.C. TO T.B.C. (B)	CL TO T.B.C. (C)
MINOR	50'	31'	15.5'
STANDARD RESIDENTIAL	60'	41'	20.5'
COLLECTOR	66'	47'	23.5'
MINOR ARTERIAL ▲	80'	61'	30.5'
MAJOR ARTERIAL ▲	100'	81'	40.5'

- NOTE: 1. MAXIMUM DIFFERENCE IN ELEVATION BETWEEN CURBS ON OPPOSITE SIDE OF STREET SHALL NOT EXCEED 1'-0"
- ▲ 2. ON ARTERIAL STREETS THE COUNTY ENGINEER WILL PROVIDE A PAVEMENT DESIGN. LOCATION OF SIDEWALK AND CURB & GUTTER MAY VARY ON INDIVIDUAL ARTERIAL STREETS PER DIRECTION OF THE COUNTY ENGINEER

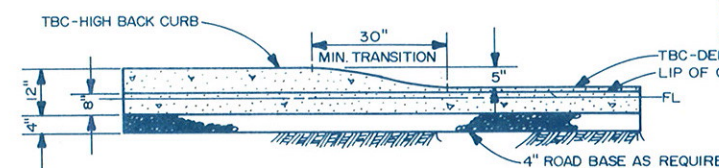


CROWN LOCATION FOR VARIOUS CROSS SLOPES

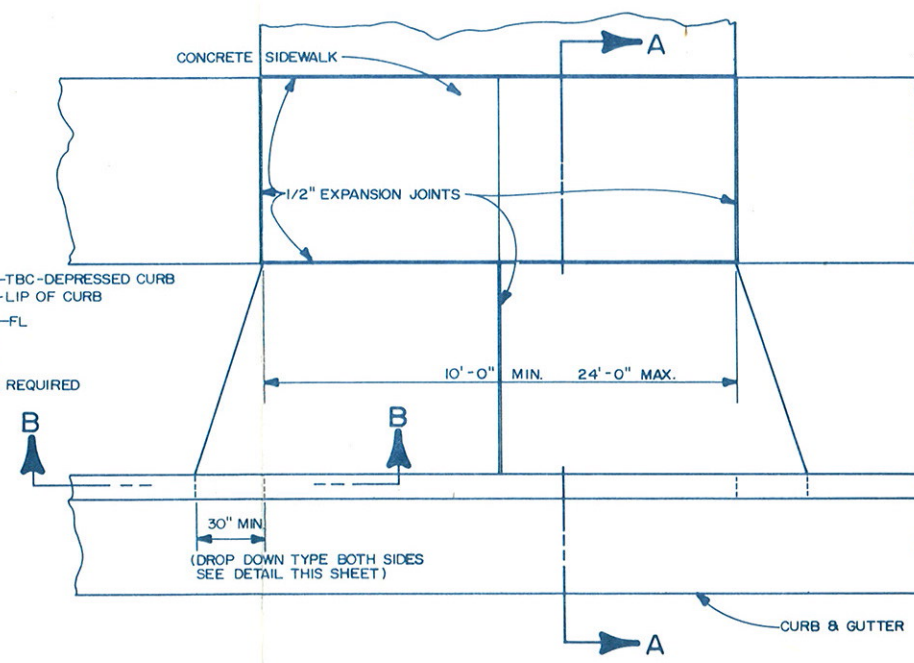
R.O.W.					
	50'	60'	66'	86'	100'
(D)	13'	12'	15'	21'	18'
(E)	0.3	0.2	0.2	0.1	0.1



TYPE A DRIVEWAY APPROACH
(CURB RADIUS STYLE)

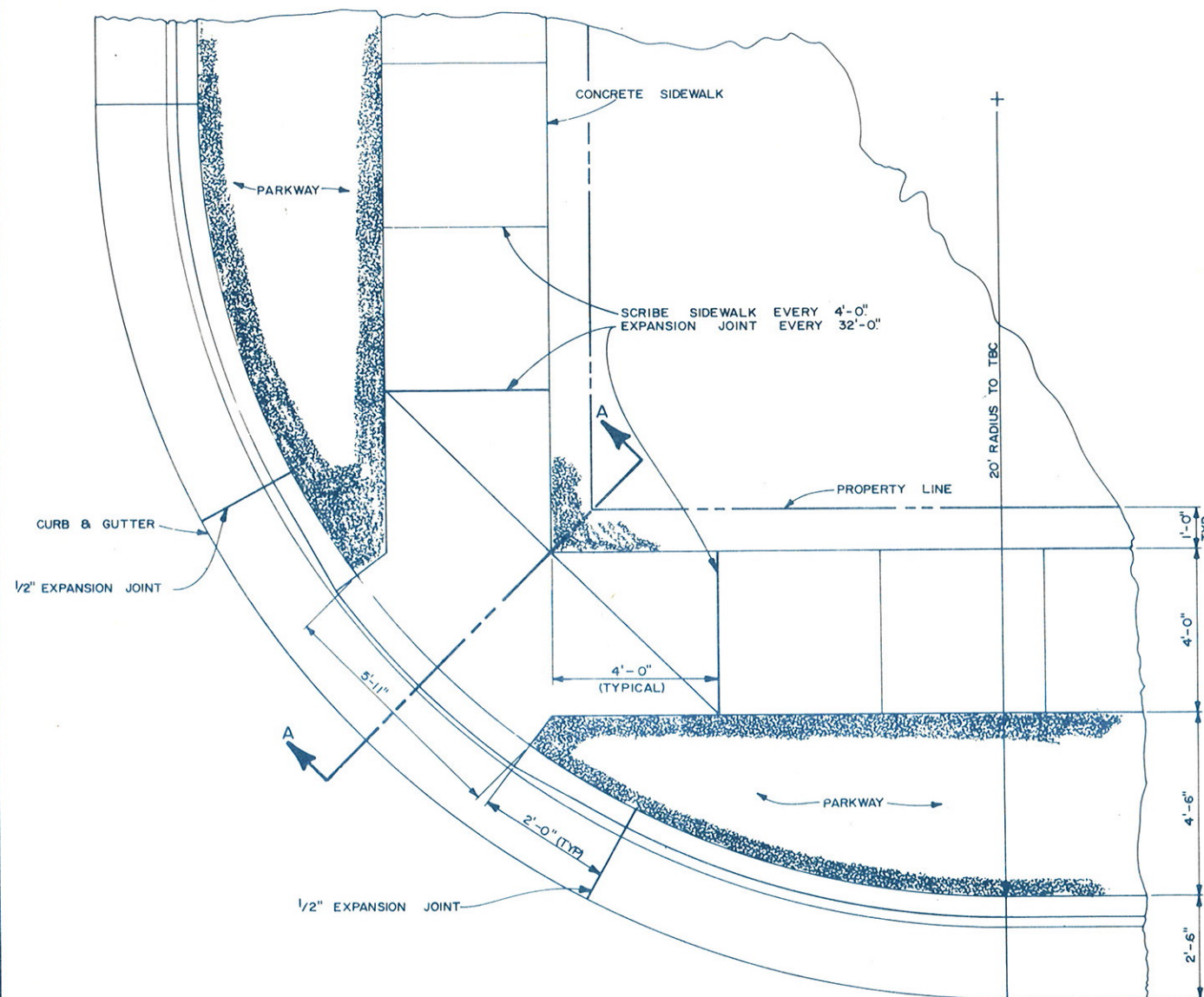


DROP DOWN STYLE CURB DETAIL
SECTION B-B

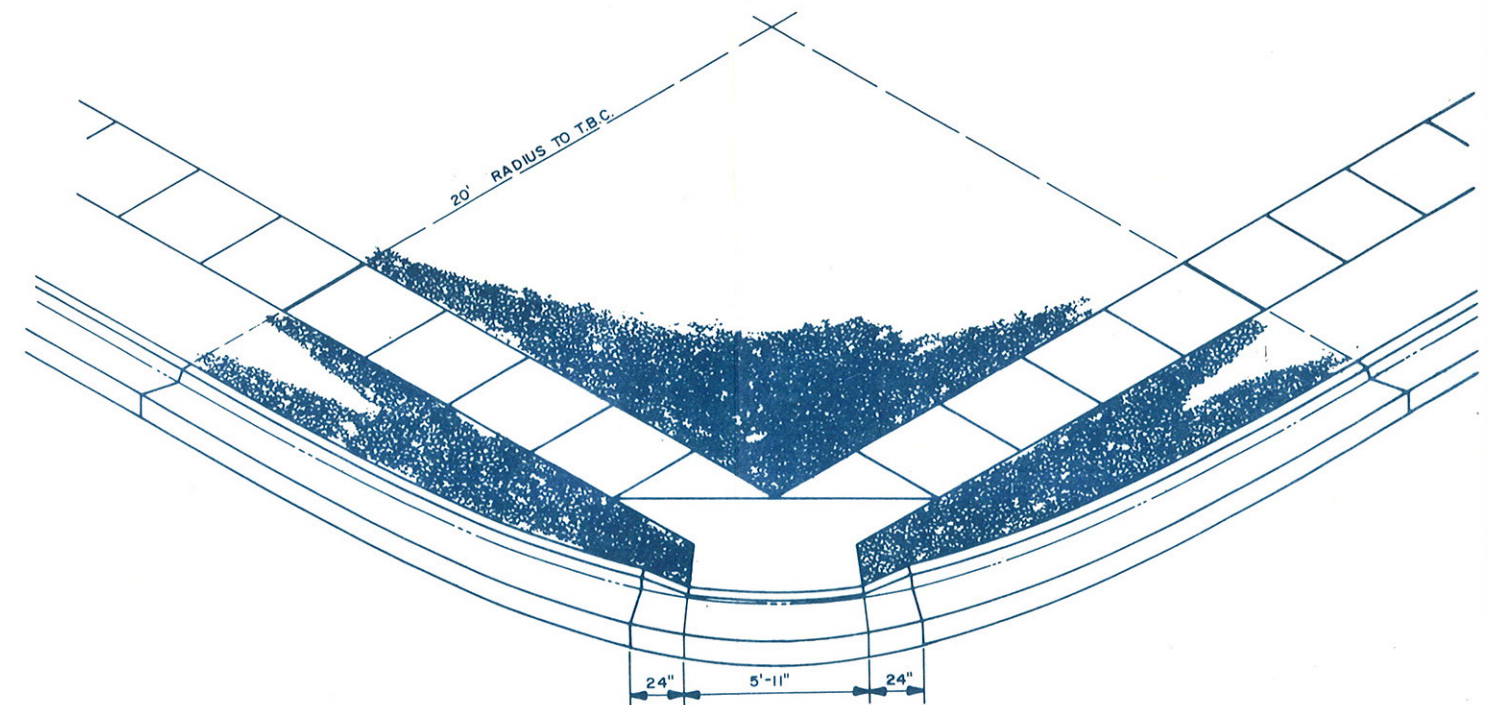


TYPE B DRIVEWAY APPROACH
(DROP DOWN STYLE)

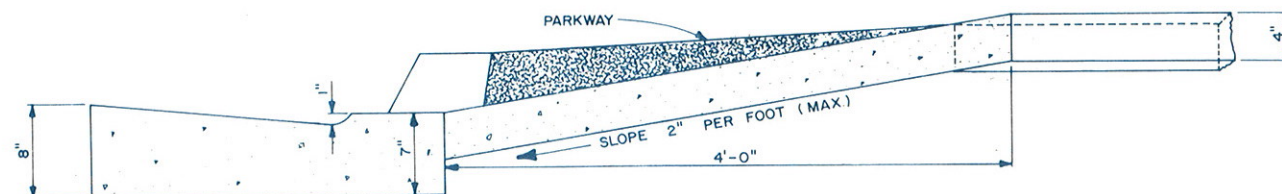
REV	DATE	BY	DESCRIPTION	SCALE	DESIGNED: <i>H. Jones</i>	SUBMITTED: <i>H. Jones</i>	PROJECT ENGINEER	4470	8/20/82	DATE	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.	APPROVED: _____	DATE	WEBER COUNTY	SHEET 3
					DRAWN: <i>G. B. Jones</i>	RECOMMENDED: <i>H. Jones</i>	PROJECT ENGINEER	2708	8/23/82	DATE	3901 WASHINGTON BLVD. OGDEN, UTAH 84403	APPROVED: _____	DATE	PUBLIC WORKS STANDARDS	OF 17 SHEETS
					CHECKED: <i>H. Jones</i>									URBAN SURFACE IMPROVEMENTS	



PLAN
TYPICAL WHEELCHAIR RAMP

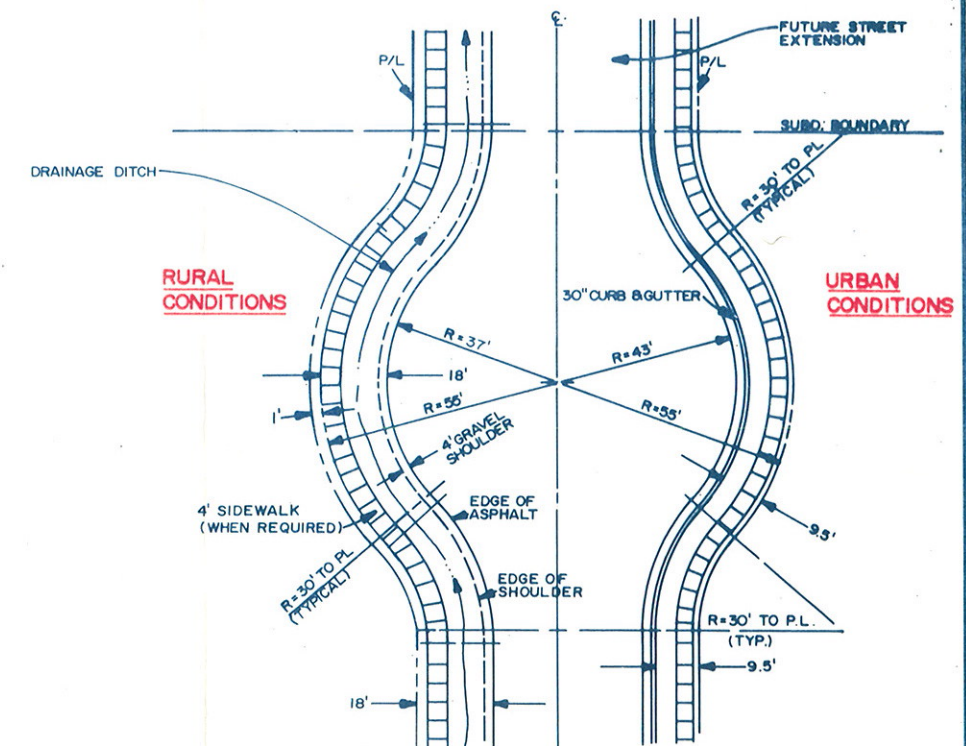
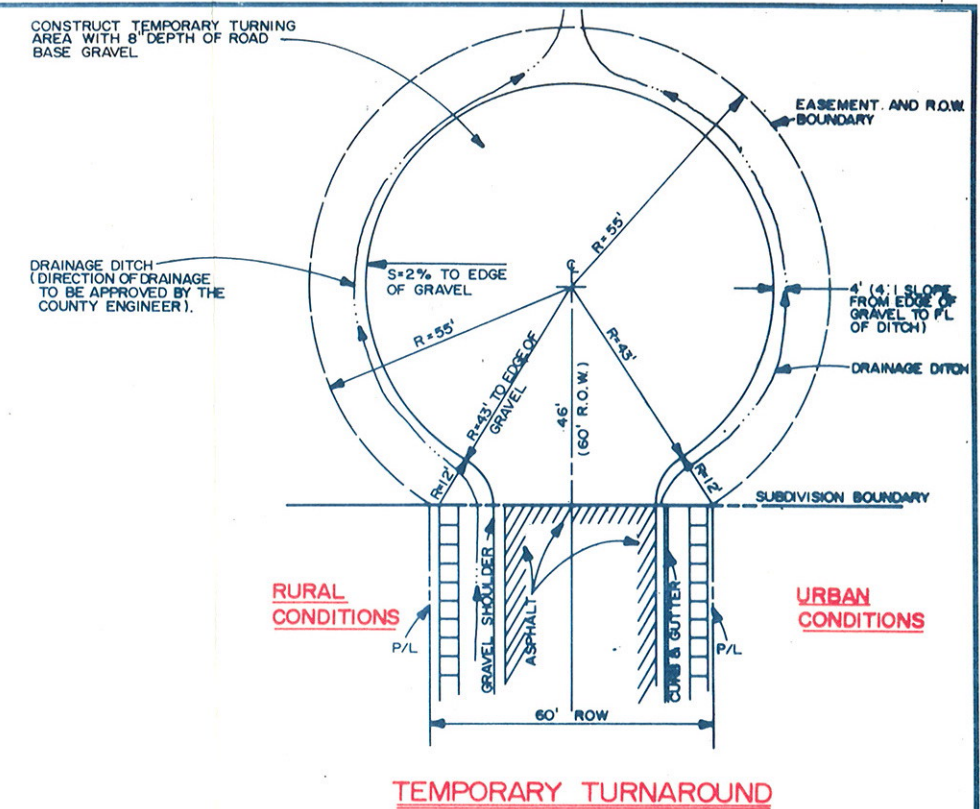
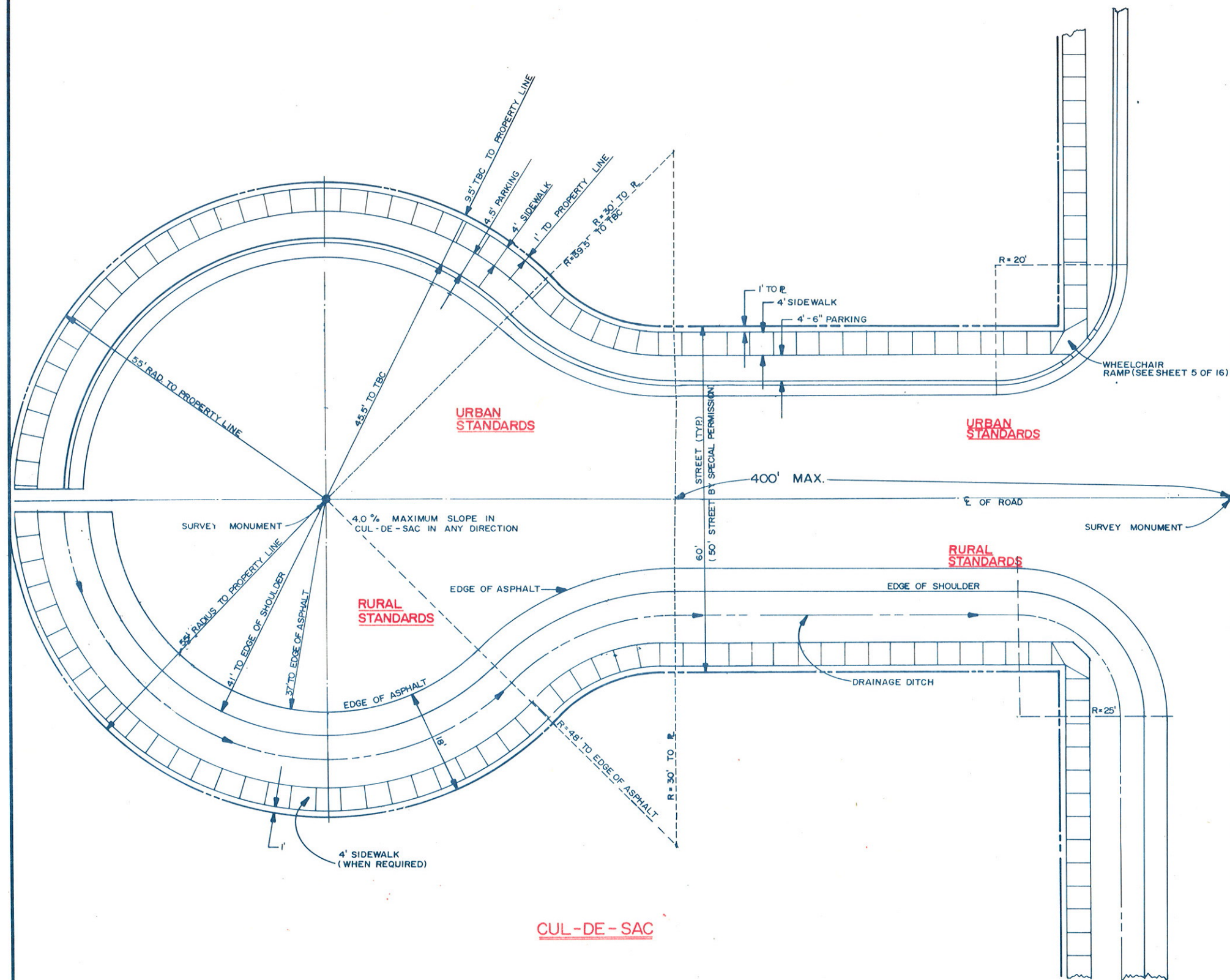


PICTORIAL VIEW



SECTION "A"

REV DATE BY DESCRIPTION				SCALE	DESIGNED <i>K. Jones</i> DRAWN <i>G. Bedford</i> CHECKED <i>LM</i>	SUBMITTED <i>K. Jones</i> PROJECT ENGINEER RECOMMENDED <i>W. A. Pennington</i>	4470 RCE NO 2186 RCE NO 8/20/82 DATE 8/23/82 DATE	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. 3901 WASHINGTON BLVD OGDEN, UTAH 84403		APPROVED _____ DATE _____ APPROVED _____ DATE _____	WEBER COUNTY PUBLIC WORKS STANDARDS TYPICAL WHEELCHAIR RAMP	SHEET 5 OF 17 SHEETS
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PERMANENT STREET BUBBLE

TO BE USED AS A TURNING AREA ON TEMPORARY DEAD END STREETS WHEN
DISTANCE FROM NEAREST STREET INTERSECTION IS GREATER THAN 400 L.F.
OR WHERE A TEMPORARY TURNAROUND OUTSIDE OF SUBDIVISION
IS NOT POSSIBLE

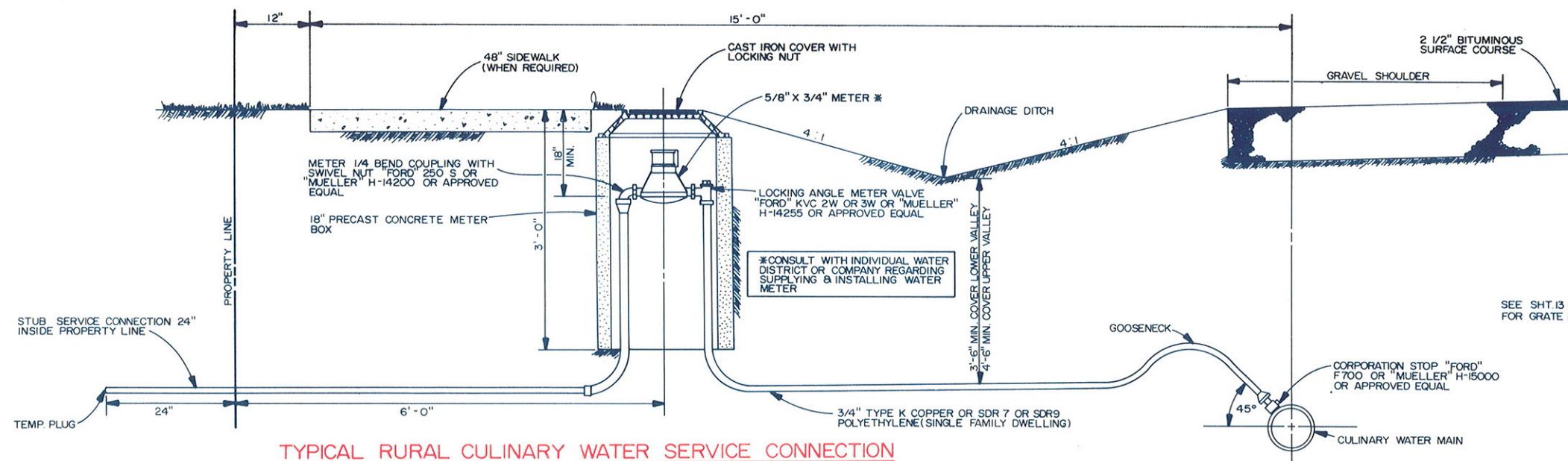
				SCALE	DESIGNED: <u>K. Jones</u> DRAWN: <u>G. Bedford</u> CHECKED: <u>Law</u>	SUBMITTED <u>Kent L. Jones</u> 4470 9/29/82 PROJECT ENGINEER R.C.E. NO. DATE RECOMMENDED <u>W.A. Harrison</u> 2184 9/23/82 R.C.E. NO. DATE	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.  3901 WASHINGTON BLVD. OGDEN, UTAH 84403	APPROVED _____ DATE _____ APPROVED _____ DATE _____	WEBER COUNTY PUBLIC WORKS STANDARDS CUL-DE-SAC / TEMPORARY TURNAROUND / STREET BUBBLE	SHEET 6 OF 17 SHEETS
REV	DATE	BY	DESCRIPTION							

SUMMARY

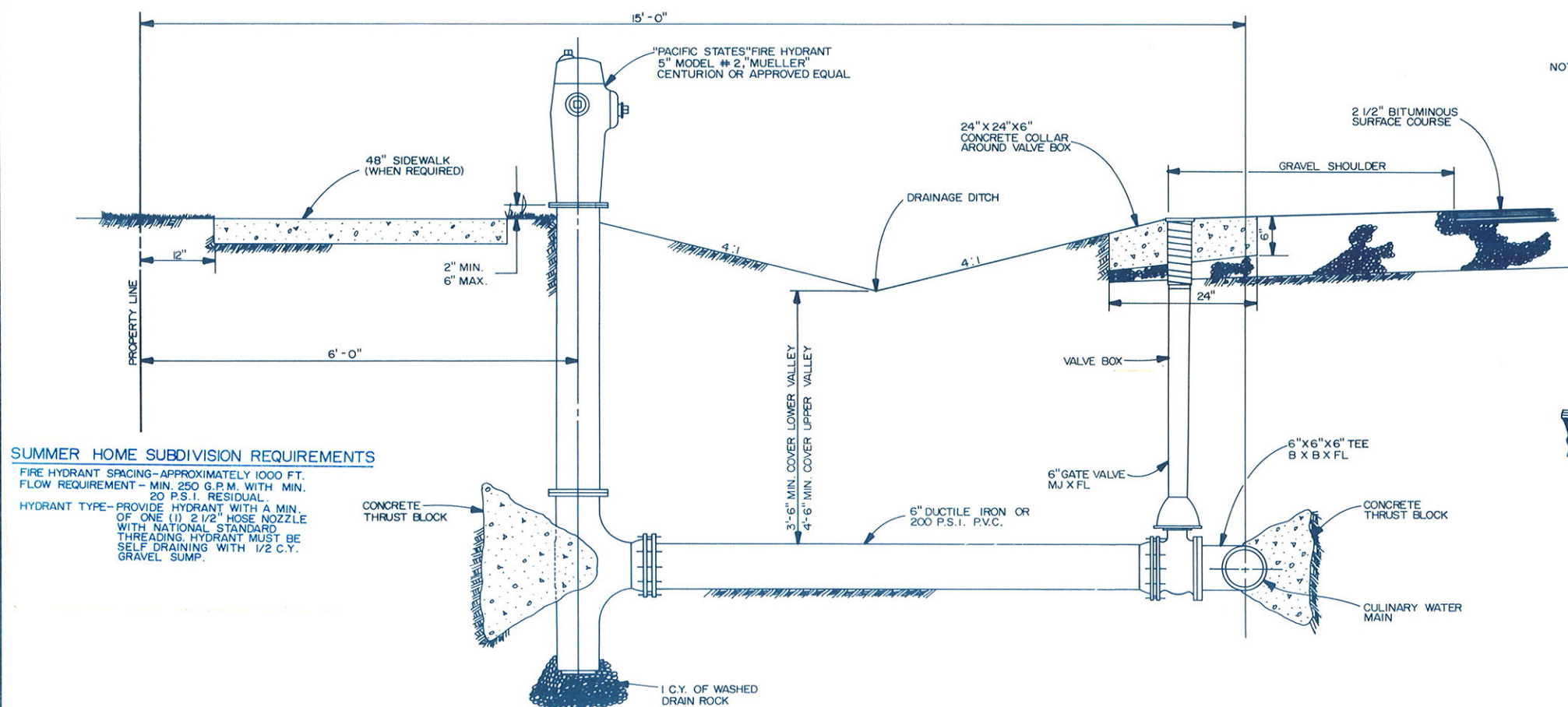
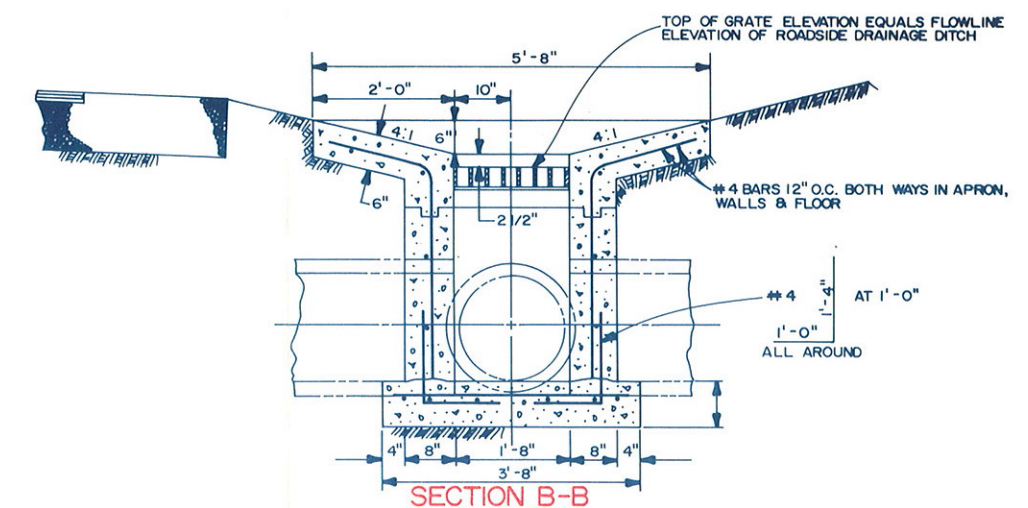
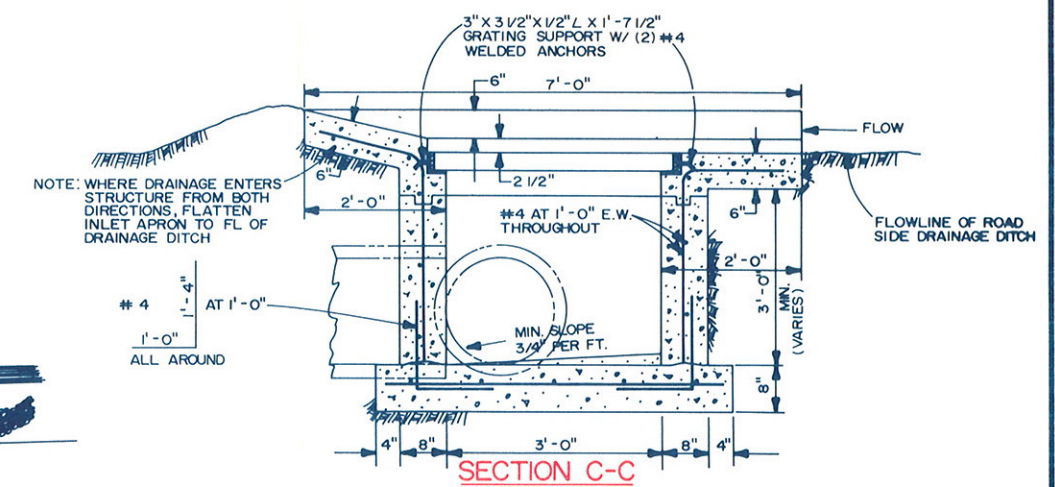
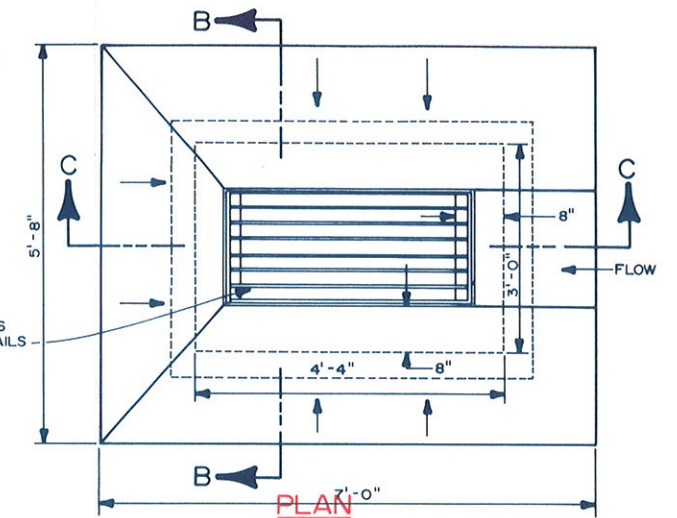
WATER DISTRICT OR WATER COMPANY NAME	① MIN. SIZE WATER MAIN	② STANDARD MAIN MATERIAL AND CLASS	③ MIN. LATERAL SIZE	④ STANDARD LATERAL MATERIAL AND CLASS	⑤ LOCATION OF MAIN FROM PROPERTY LINE	⑥ LOCATION OF WATER METER FROM PROPERTY	⑦ WATER VALVE LOCATION AT INTERSECTION	⑧ LOCATION OF FIRE HYDRANT FROM PROP LINE	⑨ FIRE HYDRANT MIN. SIZE & PREPARED BRAND (S)	⑩ FIRE HYDRANT MAXIMUM SPACING	⑪ MIN. COVER ON WATER MAINS	⑫ WATER METER BOX SIZE AND MATERIAL	⑬ WATER METER COVER MAT.	⑭ LOCATION FIRE HYDRANT AUX. VALVE	⑮ TRENCH COMP. REQUIRED UNDER PAVEMENT	⑯ TRENCH COMP. REQUIRED OUTSIDE OF PAVEMENT	⑰
BONA VISTA WATER IMPROVEMENT DISTRICT	6"	P.V.C. 200 P.S.I. OR DUCTILE IRON	3/4"	TYPE K COPPER OR CLASS 160 POLY.	18' - 0"	ON PROPERTY LINE	IN LINE WITH PROPERTY LINE	1 FOOT INSIDE RIGHT OF WAY	4" PACIFIC STATES OR MUELLER	AS SPEC. BY COMPANY FIRE DEPT.	4' SHOULDERS 4'-6" ON CROSSINGS	18" X 36" CONCRETE	CAST IRON	ADJACENT TO FIRE HYDRANT	95% OF AASHTO T-99	80% OF AASHTO T-99	
HOOPER WATER IMPROVEMENT DISTRICT	6"	P.V.C. 200 P.S.I.	1"	POLY. S.D.R. 9	15' - 0"	6"	IN LINE WITH PROPERTY LINE	6' - 0"	5" PACIFIC STATES OR KENNEDY	1,000 FEET	42"	18" X 30" CONCRETE	CAST IRON	ADJACENT TO FIRE HYDRANT	90% OF AASHTO T-99	90% OF AASH TO T-99	
TAYLOR - WEST WEBER WATER IMPROVEMENT DISTRICT	8" MAINLINES 6" DEAD ENDS	P.V.C. 160 P.S.I.	1"	POLY. SDR 9	OFF SHOULDER OF ROAD	ON PROPERTY LINE	"OUT OF INTERSECTION"	OFF SHOULDER OF ROAD	5" PACIFIC STATES	AS SPECIFIED BY COMPANY FIRE DEPT.	36"	18" X 30" CONCRETE	CAST IRON	ADJACENT TO FIRE HYD.	NONE (CO. STANDARD APPLYS)	NONE (CO. STANDARD APPLYS)	
EDEN WATER COMPANY	4"	P.V.C. 160 P.S.I.	3/4" COPPER TO METER 1" P.V.C. TO HOUSE	TYPE K COPPER AND P.V.C.	3' TO 5'	ON PROPERTY LINE	"OUT OF INTERSECTION"	ON PROPERTY LINE	4" PACIFIC STATES	1,000 FEET	48" TO 54"	18" X 36" CONCRETE	CAST IRON	ADJACENT TO FIRE HYDRANT	6" LIFTS WITH VIBRATING COMPACTOR	3" LIFTS TO 12" ABOVE PIPE, BACKFILL TO SETTLE AND FILL AGAIN	
LIBERTY PIPELINE COMPANY	6" (4" ON SMALL DEAD ENDS)	P.V.C. 160 P.S.I.	3/4"	POLY. 160 P.S.I.	5' - 6'	ON PROPERTY LINE	AT BEGINNING OF RADIUS NEAR EDGE OF PAVEMENT	ON PROPERTY LINE	5" PACIFIC STATES # 2 OR MUELLER	1,000 FEET	52"	18" X 48" CONCRETE	CAST IRON	AT WATER MAIN TEE	95% OF AASHTO T-99	90% OF AASHTO T-99	
UINTAH HIGHLANDS WATER AND SEWER IMPROVEMENT DISTRICT	6"	DUCTILE IRON CLASS 51	3/4"	TYPE K COPPER	10' OFF C. OR OFF PAVEMENT BY PERMISSION	7'-9"	IN LINE WITH PROP. LINE	7' - 9"	5" PACIFIC STATES # 2 OR APPROVED EQUAL	AS SPEC. BY COMPANY FIRE DEPT.	48"	18" X 36" CONCRETE	CAST IRON	AT WATER MAIN TEE	SUCCEEDING LIFTS AND WHEEL ROLLING	SUCCEEDING LIFTS AND WHEEL ROLL- ING	
WEBER COUNTY	6"	P.V.C. CLASS 200 P.S.I. OR DUCTILE IRON CLASS 50	3/4"	TYPE K COPPER OR POLY 160 P.S.I.	10' OFF C. (URBAN) 15' OFF PROP. LINE (RURAL)	6' (RURAL) 7' - 9" (URBAN)	15' FROM PROJECTION OF PROP. LINE (RURAL) IN LINE WITH PROP. LINE (URBAN)	6' (RURAL) 7' - 9" (URBAN)	5" PACIFIC STATES OR MUELLER	AS SPEC. BY COMPANY FIRE DEPT.	42" LOWER VALLEY 52" UPPER VALLEY	18" X 36" CONCRETE	CAST IRON	AT WATER MAIN TEE	90% OF AASHTO T-99	85% OF AASHTO T-99	

NOTE: THIS TABLE IS A GENERAL SUMMARY OF THE APPLICABLE WATER DISTRICT / WATER COMPANY STANDARDS FOR THE MAJOR WATER SUPPLY UTILITIES IN WEBER COUNTY. INDIVIDUAL DISTRICT / COMPANY STANDARDS SUPERCEDE THE WEBER COUNTY STANDARD. IN DEVELOPMENT AREAS WHERE NO STANDARDS EXIST, CONSULT WITH WATER DISTRICT OR COMPANY FOR CONSTRUCTION DETAILS. ALL CULINARY WATER FACILITIES, SHALL BE CONSTRUCTED TO THE COUNTY STANDARD.

				SCALE	DESIGNED <u>H. Jones</u>	SUBMITTED <u>Paul L. Jones</u>	4470	8/24/82	APPROVED		WEBER COUNTY		SHEET
					DRAWN <u>G. Newford</u>	PROJECT ENGINEER	R.C.E. NO.	DATE	DATE		PUBLIC WORKS STANDARDS		7
					CHECKED <u>Lee</u>	RECOMMENDED <u>Paul L. Jones</u>	2789	8/28/82	APPROVED		CULINARY WATER STANDARDS		OF 17 SHEETS
							R.C.E. NO.	DATE	DATE				
.REV DATE BY DESCRIPTION				JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. 3901 WASHINGTON BLVD. OGDEN, UTAH 84403									



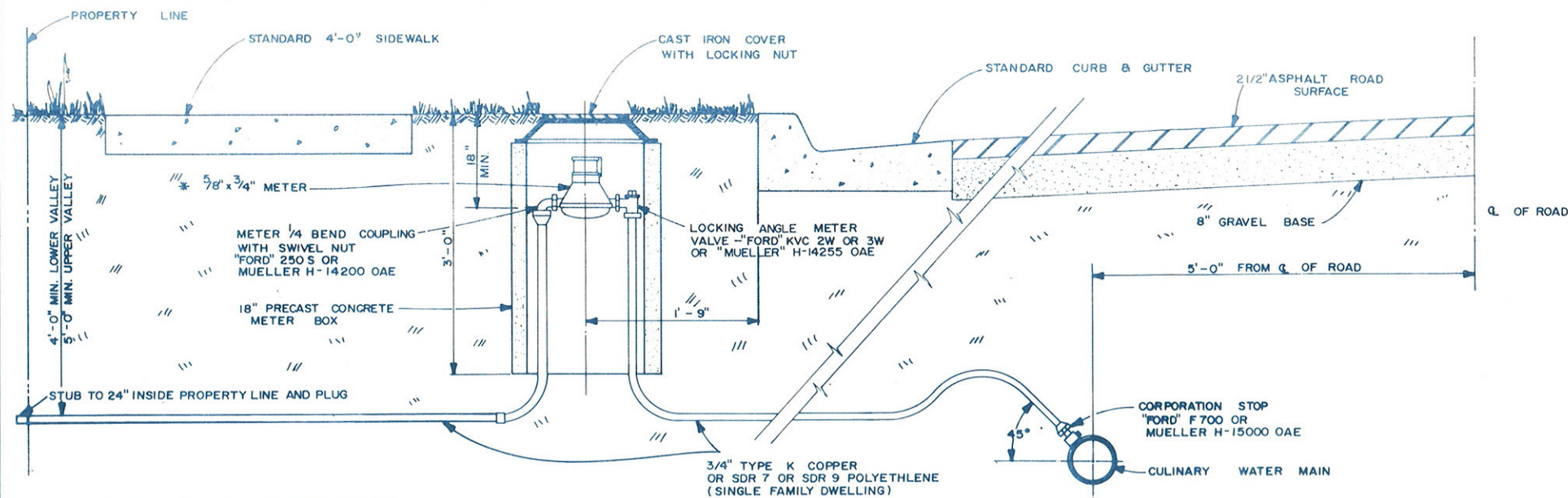
NOTE: INDIVIDUAL WATER DISTRICT & WATER COMPANY CONSTRUCTION STANDARDS SUPERCEDE WEBER COUNTY CULINARY WATER STANDARDS WHERE NO STANDARDS EXIST, CULINARY WATER SYSTEMS SHALL BE CONSTRUCTED TO THE COUNTY STANDARD.



SUMMER HOME SUBDIVISION REQUIREMENTS

FLOW REQUIREMENT - MIN. 250 G.P.M. WITH MIN. 20 P.S.I. RESIDUAL.
HYDRANT TYPE - PROVIDE HYDRANT WITH A MIN. OF ONE (1) 2 1/2" HOSE NOZZLE WITH NATIONAL STANDARD THREADING. HYDRANT MUST BE SELF DRAINING WITH 1/2 C.Y. GRAVEL SUMP.

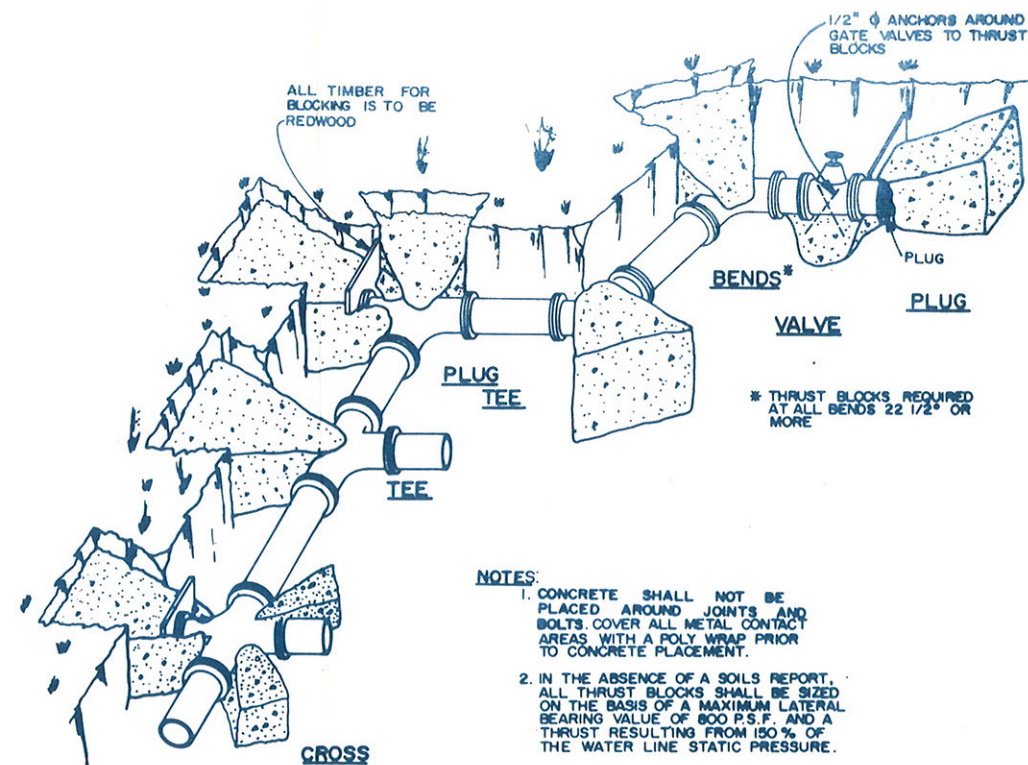
				SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>Robert L. Jones</i>	4470	8/20/82	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.		APPROVED _____	_____	WEBER COUNTY	SHEET	
					DRAWN <i>G. BENFORD</i>	PROJECT ENGINEER	RCE NO	DATE			_____	_____	DATE	PUBLIC WORKS STANDARDS	8
					CHECKED <i>Law</i>	RECOMMENDED <i>James M. Montgomery</i>	2706	8/20/82			APPROVED _____	_____	DATE	RURAL FIRE HYDRANT & SERVICE CONNECTIONS	OF 17 SHEETS
REV	DATE	BY	DESCRIPTION				RCE NO	DATE	3901 WASHINGTON BLVD. OGDEN, UTAH 84403			_____	_____	RURAL CATCH BASIN	



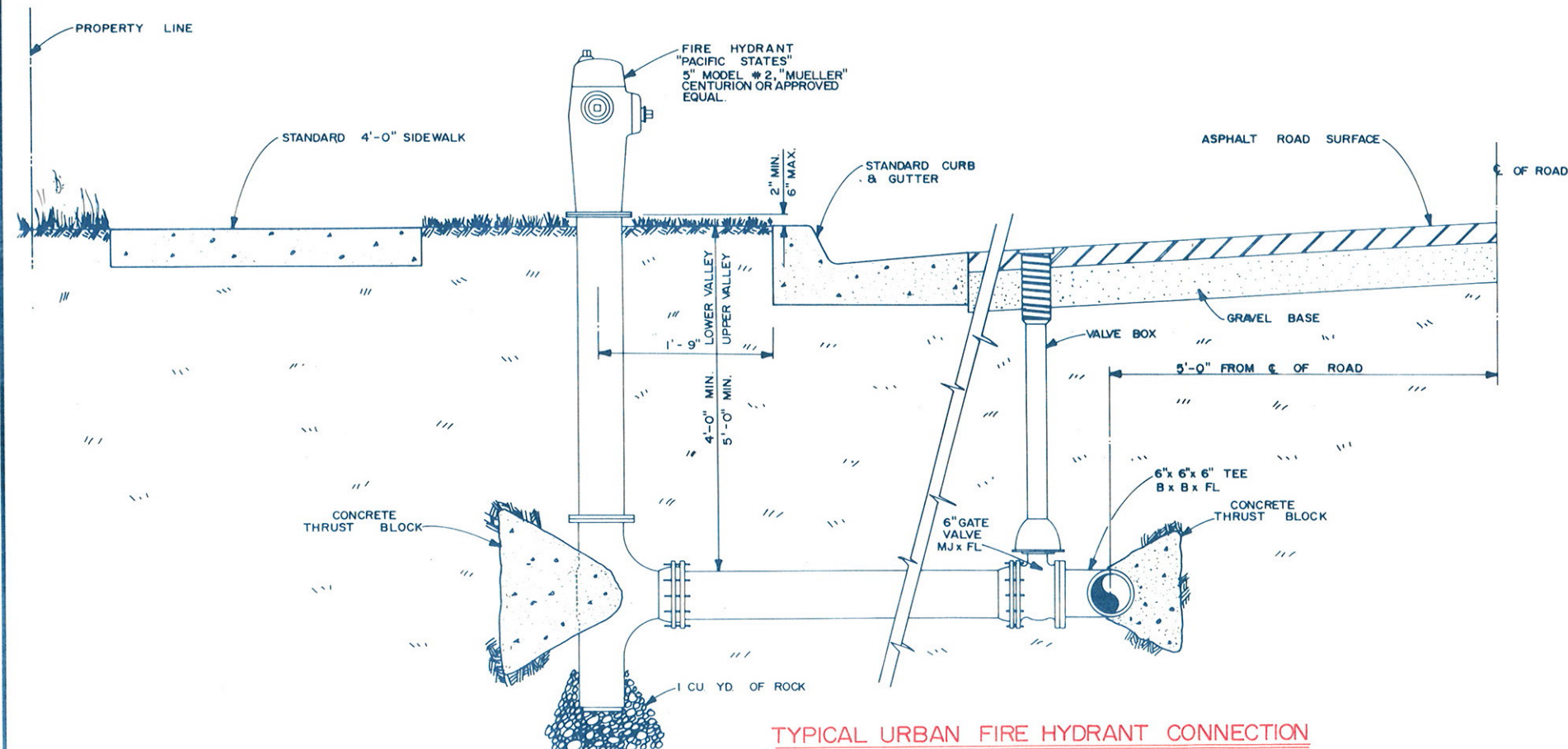
* CONSULT WITH INDIVIDUAL WATER DISTRICT OR COMPANY REGARDING SUPPLYING & INSTALLING WATER METER

TYPICAL WATER CONNECTION

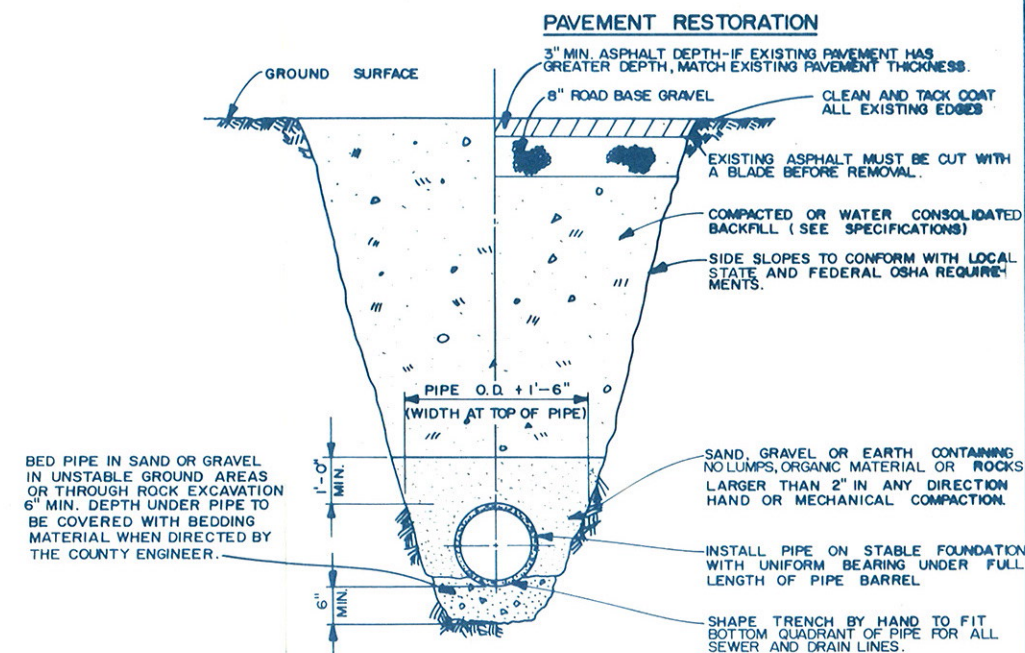
NOTE: INDIVIDUAL WATER DISTRICT & WATER COMPANY CONSTRUCTION STANDARDS SUPERCEDE WEBER COUNTY CULINARY WATER STANDARDS WHERE NO STANDARDS EXIST, CULINARY WATER SYSTEMS SHALL BE CONSTRUCTED TO THE COUNTY STANDARD.



THRUST BLOCKING



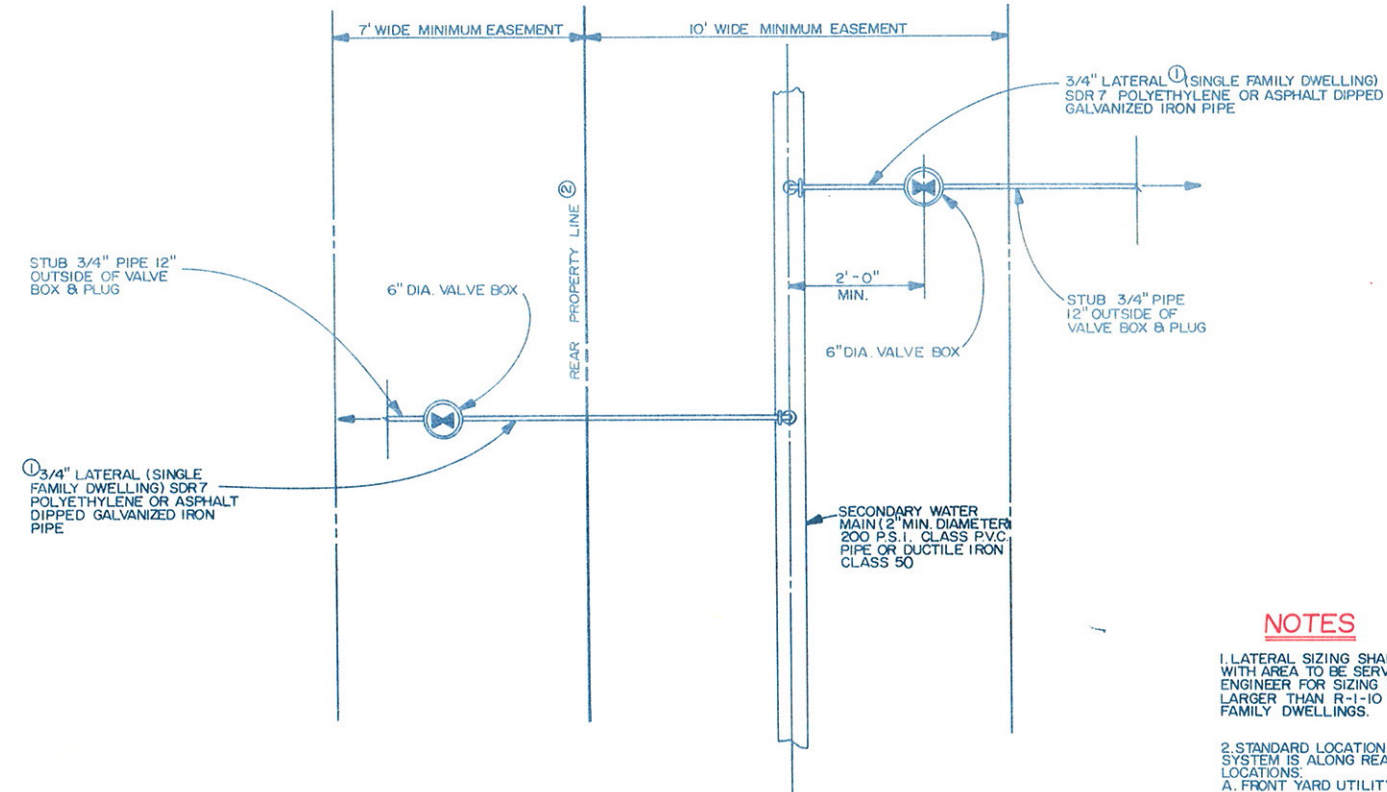
TYPICAL URBAN FIRE HYDRANT CONNECTION



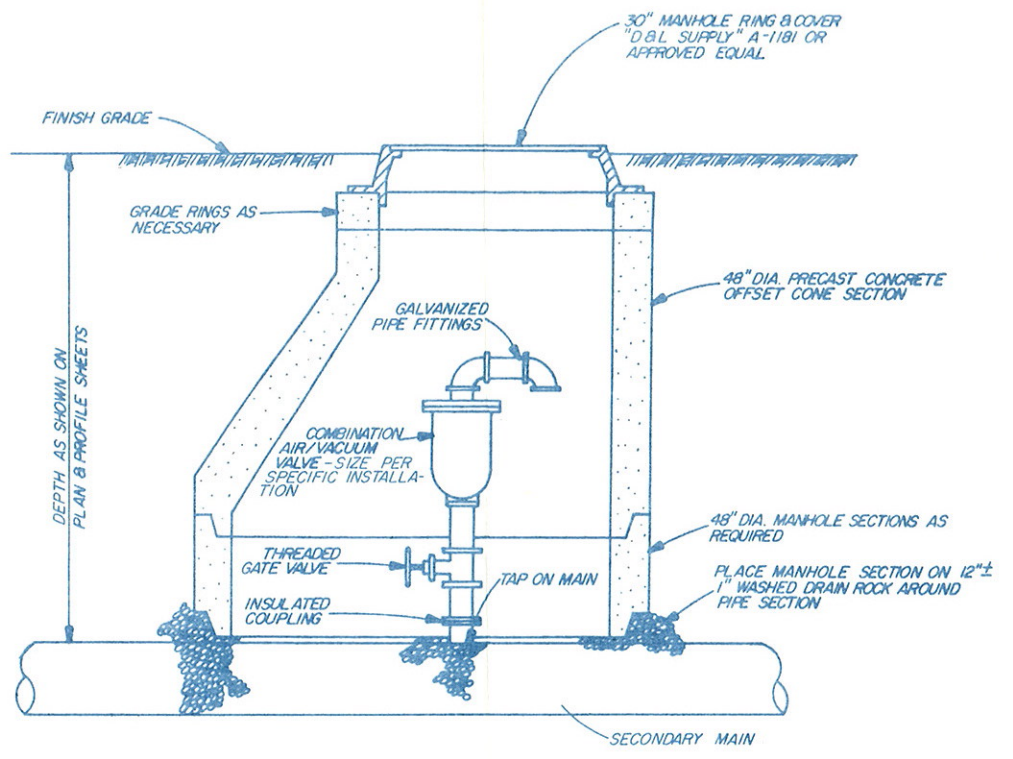
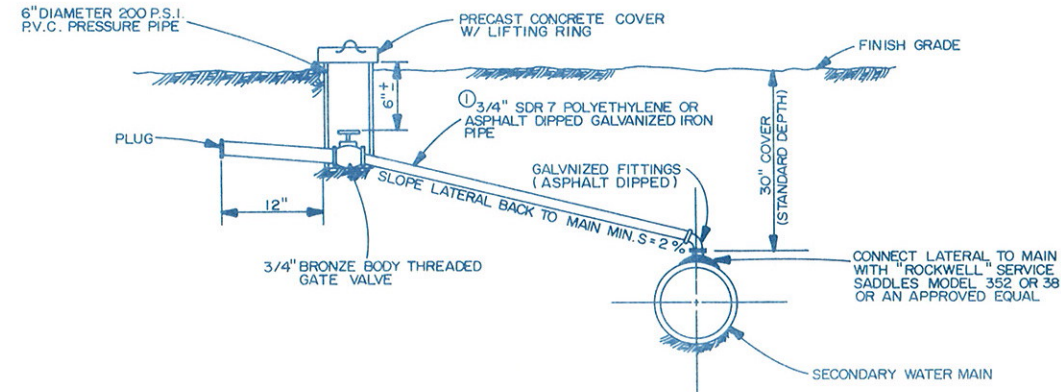
TYPICAL TRENCH SECTION
(WATER, SEWER & STORM DRAINS)

REV	DATE	BY	DESCRIPTION	SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>K. Jones</i>	PROJECT ENGINEER	4470	8/20/82	DATE	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. 3901 WASHINGTON BLVD. OGDEN, UTAH 84403		APPROVED	DATE	WEBER COUNTY	PUBLIC WORKS STANDARDS URBAN FIRE HYDRANT & WATER SERVICE CONNECTION DETAILS	SHEET
					DRAWN <i>G. Benfield</i>	RECOMMENDED <i>J. Vanaman</i>	2722	8/23/82	DATE	9							
					CHECKED <i>Law</i>				DATE	OF 17 SHEETS							

TYPICAL SERVICE CONNECTION



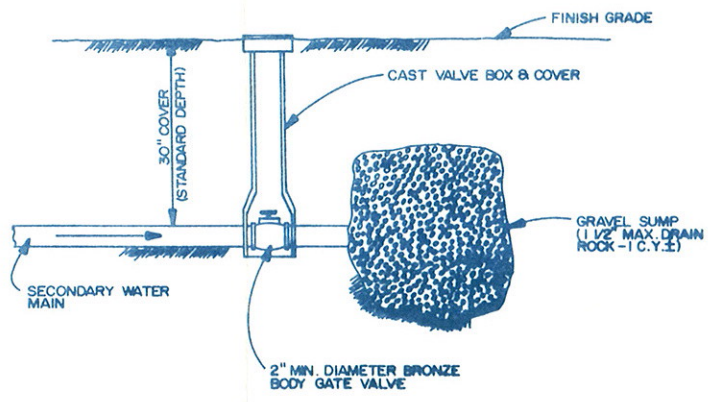
TYPICAL SERVICE CONNECTION PROFILE



AIR / VACUUM VALVE STATION

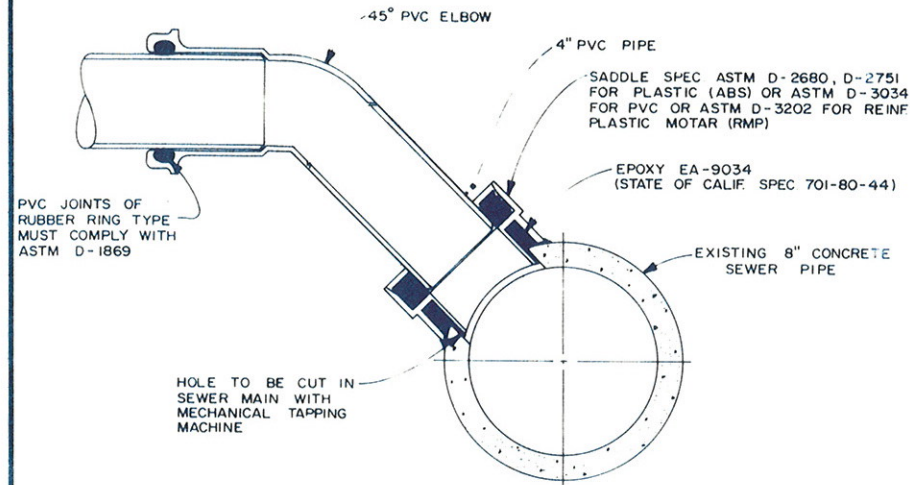
NOTES

1. LATERAL SIZING SHALL BE IN ACCORDANCE WITH AREA TO BE SERVED. CONSULT COUNTY ENGINEER FOR SIZING FOR SERVICE AREAS LARGER THAN R-1-10 ZONE & SINGLE FAMILY DWELLINGS.
2. STANDARD LOCATION OF SECONDARY WATER SYSTEM IS ALONG REAR LOT LINES. ALTERNATE LOCATIONS:
A. FRONT YARD UTILITY EASEMENTS.
B. WITH IN PUBLIC STREET R/W AT A LOCATION APPROVED BY THE COUNTY ENGINEER.
3. ALL DETAILS ON CULINARY WATER REGARDING CONCRETE THRUST BLOCKS, MAIN LINE GATE VALVES, ETC. APPLY TO SECONDARY WATER SYSTEM MAINS.
4. ALL PUMP STATIONS, RESERVOIRS OR SPECIAL STRUCTURES SHALL BE APPROVED BY THE COUNTY ENGINEER PRIOR TO CONSTRUCTION.



MAIN LINE DRAIN

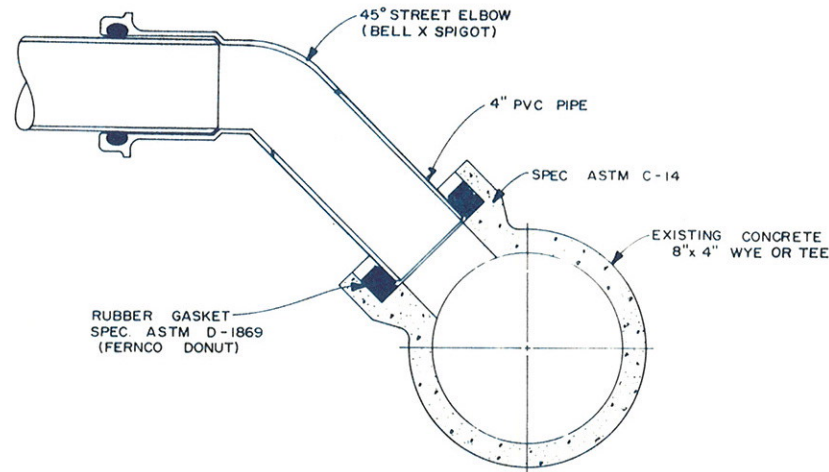
NOTE:
PVC PIPE AND FITTINGS ASTM D-3034
WITH A SDR 35



DETAIL "A"

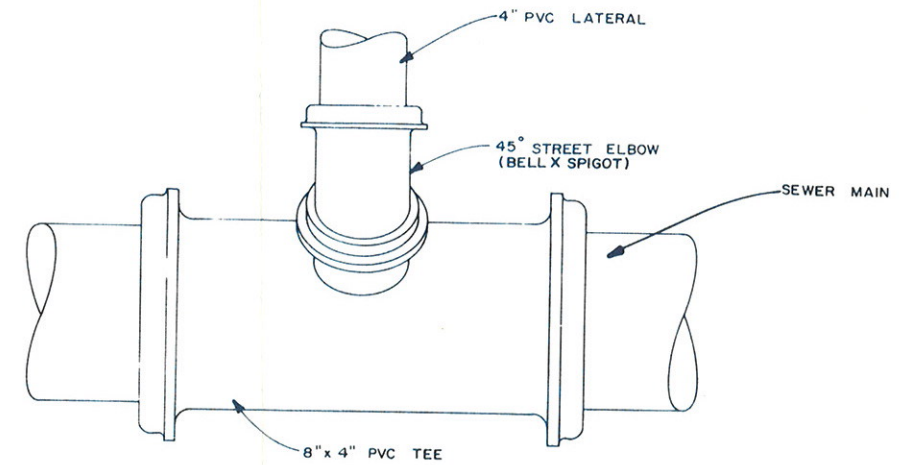
TAPPING INTO EXISTING CONCRETE PIPE

NOTE:
PVC PIPE AND FITTINGS ASTM D-3034
WITH A SDR 35



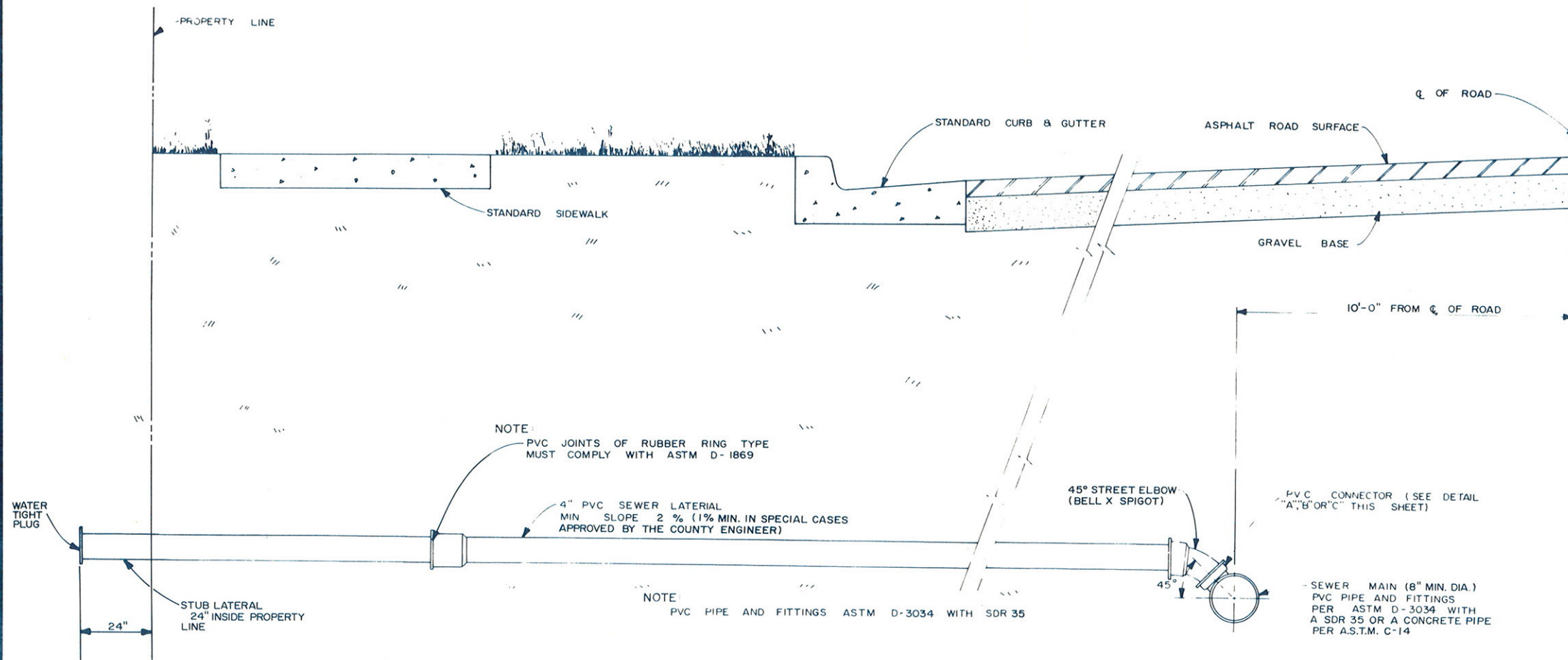
DETAIL "B"

CONNECTING INTO EXISTING CONCRETE WYE OR TEE



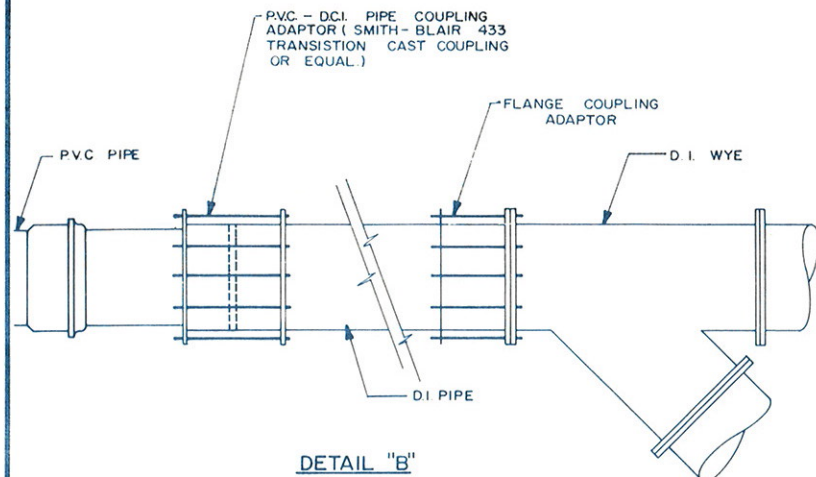
DETAIL "C"

CONNECTING INTO EXISTING PVC TEE

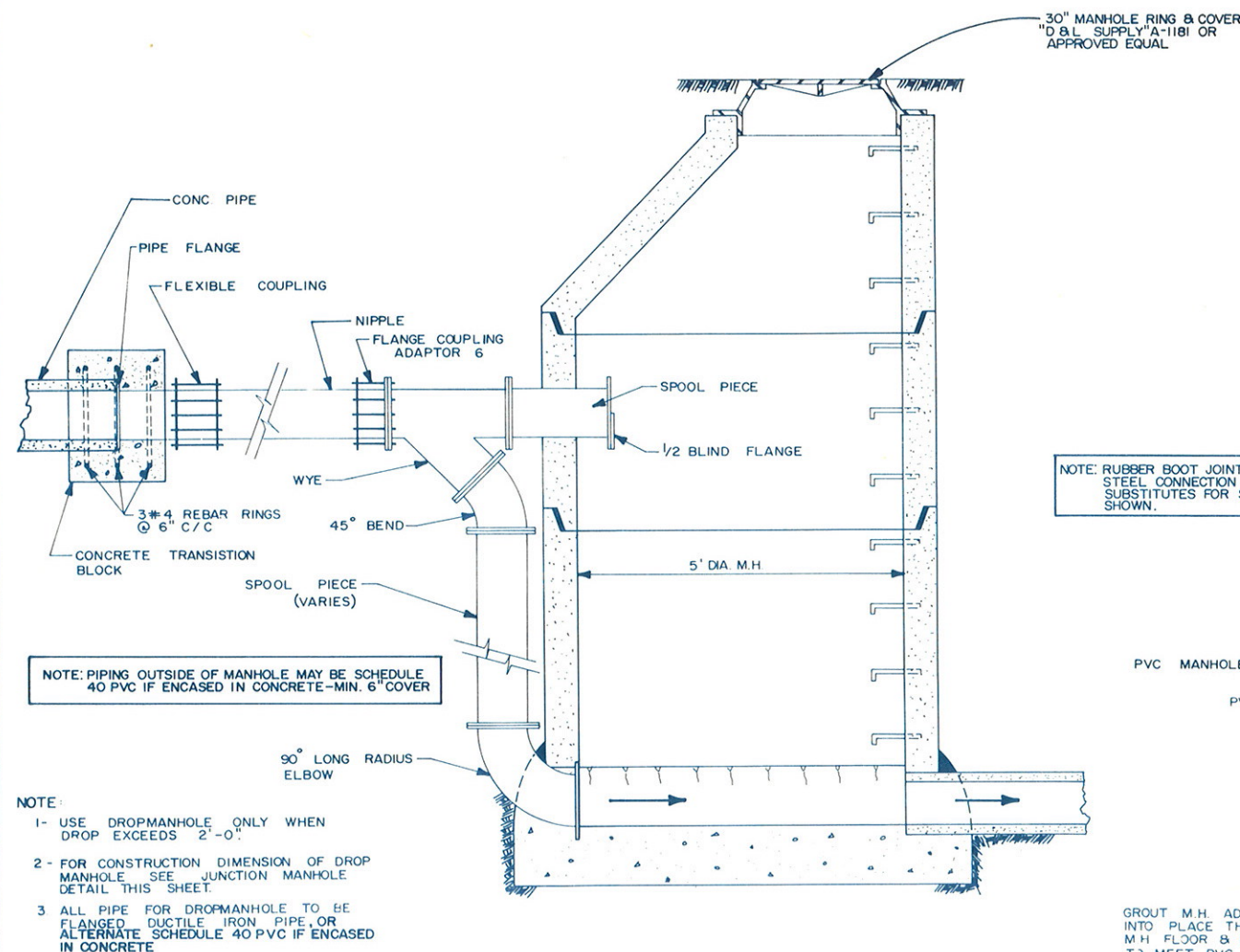
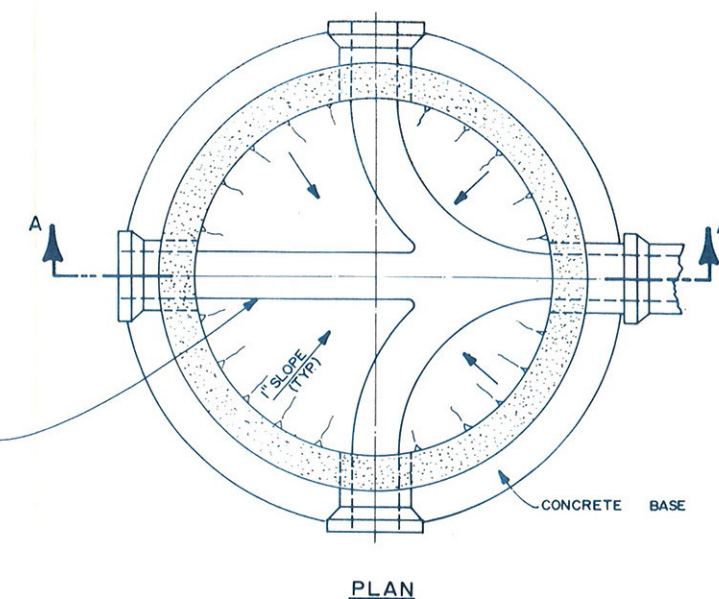
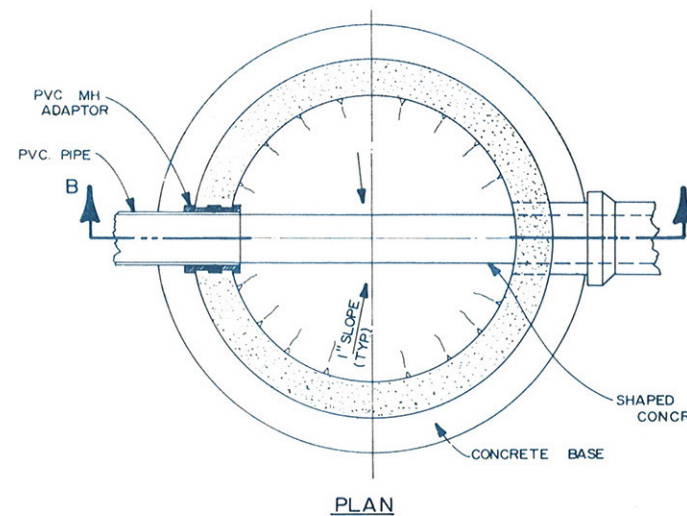


TYPICAL SEWER LATERALS CONNECTION

				SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>K. Jones</i>	4470	8/29/82	JAMES M. MONTGOMERY		WEBER COUNTY		SHEET
					DRAWN <i>G. Bedford</i>	PROJECT ENGINEER		DATE	CONSULTING ENGINEERS, INC.		PUBLIC WORKS STANDARDS		11
					CHECKED <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>	2788	8/29/82	3901 WASHINGTON BLVD. OGDEN, UTAH 84403		SANITARY SEWER LATERAL DETAILS		OF 17 SHEETS
							RCE NO	DATE					
REV	DATE	BY	DESCRIPTION										



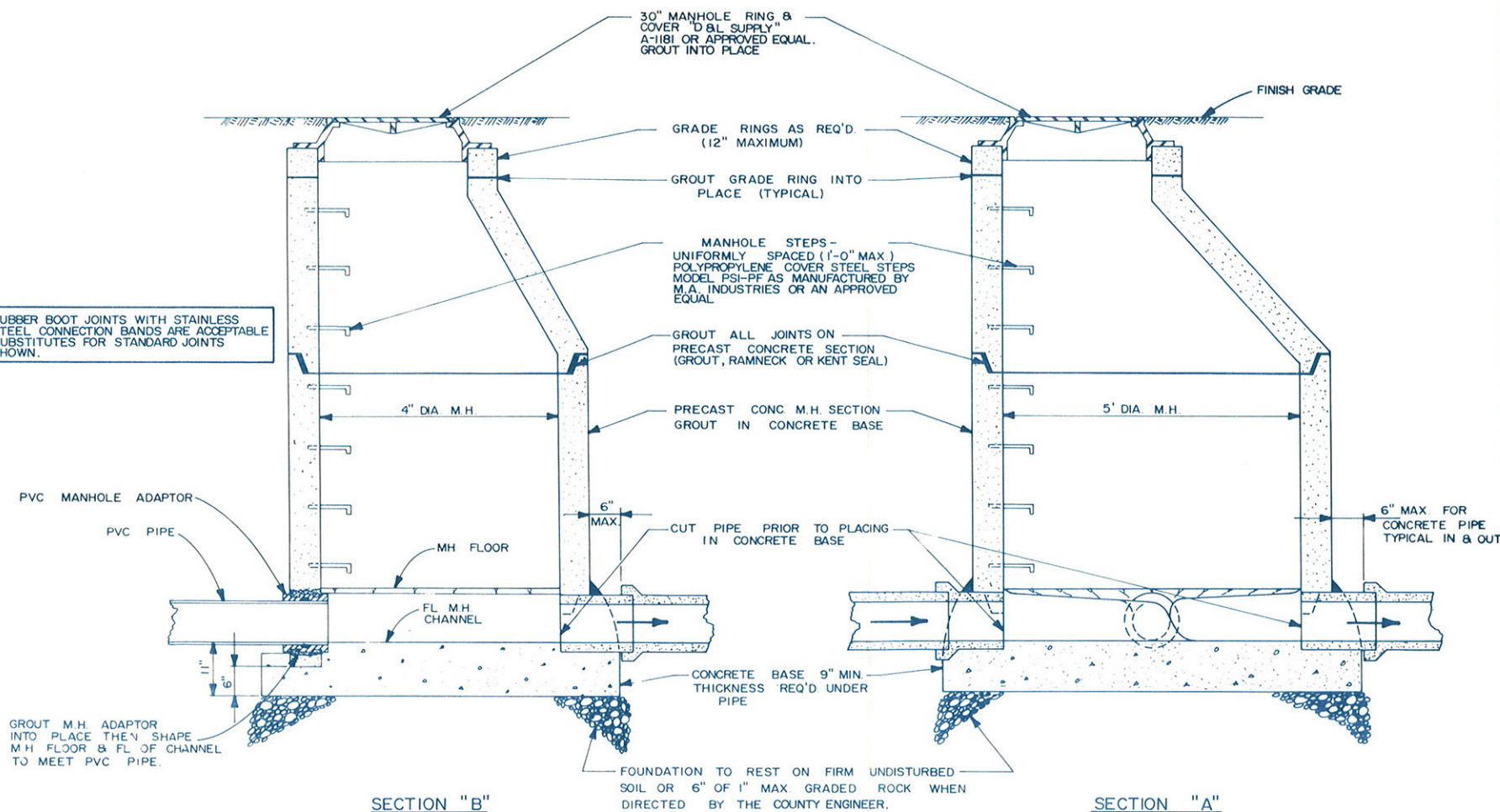
TYPICAL FOR CONNECTION D.I. PIPE TO PVC PIPE



DETAIL "A" - TYPICAL CONNECTION OF D.I. PIPE TO CONC. PIPE

DROP MANHOLE

NOTE: RUBBER BOOT JOINTS WITH STAINLESS STEEL CONNECTION BANDS ARE ACCEPTABLE SUBSTITUTES FOR STANDARD JOINTS SHOWN.



SECTION "B"
LINE MANHOLE

SECTION "A"
JUNCTION MANHOLE

REV	DATE	BY	DESCRIPTION

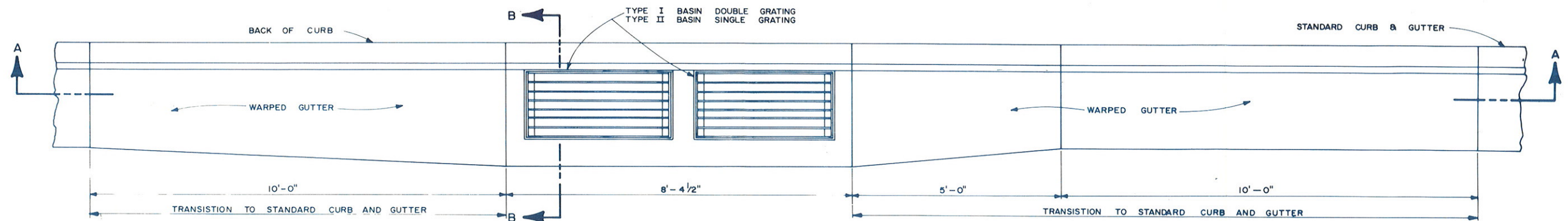
SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>K. Jones</i>	4470	8/20/82
	DRAWN <i>G. Bedford</i>	PROJECT ENGINEER	RCE NO	DATE
	CHECKED <i>Law</i>	RECOMMENDED <i>James Montgomery</i>	2184	8/23/82
			RCE NO	DATE

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.
3901 WASHINGTON BLVD. OGDEN, UTAH 84403

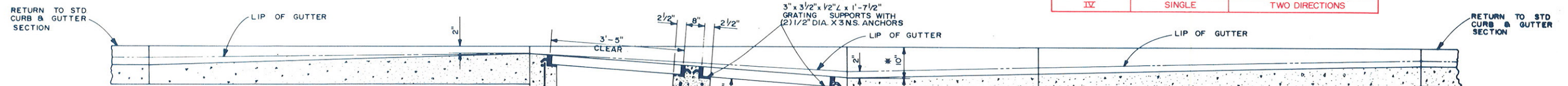


APPROVED	
APPROVED	

WEBER COUNTY	SHEET
PUBLIC WORKS STANDARDS	12
SANITARY SEWER MANHOLE DETAILS	OF 17 SHEETS

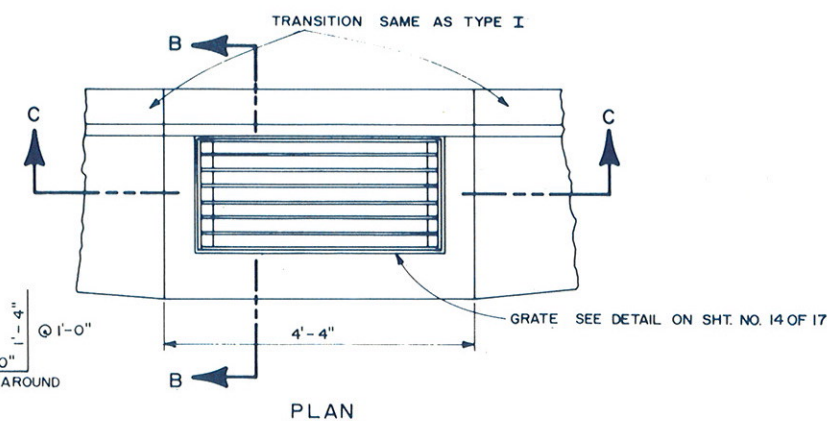
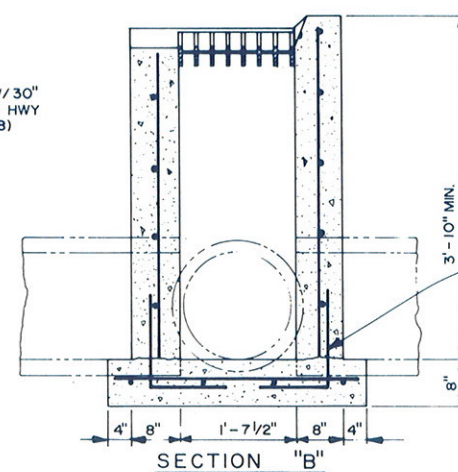
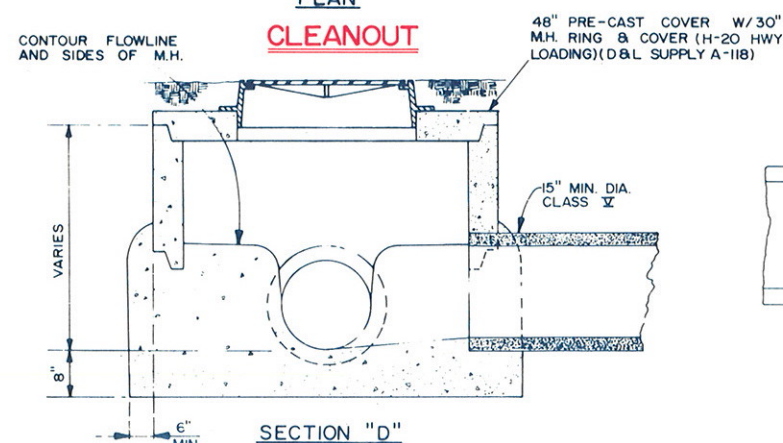
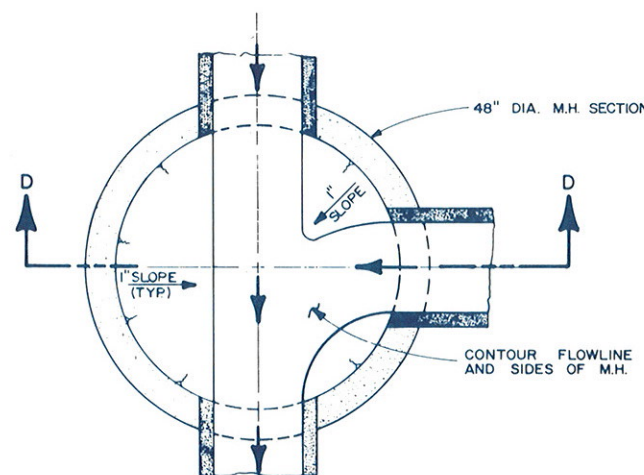


URBAN CATCH BASIN SCHEDULE		
TYPE	GRATES	RUNOFF COLLECTION
I	DOUBLE	ONE DIRECTION
II	SINGLE	ONE DIRECTION
III	DOUBLE	TWO DIRECTIONS
IV	SINGLE	TWO DIRECTIONS

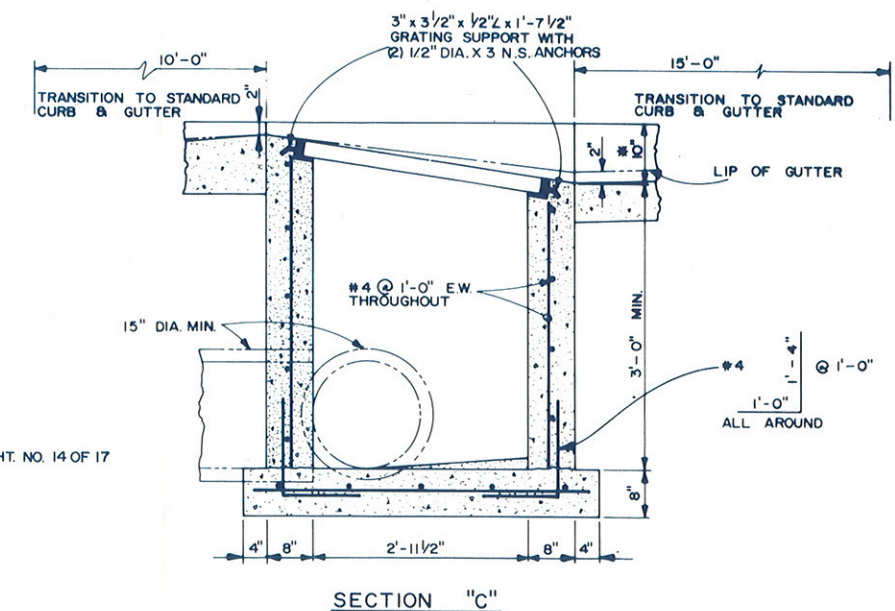


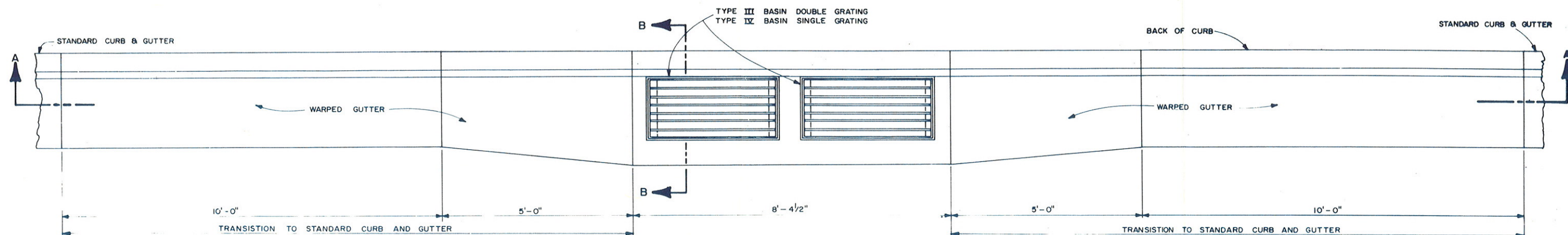
NOTE: HOT DIP GALVANIZE GRATES AND GRATING SUPPORT AFTER FABRICATION.

* DEPTH MAY VARY FROM 10" TO 6" AS DIRECTED BY THE COUNTY ENGINEER

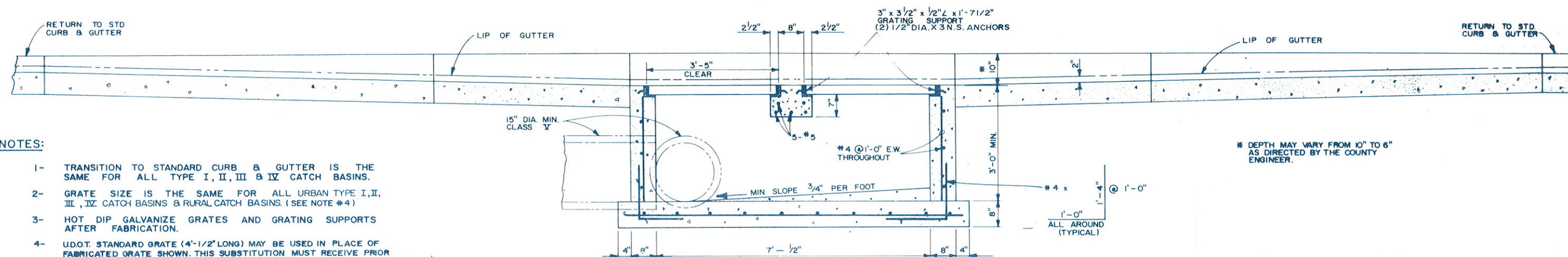


CATCH BASIN TYPE II





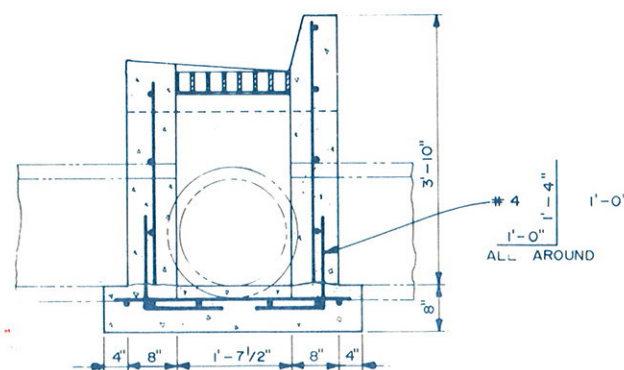
PLAN
CATCH BASIN - TYPE III



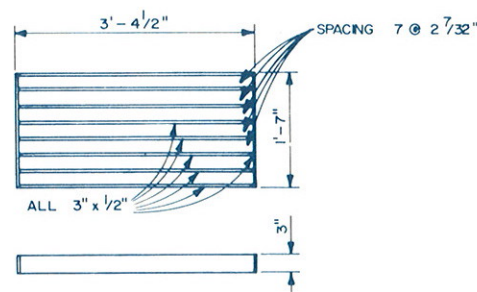
SECTION "A"

NOTES:

- 1- TRANSITION TO STANDARD CURB & GUTTER IS THE SAME FOR ALL TYPE I, II, III & IV CATCH BASINS.
- 2- GRATE SIZE IS THE SAME FOR ALL URBAN TYPE I, II, III, IV CATCH BASINS & RURAL CATCH BASINS. (SEE NOTE #4)
- 3- HOT DIP GALVANIZE GRATES AND GRATING SUPPORTS AFTER FABRICATION.
- 4- UDOT STANDARD GRATE (4'-1 1/2" LONG) MAY BE USED IN PLACE OF FABRICATED GRATE SHOWN. THIS SUBSTITUTION MUST RECEIVE PRIOR APPROVAL OF THE COUNTY ENGINEER. CONCRETE BOX SHALL BE ENLARGED AS REQUIRED TO ACCEPT THE LARGER GRATE.

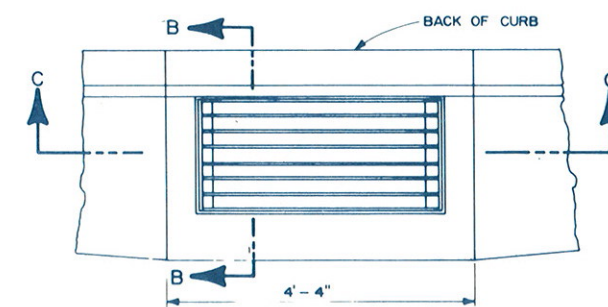


SECTION "B"

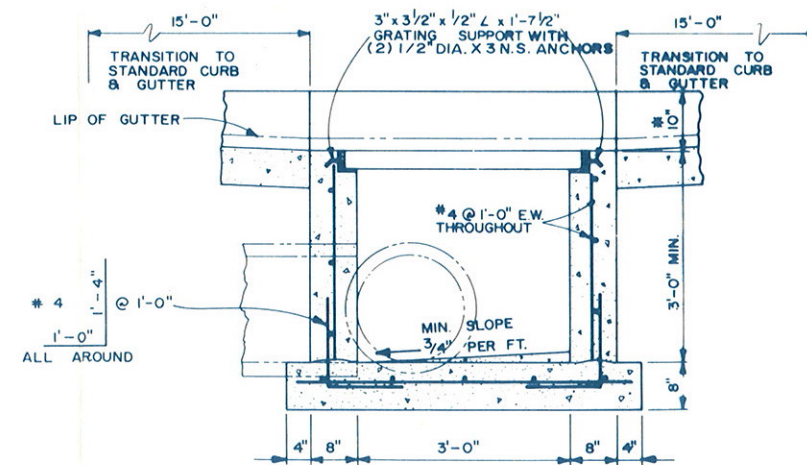


GRATE DETAIL

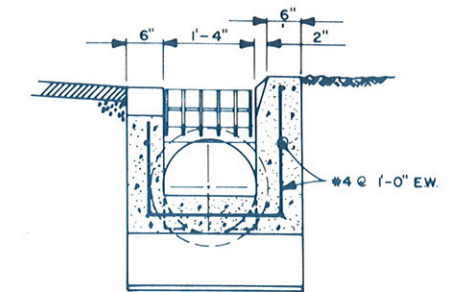
(MAY USE UDOT STANDARD GRATE) SEE NOTE #4



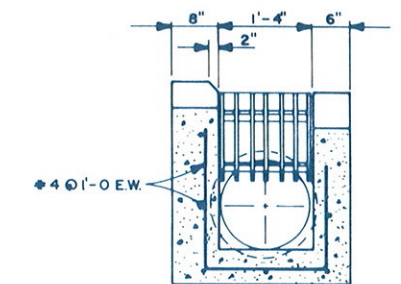
PLAN
CATCH BASIN - TYPE IV



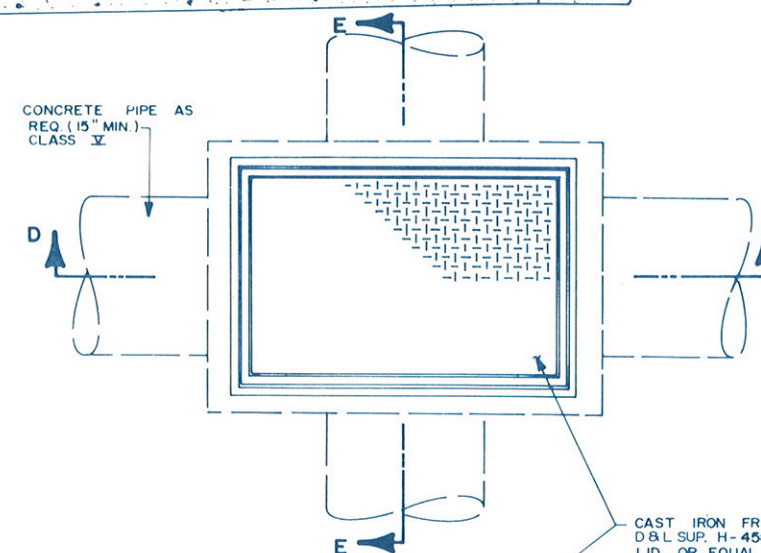
SECTION "C"



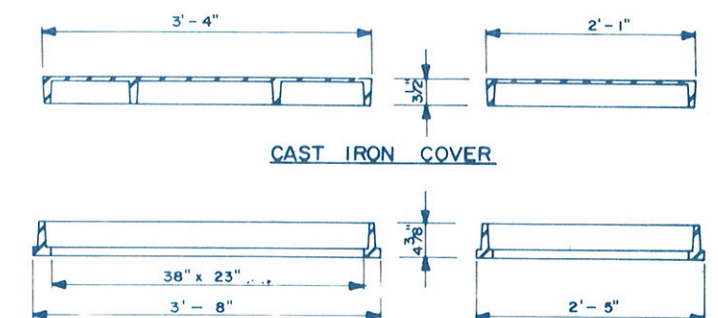
SECTION "A"



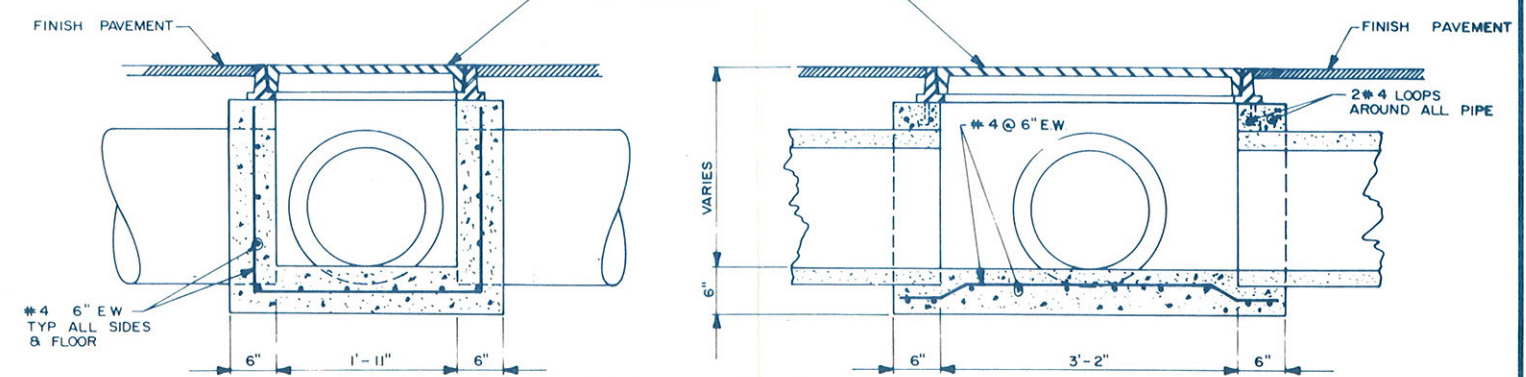
SECTION "C"



LID OR EQUAL.



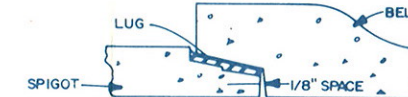
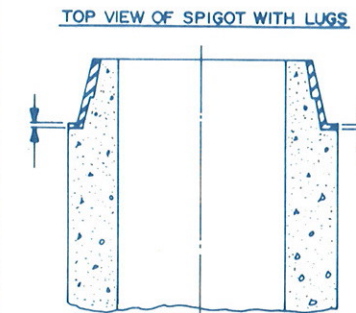
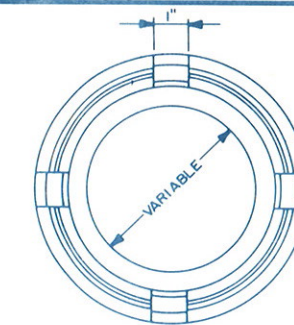
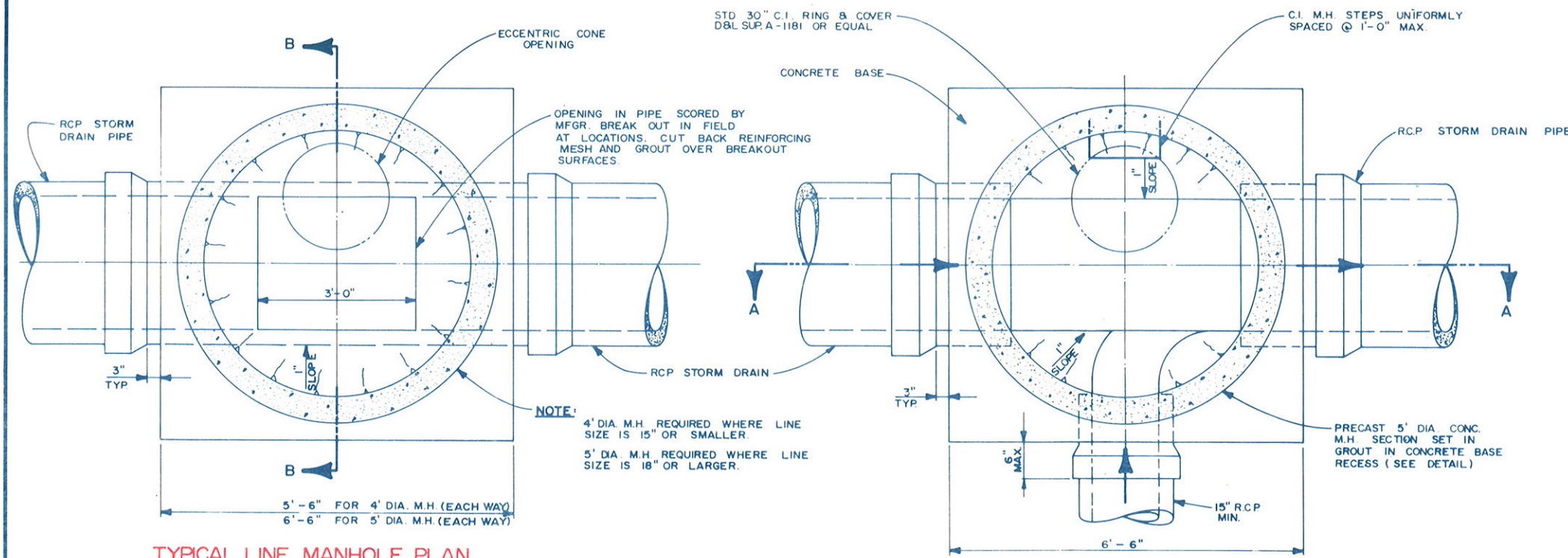
CAST IRON FRAME



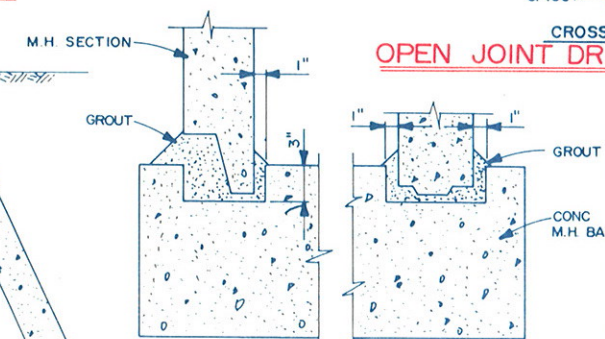
TYPICAL DIPSTONE PIPE CLEANOUT

SECTION "D"

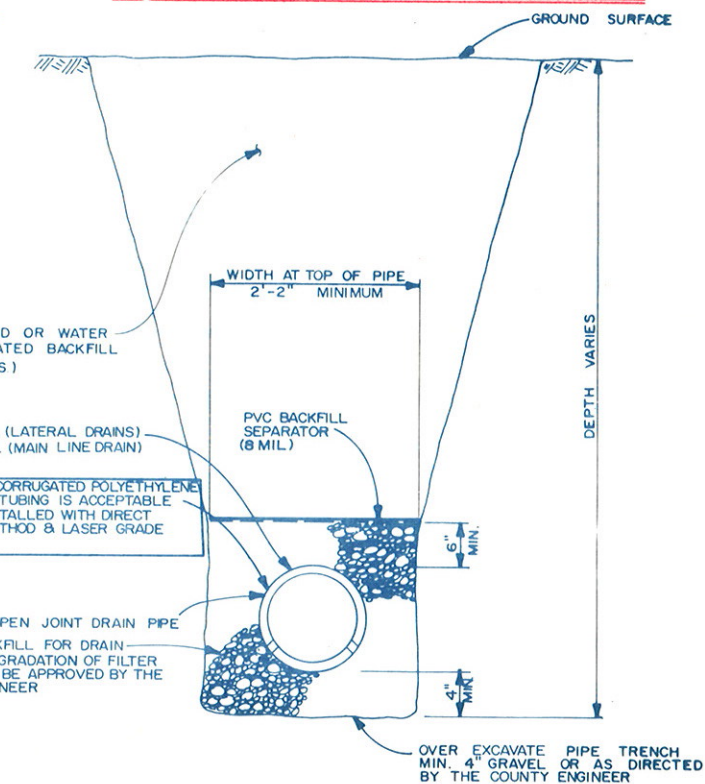
				SCALE	DESIGNED <i>K. L. Jones</i>	SUBMITTED <i>K. L. Jones</i>	4470	8/25/02	JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.		APPROVED		WEBER COUNTY		SHEET
					DRAWN <i>G. BERGER</i>	PROJECT ENGINEER	RCE NO	DATE	3901 WASHINGTON BLVD. OGDEN, UTAH 84403		DATE		PUBLIC WORKS STANDARDS		15
					CHECKED <i>J. V.</i>	RECOMMENDED <i>J. V. Montgomery</i>	2109	8/23/02	JM		DATE		INLET-OUTLET DIPSTONE DETAILS / CLEANOUT		OF 17 SHEETS
REV	DATE	BY	DESCRIPTION												



OPEN JOINT DRAIN FOR CONCRETE & CLAY PIPE

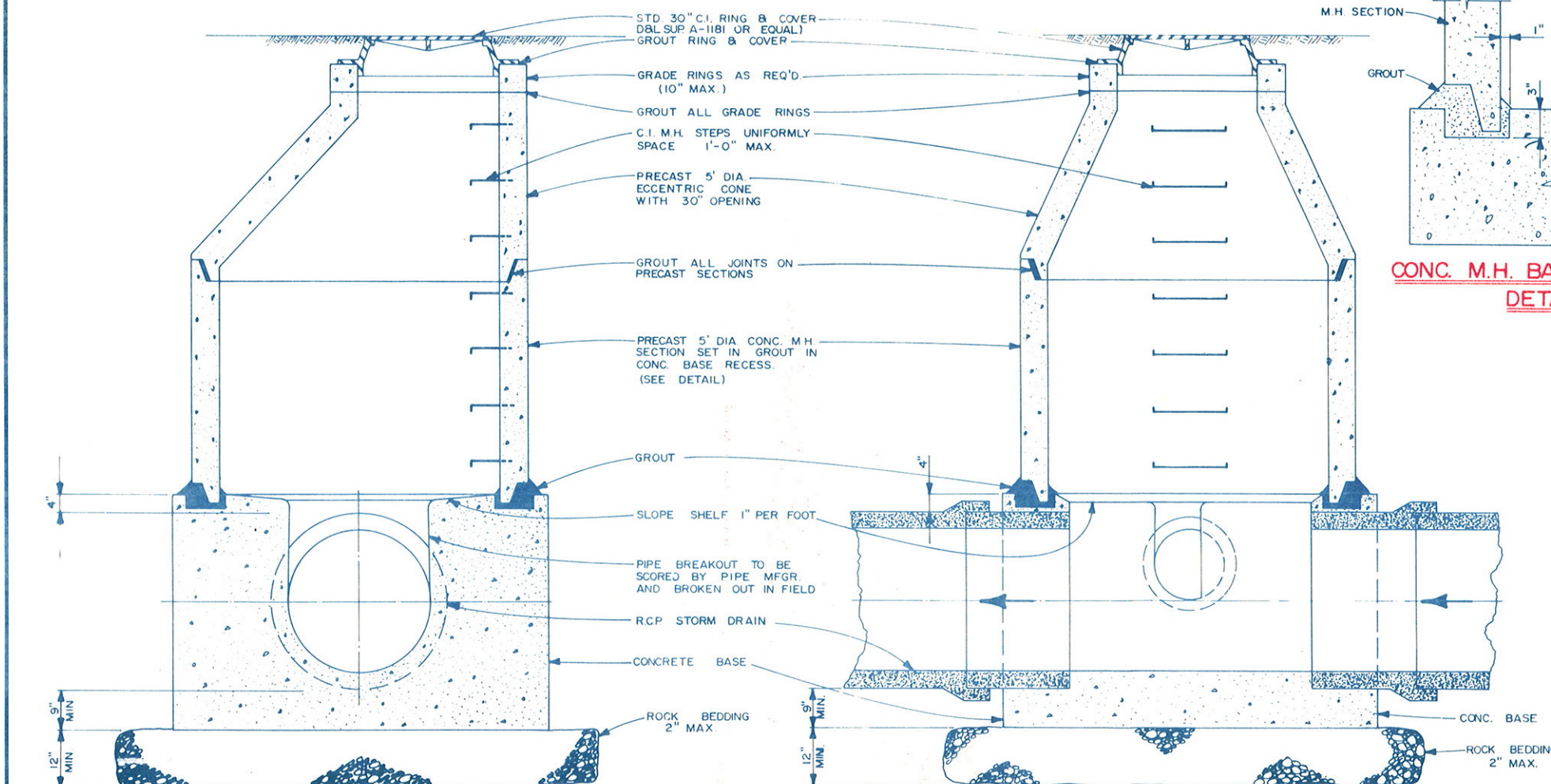


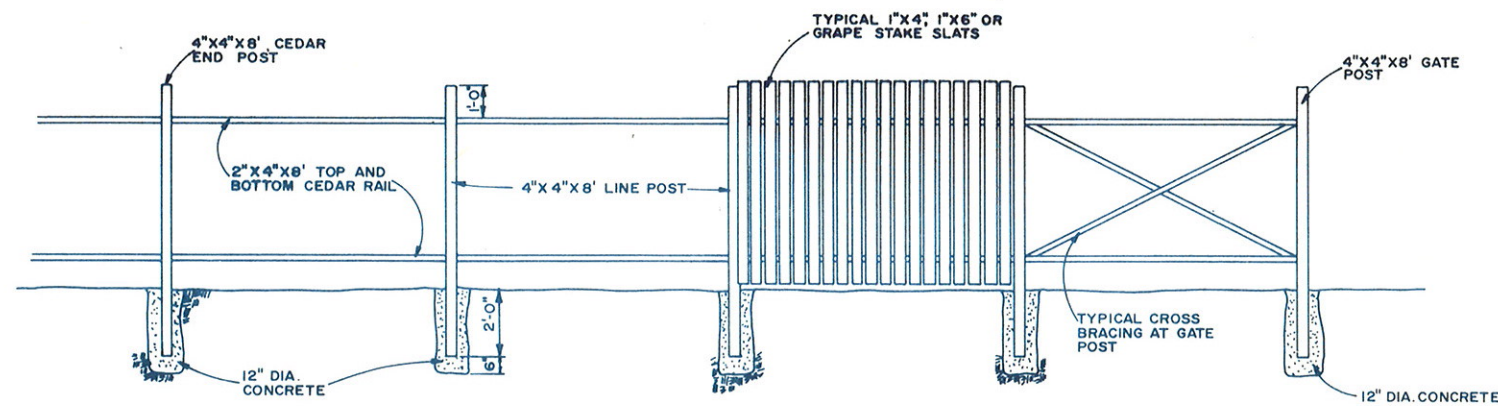
TYPICAL LAND DRAIN PIPE SECTION



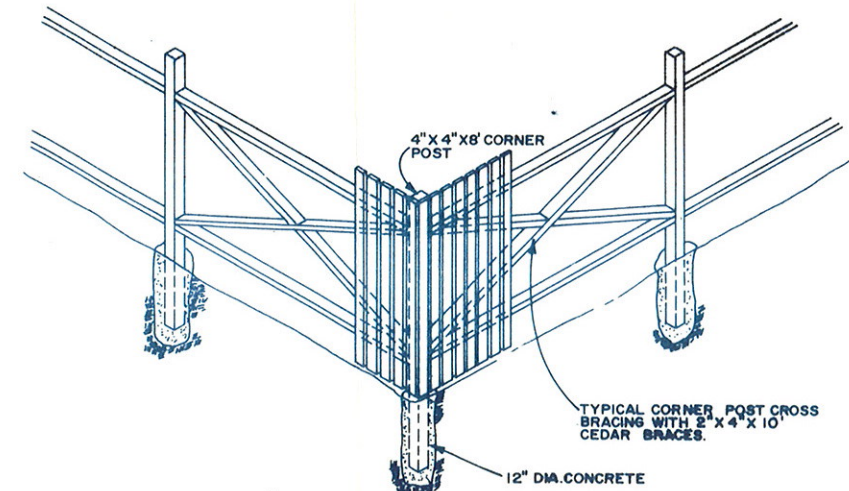
MINIMUM LAND DRAIN PIPE STD'S.	
PIPE MATERIAL	SPECIFICATION
CONCRETE (B&S LUG TYPE)	A.S.T.M. C-14
CONCRETE (PERFORATED)	A.S.T.M. C-444
PVC (PERFORATED)	A.S.T.M. D-1784
* CORRUGATED POLYETHYLENE	A.S.T.M. F-405-77a
CLAY (B&S LUG TYPE)	A.S.T.M.C. 700-75

* SEE NOTE IN LAND DRAIN PIPE SECTION

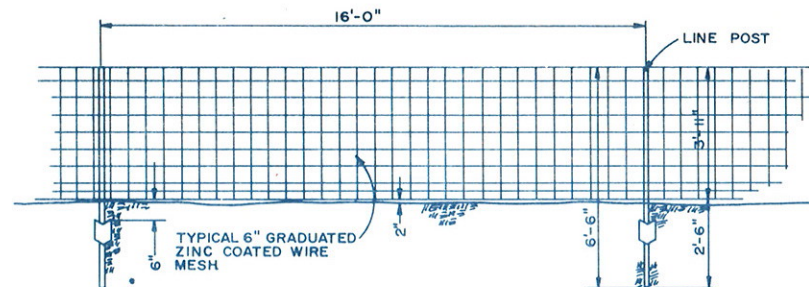




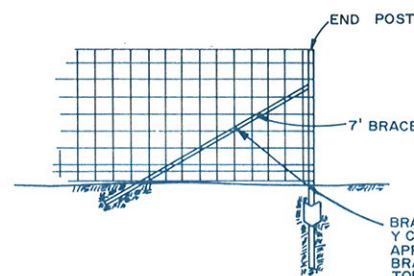
TYPICAL WOOD FENCE
SCALE 3/8"=1'-0"



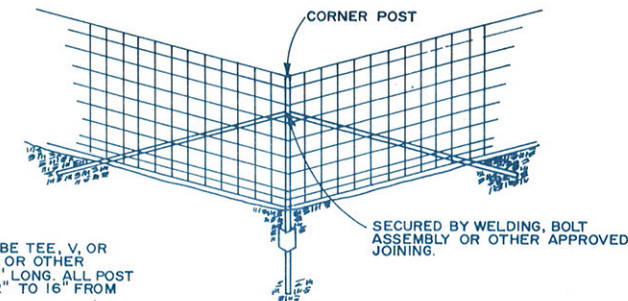
TYPICAL CORNER POST



TYPE "D" CONSTRUCTION FENCE
SCALE 3/8"=1'-0"

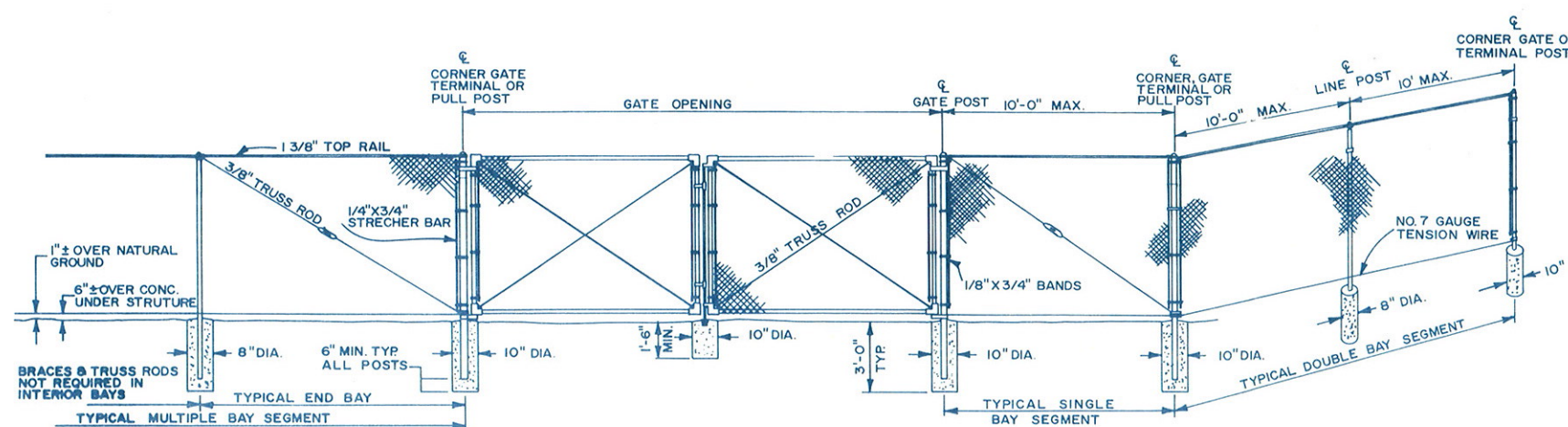


TYPICAL END POST BRACING

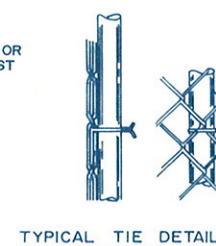


TYPICAL CORNER POST

GATES				
GATE POSTS AND GATE FRAMES				
HEIGHT	GATE OPENING	GATE POST	GATE FRAME	
6 FEET AND OVER	SINGLE TO 6' OR DOUBLE TO 12'	2 5/8"	1 1/2"	
	SINGLE OVER 6' TO 13' OR DOUBLE OVER 12' TO 24'	3 1/2"		
	SINGLE OVER 13' TO 18' OR DOUBLE OVER 24' TO 36'	6"		
	SINGLE OVER 18' OR DOUBLE OVER 36'	8"		

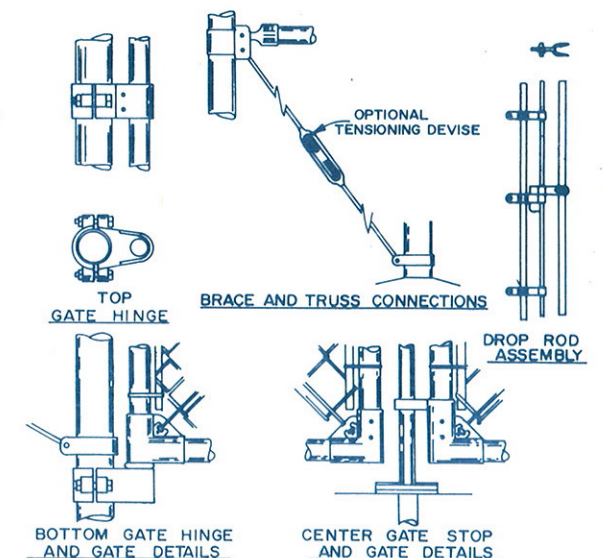


TYPICAL CHAIN LINK FENCE
N.T.S.



NOTE:

- ALL FABRIC SHALL BE 6' HIGH CHAIN LINK OF 2" GALVANIZED MESH OF 11 1/2 GAUGE.
- ALL STEEL PIPE MEMBERS SHALL CONFORM TO THE REQUIREMENTS OF A.S.T.M. DESIGNATION A-120, SCHEDULE 40, HOT DIPPED ZINC COATED STEEL PIPE.
- ALL POST SHALL BE SET IN CONCRETE AND SHALL BE TOPPED WITH BALL TYPE OR OTHER APPROVED ORNAMENT.
- ALL END, CORNER OR PULL POST SHALL BE 9 FEET IN LENGTH WITH A MINIMUM DIAMETER OF 2 5/8 INCHES. ALL LINE POSTS SHALL BE 8 FEET 8 INCHES IN LENGTH WITH A MINIMUM DIAMETER OF 1 7/8 INCHES.



REV	DATE	BY	DESCRIPTION

SCALE	DESIGNED <i>K. Jones</i>	SUBMITTED <i>K. Jones</i>
	DRAWN <i>G. Benford</i>	PROJECT ENGINEER
	CHECKED <i>Jan</i>	RECOMMENDED <i>James M. Montgomery</i>

4470	8/20/82
RCE NO.	DATE
2704	8/23/82
RCE NO.	DATE

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

3901 WASHINGTON BLVD. OGDEN, UTAH 84403



APPROVED	DATE
APPROVED	DATE

WEBER COUNTY	SHEET
PUBLIC WORKS STANDARDS	17
FENCING STANDARDS	OF 17 SHEETS