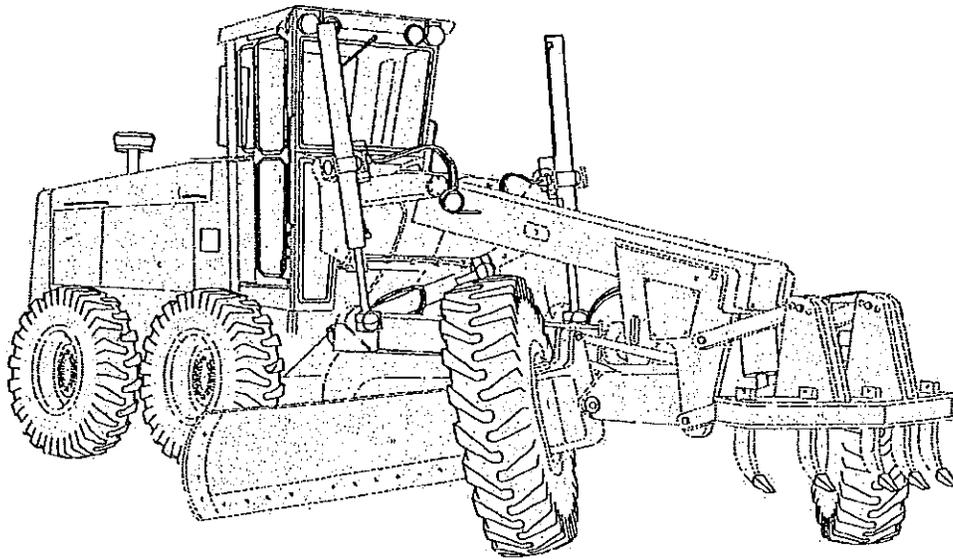


# *CITY OF LOCKHART TEXAS*

## **CONSTRUCTION STANDARDS**



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**NOVEMBER 2002**

4.6.09.  
11/02/2002

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

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CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 1- GENERAL PROVISIONS

I. PURPOSE AND SCOPE

A. These Construction Standards are a supplement to the Subdivision Ordinance of the City and constitute the minimum requirements for construction of municipal improvements within the Corporate Limits of the City and of such improvements in those areas which may be annexed by the City. They provide guidance to sub-dividers, developers, engineers, and contractors with respect to design, materials, and methods which will be used in construction of municipal improvements.

B. Approval, in writing, of variance from these Construction Standards and of additional design, details, and specifications is required as a part of the procedure of the subdivision process or, after approval by the Council of the final plat and engineering plans, by the City Manager, acting on behalf of the Council, and upon recommendation of the City Staff.

II. DEFINITIONS AND ABBREVIATIONS

A. See Section 23-1-2, Subdivision Ordinance.

B. The following definitions and abbreviations are added:

1. ASHO -American Association of State Highway Officials
2. ASTM -American Society for Testing Materials
3. AWWA -American Water Works Association
4. BUILDER- A person or firm engaged by a lot owner to erect one or more structures and make connections to city streets and/or services.
5. CI -Cast Iron
6. CONTRACTOR- is a person or firm engaged by the sub-divider to construct public improvements according to plans and documents approved by the City.
7. DI -Ductile Iron
8. NEC -National Electrical Code
9. NSF -National Sanitation Foundation
10. PPM -Parts Per Million
11. PS -Pipe Stiffness
12. PSI -Pounds Per Square Inch
13. PVC -Polyvinyl Chloride
14. RCP- Reinforced Concrete Pipe
15. SDR -Standard Dimension Ratio
16. TDHPT -Texas Department of Highways and Public Transportation
17. TDWR -Texas Department of Water Resources

ORDINANCE 02-50

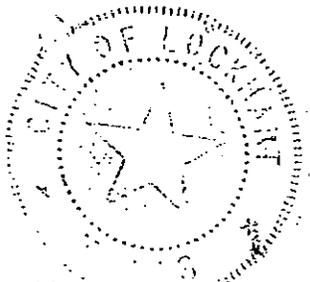
AN ORDINANCE OF THE CITY OF LOCKHART, TEXAS, AND REVISING AND AMENDING CONSTRUCTION STANDARDS ADOPTED BY COUNCIL ON APRIL 28, 1987 WITH SUBSEQUENT REVISIONS OF APRIL 28, 1990 AND JUNE 19, 1990 ; PROVIDING FOR SEVERABILITY; PROVIDING FOR PENALTY; PROVIDING FOR PUBLICATION AND PROVING AN EFFECTIVE DATE.

WHEREAS, the City Council desires to amend the Construction Standards of the City of Lockhart adopted by Council on April 28, 1987 with subsequent revisions of April 28, 1990 and June 19, 1990;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LOCKHART, TEXAS THAT THE CITY OF LOCKHART CONSTRUCTION STANDARDS ARE HEREBY REVISED AND AMENDED TO REFLECT:

- I. The City of Lockhart Construction Standards as revised and amended in Attachment "A" identified at (11-19-02 Revisions) are hereby adopted. All other chapters, sections, subsections, and details shall remain as previously adopted and/or revised.
- II. **Severability:** If any provision, section, clause, sentence, or phrase of this ordinance is for any reason held to be unconstitutional, void, invalid or unenforceable, the validity of the remainder of this ordinance or its application shall not be affected, it being the intent of the City Council in adopting and of the Mayor in approving this ordinance that no portion, provision, or regulation contained herein shall be inoperative or fail by way of reason of unconstitutionality or invalidity of any other portion, provision, or regulation.
- III. **Penalty:** Any person who violates any provision of this ordinance shall be guilty of a misdemeanor, and upon conviction shall be fined as provided in Section 1-8 of the City Code.
- IV. **Publication:** That the City Secretary is directed to cause this ordinance to be published in a newspaper of general circulation according to law.
- V. **Effective Date:** That this ordinance shall become effective 10 days from passage.

PASSED, APPROVED AND ADOPTED this the 19 day of November, 2002.



ATTEST:

  
\_\_\_\_\_  
Connie Ortiz, City Secretary

CITY OF LOCKHART

  
\_\_\_\_\_  
RAY SANDERS, MAYOR

APPROVED AS TO FORM:

  
\_\_\_\_\_  
Todd A. Blomerth, City Attorney

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 2 - WATER DISTRIBUTION SYSTEM STANDARDS

I. General

A. Standard Requirements

All water line connections shall be in compliance with the following rules, regulations, and standards.

1. Rules and Regulations for Public Water Systems, Texas Department of Health, latest edition.
2. Key Rate Grading Standards of the State Board of Insurance, latest edition.

B. Design Requirements

1. Minimum Pressure - Water lines shall be sized to provide a minimum dynamic pressure of 40 PSI at an instantaneous demand of 3.5 gallons per minute per connection.
2. Minimum Diameter - Except for service lines, all mains shall have a diameter of not less than six inches (6"). All mains in commercial and industrial areas shall have a diameter of not less than eight inches (8").
3. Gate Valves - Gate valves shall be provided on all water mains so that repairs can be made without inactivating more than 500 feet of water mains in commercial and industrial areas nor more than 800 feet in residential areas.
4. Water Mains - Water mains are defined as pipelines six inches (6") in diameter or greater. All water mains must extend to the most distance border of the proposed subdivision. A valve, plug, and concrete block shall be provided on the end of each main so that an extension of the main can be made without street right-of-way. Dead end mains are not acceptable except in special situations when approved by the City Engineer.
5. Service Lines - Service Lines are defined as the lines extending from the mains to the meters. All service lines shall be extended to within one foot (1') of lot lines, see Details.
6. Fire Hydrants - In residential areas, fire hydrants shall be spaced at not more than 600 feet intervals along the mains and located so that all areas are not more than 500 feet from a hydrant. In commercial, industrial, and high density areas, fire hydrants shall be spaced at not more than 300 foot intervals along the mains. Hydrants shall be located at street intersections when practical. If existing mains are present, hydrants shall be installed to meet coverage requirements. Hydrants shall be located approximately eight feet (8') back of curb.

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

7. Meters -Meter installations shall be completed and ready for service. The City of Lockhart will furnish and install the meter only.

## II. MATERIALS FOR WATER DISTRIBUTION SYSTEM

### A. General

All water main pipe used in distribution systems shall be rated for a minimum pressure of 150 PSI, shall display the appropriate AWWA specification stamp, shall display the NSF stamp, and be approved by Underwriters Laboratories or Factory Mutual for fire service. All pipe six inches (6") and larger shall be PVC, concrete steel cylinder, or D1, as detailed below. All main line fittings shall be CI, D1, or steel cylinder.

### B. PVC Pipe

All six inch (6") and larger PVC pipe shall conform to AWWA Specification C-900, SDR 18, Class 150. PVC fittings shall not be used with PVC pipe of six inch (6") diameter or larger.

### C. Concrete Steel Cylinder

1. Except as otherwise modified or supplemented herein, the latest revision of AWWA Specification C-301 for "Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids" shall govern the design, component materials, manufacture, and testing of all concrete-steel cylinder pipe furnished.

2. All pipes shall be AWWA Class 150 and shall be designed for an internal working pressure of 150 PSI and a minimum external load equivalent to six feet (6') of earth cover. Where the depth of bury of the pipe is indicated to be greater than six feet (6') in the engineering plans or job plans the design of the pipe shall be suitable for the earth loads indicated.

3. A tabulated layout schedule with reference to the stationing and grade lines shown on the job plans shall be submitted to the City for approval.

4. Each special section and length of straight pipe shall have plainly marked on the inside of the bell end the class of pipe and identification marks sufficient to show the proper location of the pipe by reference to job plans.

5. Pipe 16 inches through 42 inches in size shall be furnished in nominal lengths of 20 feet and pipe 48 inches through 72 inches in size shall be furnished in nominal lengths of 16 feet, except that this requirement may be modified by design requirements of the particular job.

6. Each joint of pipe shall be furnished with a rubber gasket and a 12 inch diaper.

### D. D1 Pipe

The requirements for D1 pipe shall meet the current AWWA Specification C-151 and shall be Class 50.

### E. CI Fittings

All fittings shall conform to the current AWWA Specification C-110. Mechanical joints shall be used for all underground fittings, shall be lined with cement mortar, and coated with a bituminous coating.

#### F. Fire Hydrants

1. General -Fire hydrants shall conform to AWWA Specification C-502 and shall have one (1) each 4-1/2 inch pumper connection and two (2) each 2-1/2 inch hose connections. Threads for hose connections shall be National Standard Threads.

2. Operating Nut -The operating nut shall be designed to prevent the seepage of rain into the top of the bonnet.

3. Bonnet -The bonnet or hydrant top shall be free-draining easily replaceable without shutting off the hydrant from the water main and shall contain means of automatically lubricating all operating threads.

4. Breakaway Design -The hydrant shall be of such design that the entire top barrel may be broken away, as by traffic collision without causing leakage and the broken hydrant shall be repairable without any excavation.

5. Main Valve -The main valve shall be compression closed with a 5-1/4 inch valve seat and the pipe connection shall be a six inch (6") mechanical joint.

6. Type- Hydrants shall be improved type Mueller.

#### G. Gate Valves

1. Gate valves shall be of the double disc, parallel seat mechanical joint type. Valves shall be iron body bronze mounted and designed for a minimum of 150 PSI working pressure conforming to the current AWWA Specification C-500.

2. Underground Installations -For underground installations non-rising stem and yoke valves with square operating nuts shall be used.

3. Direction of Opening -Direction of opening shall be counter clockwise.

4. Type -Valves shall be Mueller or equal.

#### H. Gate Valve Boxes

Valve boxes shall be the two piece screw type, adjustable by screwing the upper section over the lower section. Flanges on both sections shall serve to locate the upper section and hold it in place. Boxes shall be CI, shall have a cover designed for easy removal for access to the valve operating nut, and shall be marked "WATER" I for ready identification.

#### I. Service Connections

Water service shall be provided to each separate tract or lot. The service connection shall include the items as shown on Details.

1. Service Line: Service lines from the water mains to the meter installation shall be Type "K" soft copper conforming to ASTM Specification B-88t or latest revision and rated at 150 PSI working pressure. All service line material shall bear the NSF seal of approval for potable water pipe.

2. Meter Valve: Meter valves shall be Mueller or approved equal angle stop with compression fitting on one end and meter coupling nut on other end to connect to meter. Meter valves shall have wings for locking the valve in the closed position. Locking holes shall be not less than 7/16 inch diameter.

3. Meter Box: Meter boxes shall be pre-cast concrete, with covers, by Austin Concrete Works or approved equal.

4. Corporation Stop: Brass stops for connecting tubing to service clamps shall be Mueller or approved equal with compression by CC thread fittings.

5. Tapping Saddle: Tapping saddles shall be Mueller or approved equal double strap with CC thread.

### III. WATER DISTRIBUTION SYSTEM CONSTRUCTION

#### A. Trench Construction

1. Not more than 300 feet of trench shall be opened in advance of pipe installation and pipe shall be laid in all opened ditch by the end of the work day. A test type plug shall be installed in the open ends of all pipes at the end of each day.

2. All pipes shall be installed to provide a minimum cover of 36 inches, except that under road side ditches and road crossing, additional cover and encasement may be required.

3. Trenches shall be excavated by a trenching machine, except where hand trenching is required. The banks of trenches shall be vertical above the top of the pipe. Trench width shall extend four inches (4") to eight inches (8") beyond each side of the pipe bell. Depth of trench shall provide for installing in the exposed end of line.

4. In rock, the excavation shall be carried three inches (3") below the bottom of the pipe bell, and loose earth or gravel, thoroughly tamped, shall be used for backfilling to the grade of the bottom of the pipe line.

#### B. Bedding

##### Pipe Embedment Materials:

For pipe 12 inches in internal diameter and smaller, the embedment material shall meet ASTM S-33, size Nc. 67 (See Trench Detail)

For pipe 12-inches in internal diameter and larger, the embedment material shall meet ASTM C-33, No. 57 (See Trench Detail)

1. PVC pipe shall be installed on a minimum six-inch (6") embedment material. The pipe shall be covered by not less than twelve inches (12") of compacted embedment material.

2. DI pipe shall be installed on a minimum embedment material. The pipe shall be covered by not less than twelve inches (12") embedment material.

C. Installation -Pipe shall be installed in accordance with the manufacturer's recommended procedure for each type of pipe, using trench construction and bedding as set forth above.

1. DI pipe shall be wrapped with a polyethylene wrap of at least eight (8) mils thickness. The polyethylene wrap shall be at least two feet (2') longer than the pipe joint to provide overlap at each juncture. Plastic tape used to join pieces of the wrap shall be 1-1/2 inches wide and ten (10) mils thick.

2. The Developer may have soil resistivity testing performed by an independent testing laboratory. If such tests determine that the soil resistivity is greater than 1500 ohms per c.c., the polyethylene wrap may be deleted.

(2-4)

ADOPTED BY COUNCIL 4/28/87  
DATE(S), REVISED: 11/19/02

D. Backfill -After inspection of pipe installation and approval by the City given on any completed portion of the work the trench may be backfilled.

1. Amended, Embedment -Specified embedment material shall be placed as shown in details.

2. Backfill Materials for trenches not to be in proposed street areas, existing streets, or within 5' of the back of curb or edge of pavement must include specified embedment material and may be backfilled with excavated materials that void of rocks and other objects larger than 4" in diameter. (See Trench Detail)

3. Backfill in areas that will be in streets, existing streets or within 5' of the back of curb or edge of pavement must include specified embedment material up to the specified sub-grade elevation in the construction plans. (See Trench Detail)

#### E. Pipe Restraints

1. Pipe restraints shall be used at all valves, tees and fittings. Restraints shall be a minimum of three (3) joints of pipe or as indicated by the Engineer for dead end lines.

### IV. DISTRIBUTION SYSTEM TESTING AND DISINFECTING

#### A. Pressure Testing

1. After a pipeline section has been laid, services installed, valve-off, and at least six inches (6") of compacted backfill have been placed over the top of the pipe, the pipe shall be slowly filled with water in a manner that will expel all air from the pipeline. With the line full, the test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City. The pump, pipe connection, and necessary apparatus shall be furnished by the Contractor. The test pressure (Hydrostatic) shall be 150 PSI minimum and shall be maintained for one hour (1) inspected by the City Personnel, allowable leakage shall be determined by a water meter provided by the Contractor. At no time shall two or more lines in different size be tested at the same time. Contractor shall perform a preliminary test prior of calling City Personnel. One gauge shall be located at the pump and the other shall be located at a remote high point location on the line.

Allowable hydrostatic leakage rates must comply with the following formula:

$$L = \frac{ND}{7,400} (P - 15)$$

Where L = Allowable leakage, gph  
N = Number of joints in the length of pipeline tested  
D = Nominal diameter of the pipe, in.  
P = Pressure test during the leakage test, psig (150)

2. Contractor shall notify the City of Lockhart Water Department 48 hours in advance of opening valve(s) to fill new water mains. City personnel shall witness operation to prevent low water pressure within the area. Caution shall be taken in preventing cross-connection contamination. Contractor shall keep record of water loss when charging and flushing lines and submit records to the Water Department.

3. Final testing of each section shall be observed and approved by the City.

### B. Disinfection

After each pipeline section has been satisfactorily tested it shall be flushed and disinfected by the contractor using the following procedure:

1. Initial Flushing -The pipeline section shall be flushed prior to disinfection. Flushing shall be done through a fire hydrant opening if there is a hydrant on the end of the section, or through a tap on the end of the line which provides a two inch (2") orifice. The line shall be flushed for a period of time equal to one minute for each 100 feet of line, or until the water being discharged is no longer transporting visible particles, whichever is longer.

2. Chlorination -Chlorine may be added to the water in new lines by a chlorine gas-water mixture, direct feeding of dry gas, or a chlorine compound water mixture may be injected.

3. Samples shall be taken every 1000' of line from taps already in place or installed by the Contractor at his own expense. Samples shall be taken from a household type facet. Facet shall be a minimum 12" above the ground level. City Personnel shall witness the operation.

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

b. The application shall be continued until the water being discharged at the far end of the new section shows that the chlorine solution has reached the length of the new section, after which the valves shall be closed and the new section isolated for at least 24 hours. All valves, hydrants, and meter angle stops shall be operated during the chlorination process.

c. If at the end of the detention period of 24 hours the water does not indicate at least 10 ppm residual, a second dosage of 50 ppm shall be applied as before and retained for at least 12 hours, and this process shall be repeated until the residual at the end of the 12 hour period is at least 10 ppm.

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

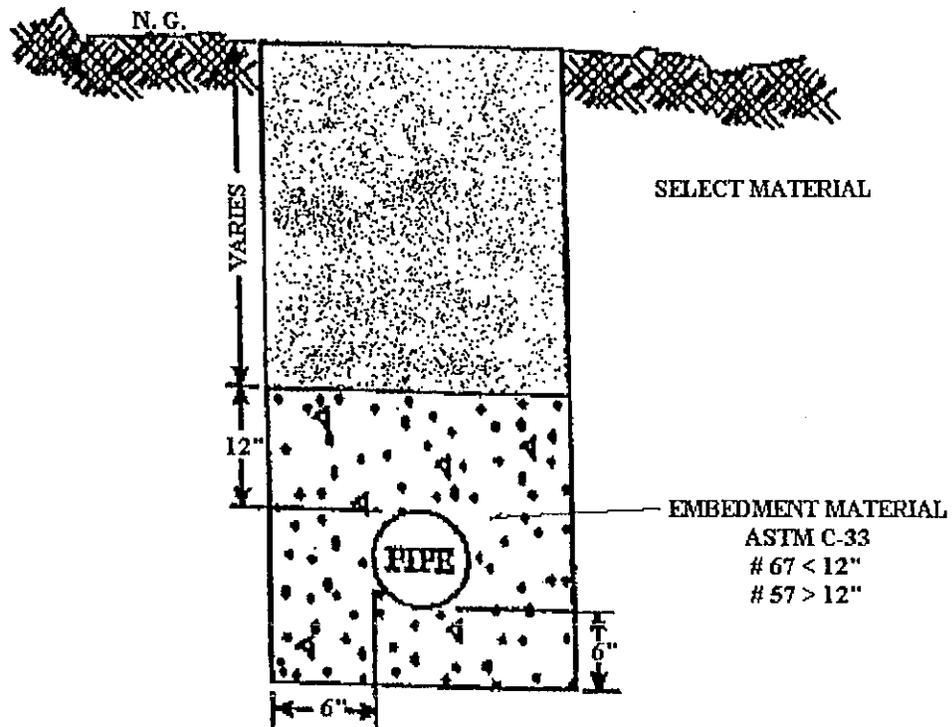
3. Final Flushing and Testing -Following the chlorination of each section, the section shall be thoroughly flushed until the water being discharged has the same chlorine residual as the water being used to feed the system. A sample of water, taken at the extremity of each newly constructed section, shall be obtained and submitted to the Texas State Department of Health for bacteriological examination. If the samples are not of the same purity and quality as the water injected into the section, the section will not be accepted. Samples shall be taken from taps located and installed in such a way as to prevent outside contamination. Results of the laboratory analysis shall be provided to the City. Samples shall be taken every 1000' of line from taps already in place or installed by the Contractor at his own expense. Samples shall be taken from a household type facet. Facet shall be a minimum 12" above the ground level. City personnel shall witness the operation.

WATER DISTRIBUTION SYSTEM DETAILS

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R.O.W. Trench Detail		W-1B	2-18

(2-7)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02



NOTE:  
 SELECT MATERIAL SHALL BE COMPACTED TO 95%  
 STANDARD PROCTOR WITHIN THE R.O.W. AND  
 90% COMPACTION WITHIN AN EASEMENT  
 (TEST METHOD TXDOT TEX 113-E

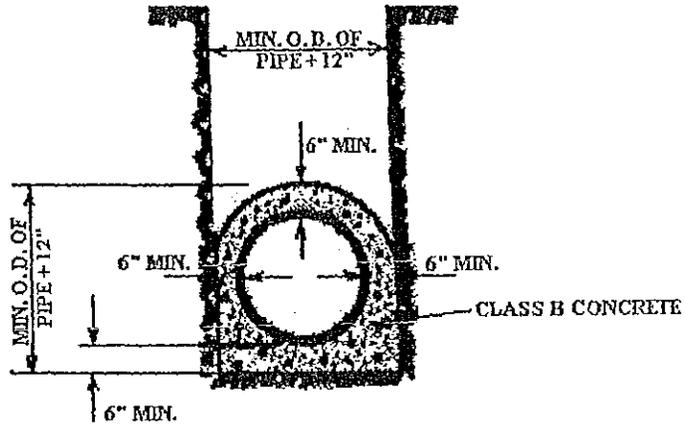
# TRENCH DETAIL

CITY OF LOCKHART

N.T.S.

W-1A  
 (2-8)

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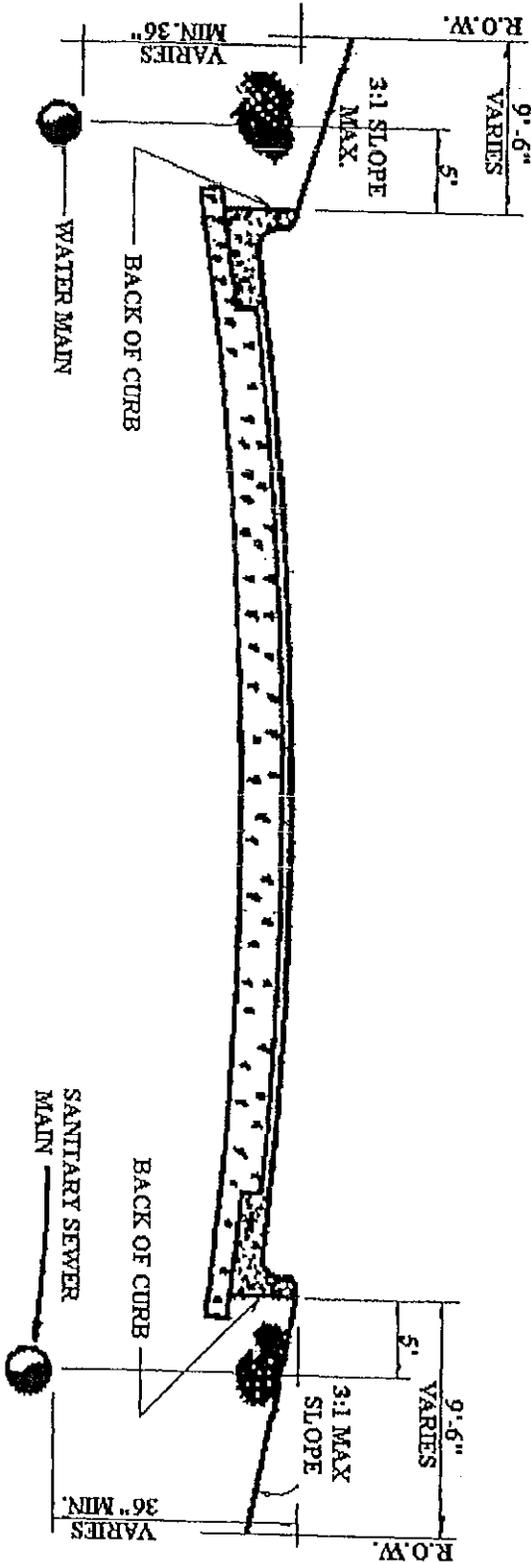
NOTE:  
 CONCRETE ENCASEMENT SHALL BE USED FOR  
 PROTECTION OF WATER MAINS WHEN REQUIRED.

**CONCRETE ENCASEMENT**  
 CITY OF LOCKHART N.T.S.

W-2  
 (2-9)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02

W-3  
(2-10)

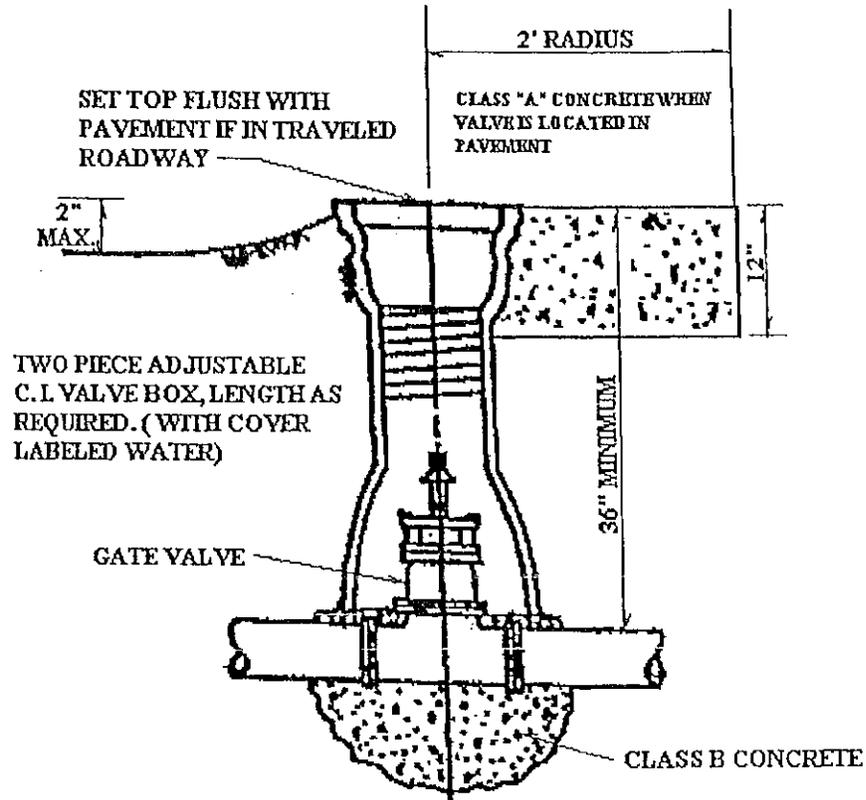


NOTE:  
WATER MAINS SHALL BE INSTALLED ON THE UPHILL SIDE  
OF THE STREET AND SANTARIY SEWER MAINS INSTALLED  
ON THE DOWNHILL SIDE OF THE STREET

# TYPICAL UTILITY PLACEMENT

CITY OF LOCKHART

N.T.S.



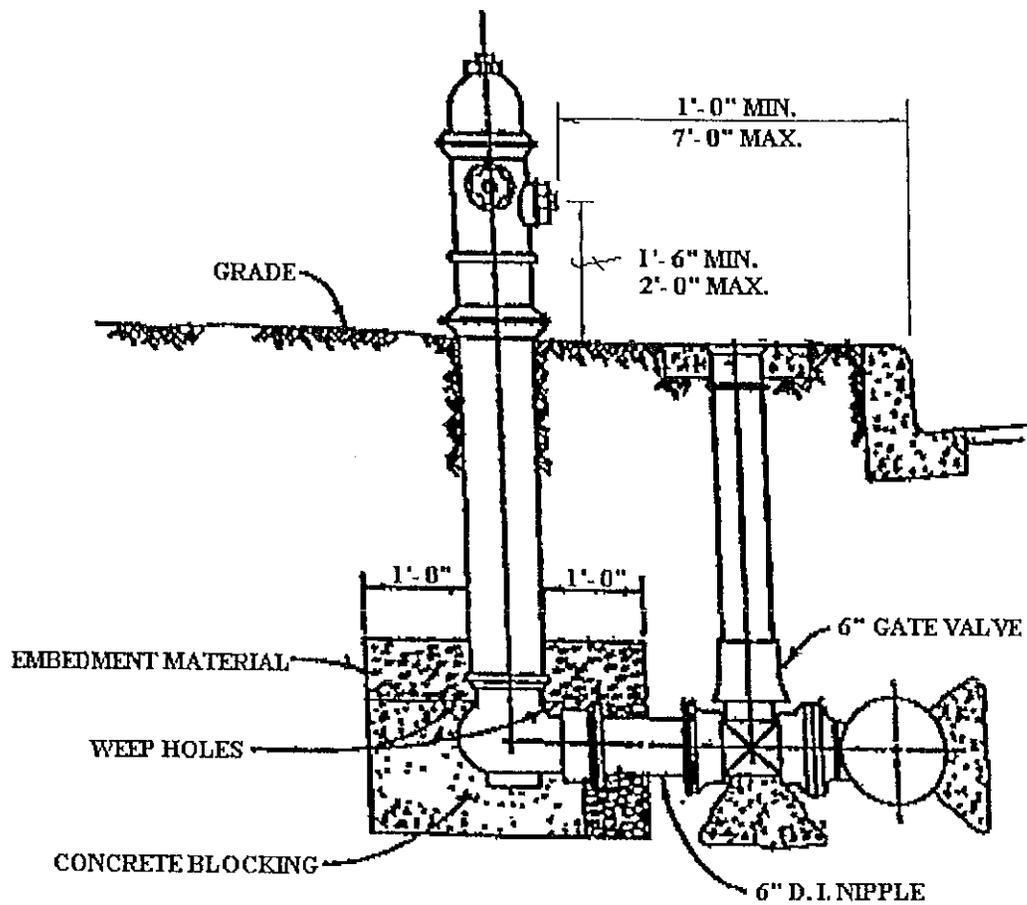
**NOTE:**

VALVE BOX SHALL NOT CONTACT WATER MAIN  
OR VALVE, VALVE AND VALVE BOX SHALL BE  
SUPPORTED BY BLOCKING

# VALVE INSTALLATION

W-4  
(2-11)

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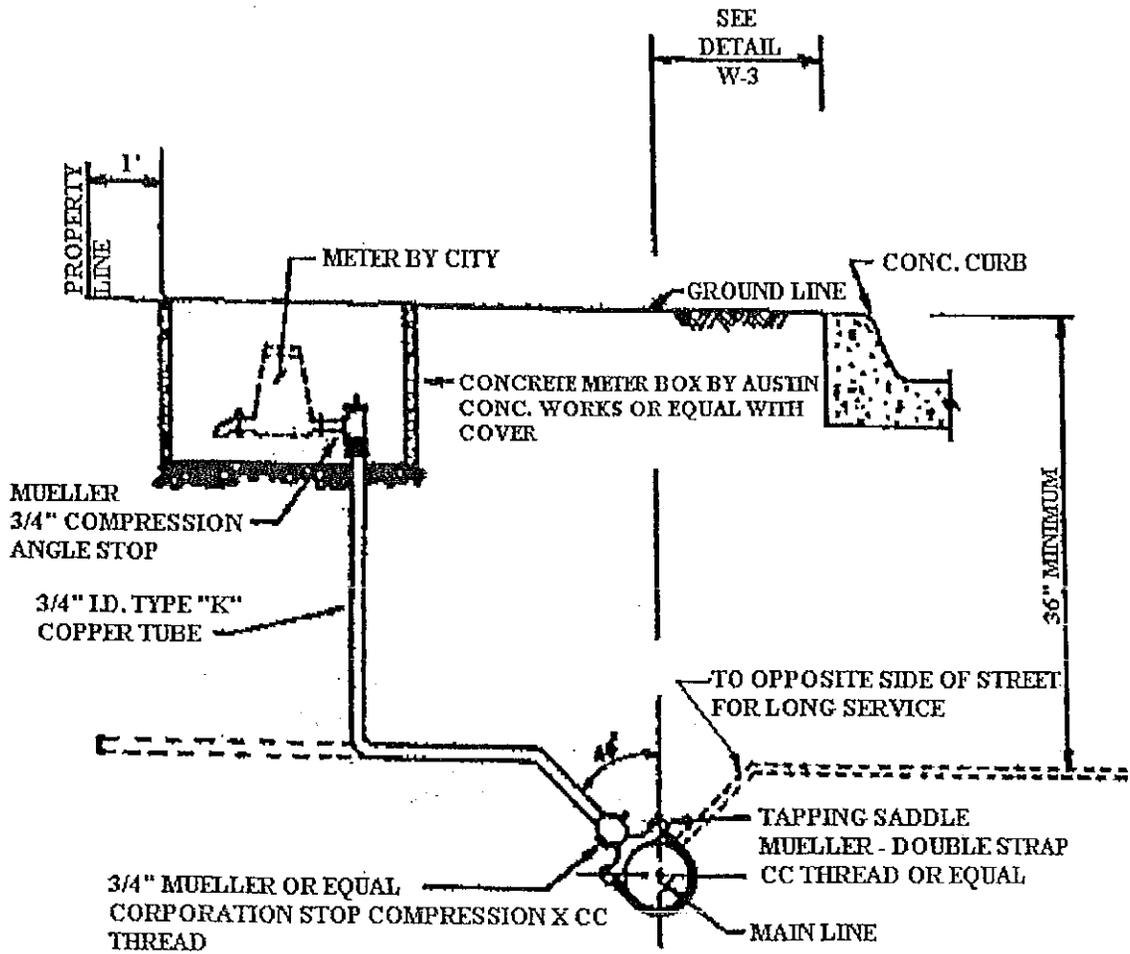
# FIRE HYDRANT DETAIL

CITY OF LOCKHART

N.T.S.

W-5  
(2-12)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



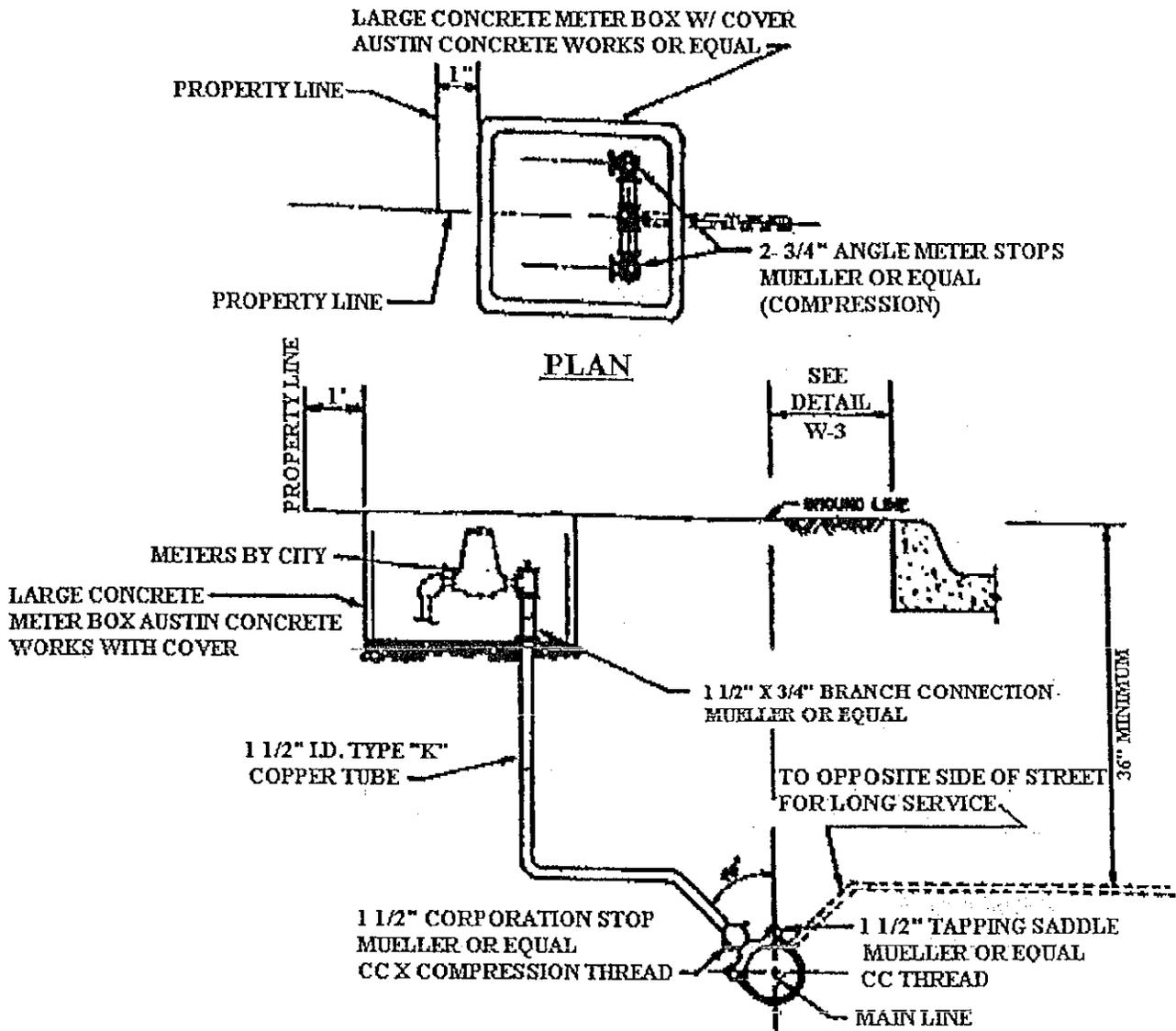
# SINGLE SERVICE CONNECTION

CITY OF LOCKHART

N.T.S.

W-6  
(2-13)

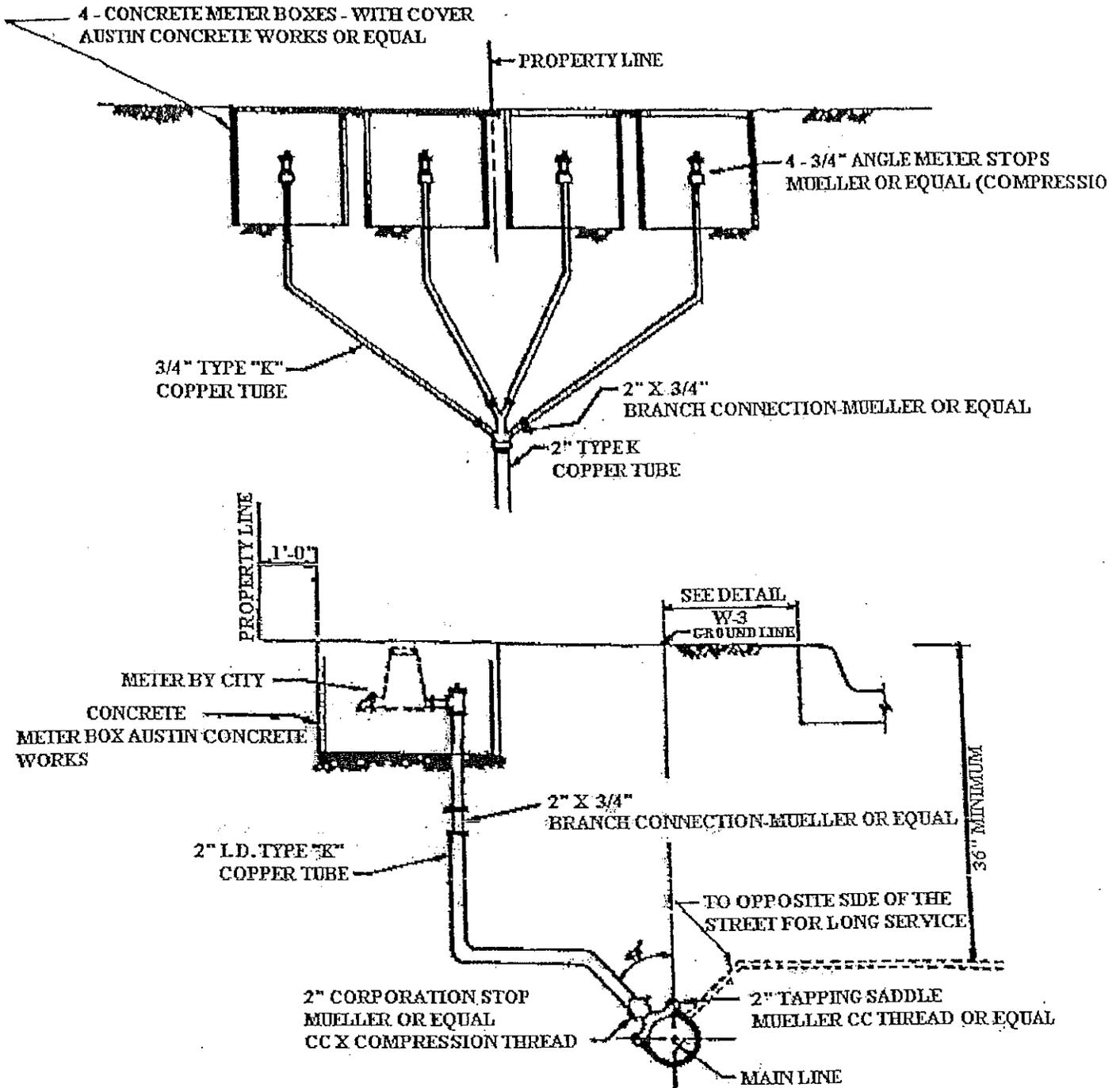
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**DOUBLE SERVICE CONNECTION**  
CITY OF LOCKHART                      N.T.S.

W-7  
(2-14)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



# MULTI SERVICE CONNECTION

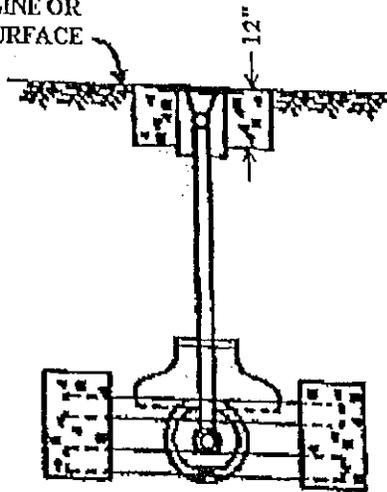
CITY OF LOCKHART

N.T.S.

W-8  
(2-15)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02

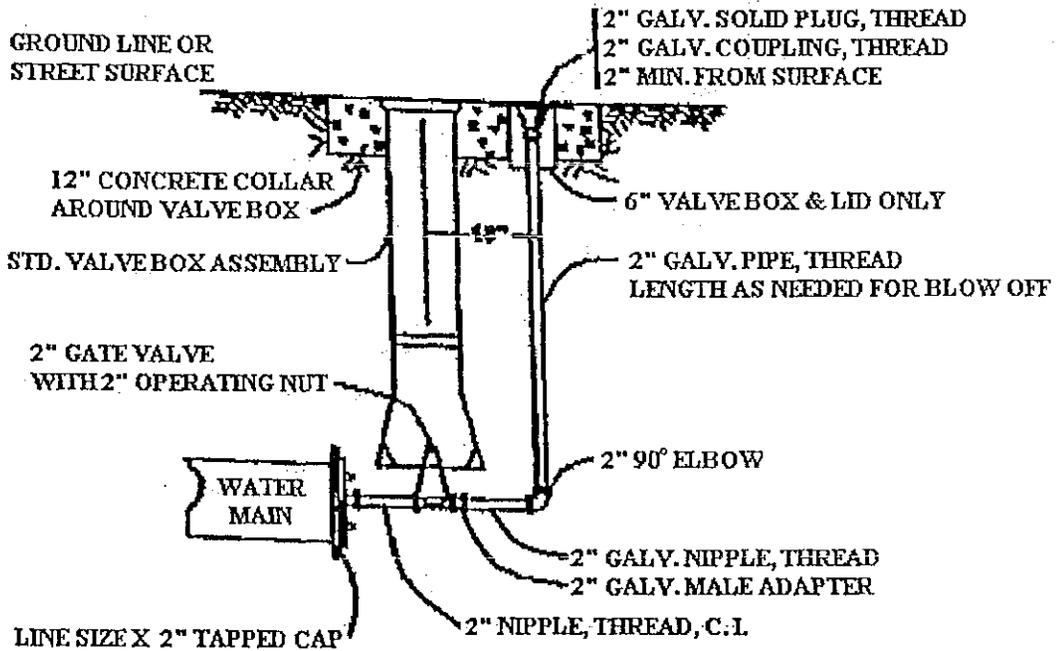
GROUND LINE OR  
STREET SURFACE



**NOTES:**

1. EMBED ALL C.L FITTING IN # 67 ROCK.
2. BLOCKING ARRANGEMENT & BEAM SCHEDULE SHALL BE USED FOR END CAPS AND PLUGS, OMITTING BLOW-OFF FITTINGS.
3. BEAMS SHALL BE EXTENDED 3' BEYOND TRENCH WALL.
4. CONCRETE BLOCKING SHALL BEAR ON UN-DISTURBED SOIL IN TRENCH WALL.

**2" BLOW OFF VALVE**



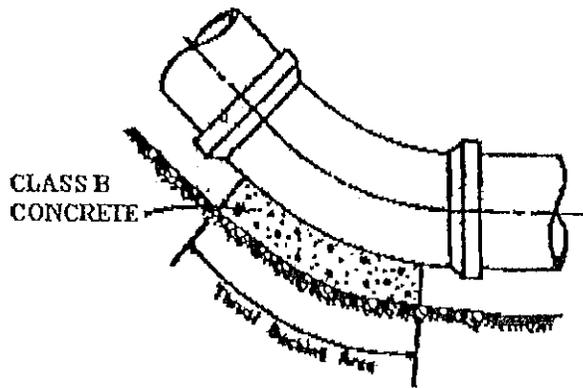
**2" BLOW - OFF VALVE**

CITY OF LOCKHART

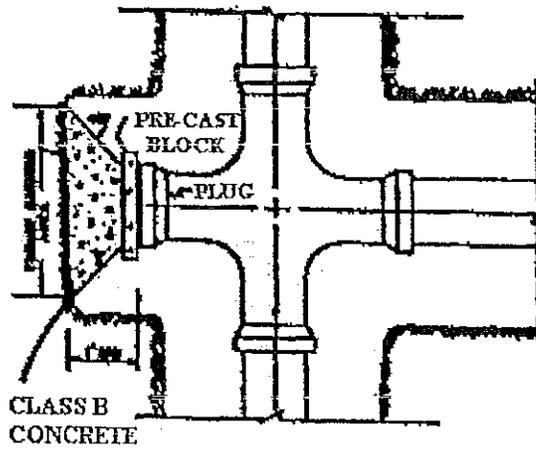
N.T.S.

W-9  
(2-16)

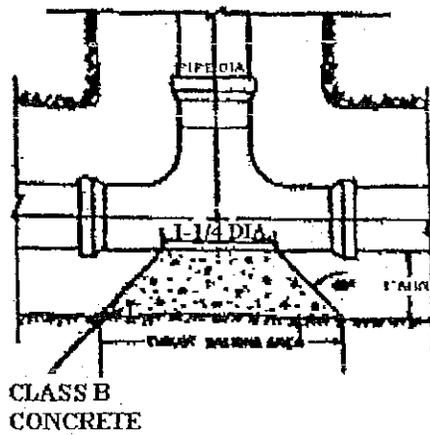
REVISED: 11/19/02



HORZ. BENDS



CROSS OR END



TEE

PIPE DIA.	TEE, CROSS, OR END	1/4" BEND	1/8" BEND	1/16" BEND
6"	1.00	1.00	.75	.50
8"	1.60	1.60	1.25	0.90
12"	5.40	5.40	4.20	3.00
16"	11.40	11.40	8.70	6.00

## THRUST BLOCKING DETAILS

CITY OF LOCKHART

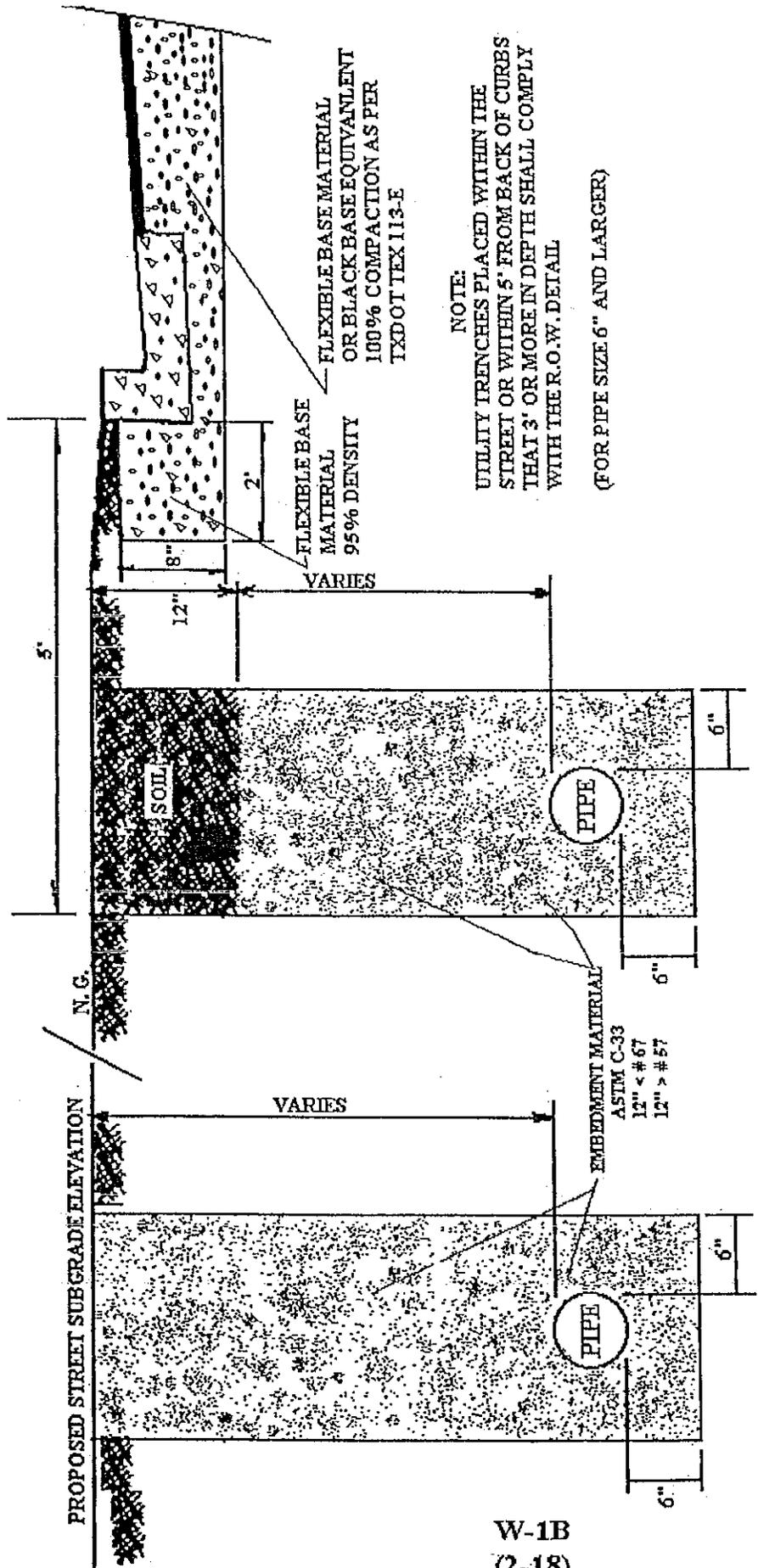
N.T.S.

W-10

(2-17)

ADOPTED BY COUNCIL 4/28/87

DATE (S) REVISED: 11/19/02



NOTE:  
 UTILITY TRENCHES PLACED WITHIN THE  
 STREET OR WITHIN 5' FROM BACK OF CURBS  
 THAT 3' OR MORE IN DEPTH SHALL COMPLY  
 WITH THE R.O.W. DETAIL  
 (FOR PIPE SIZE 6" AND LARGER)

**R.O.W.**  
**TRENCH DETAIL**  
 CITY OF LOCKHART N.T.S.

W-1B  
 (2-18)

ADOPTED BY COUNCIL 4/28/02  
 DATE (S) REVISED: 11/19/02

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 3 - SANITARY SEWER SYSTEM STANDARDS

I. GENERAL DESIGN REQUIREMENTS

All new subdivisions must have sanitary sewer facilities constructed in general compliance with Design Criteria of the TDWR, and the State Department of Health. The following design considerations must be observed:

A. No sewer main shall be less than six inches (6") in diameter and shall have a minimum velocity, flowing full or one-half full, of two feet (21) per second based on Manning's formula. Minimum grade for a six inch (6") line shall be 0.5 percent.

B. Sewer line shall be designed with straight alignment where possible. Horizontal radius of bends, where required, shall not be less than 300 pipe diameters.

C. All lines shall be designed for trench and dynamic loads.

D. Unless otherwise approved, manholes shall be constructed at all changes in grade, at changes in pipe size, at intersections with other mains, and any change in direction. When required by City Engineer a manhole with stub-outs shall be installed at the termination of a line. In straight-ways manholes shall be spaced at maximum distances of 500 feet.

E. Where water and sewer lines are installed in the same area, a minimum separation of nine feet (91) between the outside pipe diameters shall be maintained.

F. Sewer service lines shall be extended to the street right-of-way lines.

II. MATERIALS

A. Gravity Flow Lines

Gravity flow sewer lines shall be constructed of PVC pipe which conforms to ASTM Specification ASTM F-679 SDR-26

B. Pressure Lines

Force mains shall be constructed of four inch (4") or larger PVC pipe with PVC gasket fittings. All PVC pipe four inch (4") and larger shall have an SDR of 26 and a pressure rating of 160 PSI. Fittings used in line construction shall be CI mechanical joint.

(3-1)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

C. Aerial Crossings

Where aerial crossing of creeks are required to maintain grade, ductile iron pipe, Class 150 shall be used with not less than one concrete support per joint. Support size design criteria shall be based upon there being no damage to the line from a 100 year frequency flood.

D. Manholes

Manholes lids and covers, specification ASTM - A 48" 30 (weight of 460 lbs. Outside diameter of the lid shall be 32 inches. Manhole ring and cover shall be specified for standard or bolted water tight or as approved by the City Engineer.

E. Cleanouts

Cleanouts shall be provided at the end of each line when a manhole is not required. A CI cleanout casting Alamo Iron Works No.813-45, or approved equal shall be used.

III. WASTEWATER COLLECTION SYSTEM CONSTRUCTION

A. General

Batter boards shall not be used for grade control; laser beam grade control shall be the only method that will be acceptable.

1. Construction will begin at the lowest pipe elevation and continue upgrade with bells facing upgrade. Construction shall be continuous with construction of branch mains deferred until the main is constructed to the manholes at the branch junction point.

2. Not more than 300 feet of trench shall be opened in advance of pipe installation and pipe shall be laid in all opened ditch by the end of the work day. A test type plug shall be installed in the open ends of all pipes at the end of each day.

B. Trench Construction

1. The maximum trench width shall be six (6) pipe diameters. The minimum trench width (to provide room for embedment) shall be as follows:

Pipe Size (inches)	Trench Width (inches)
6	18
8	24
10	26
12	30
15	30

2. The trench shall be excavated to a depth to permit a minimum bedding thickness of four inches (4") under the pipe.

3. The trench shall be excavated to a depth to permit a minimum embedment thickness of six inches (6") under the pipe.

#### C. Embedment & Backfill

1. Embedment-Specified embedment material shall be placed as shown in trench details.

2. Backfill Material for trenches not to be in proposed street areas, existing, or within 5' of the back of curb or edge of pavement must include specified embedment material and may be backfilled with excavated material that are void of rocks and other objects larger than 4" in diameter. (See Trench Detail)

3. Backfill in areas that will be in streets, existing streets or within 5' of the back of curb or edge of pavement must include specified embedment material up to the specified sub-grade elevation in the construction plans. (See Trench Detail)

#### D. Manholes

Manholes shall be constructed of four (4') foot diameter reinforced concrete pipe meeting the requirements of ASTM Specifications C-478 or pour monolithically. Concrete rings shall be used to adjust manhole heights to match existing grade, maximum height shall not exceed 12". Cast Iron frames and covers shall conform to ASTM Specifications A-48 Class 30. Manhole rings and covers shall weight a minimum of 460, pounds. Outside diameter of the lid shall be thirty-two inches (32"). Lids are to be solid with no pick holes. Manhole covers shall be marked "Sanitary Sewer". When required by the City, sealed bolted type (water tight) cover shall be used. (See Detail) Pipe connections to manholes shall be cored and water tight manhole connectors Kor-N-Seal I & II or equal ASTM C.

1. The invert shall be built of concrete or half-section of pipe. If built of concrete, the invert shall be true and trowel to a smooth hard finish.

2. Pipe connections to manholes shall be made water tight using a gasket around the pipe. The gasket pipe shall then be grouted into place, using a stiff mix non-shrink grout, via knocked out holes in concrete pipe walls. Steps shall not be provided. Drop manholes shall be constructed as shown in the Details.

#### IV. TESTING

##### A. Deflection Testing for PVC Pipe

After backfilling, the line shall be tested for excessive deflection. A mandrel of approved design having an outside diameter of 95% of the inside diameter of the pipe to be tested shall be pulled through the line. Should the mandrel reach an impasse, the line shall be uncovered and repaired. The entire sanitary sewer main system shall be tested for excessive deflection.

(3-3)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

## B. Infiltration-Exfiltration Testing

1. The allowable infiltration-exfiltration leakage shall not exceed 200 gallons per inch diameter per mile per 24 hours.

2. After completing backfill of each section of wastewater line, the Contractor shall conduct a air test and shall provide approved plugs to seal manhole outlets at the downgrade and upgrade ends of test section. The upgrade manhole shall be filled with water to a point not less than six feet (6l) above the pipe crown of the test section. Accurate measurements of all additional water required to maintain this level for four (4) hours shall be used to calculate ex filtration rate.

3. The use of an air test in lieu of the hydrostatic test may be used if prior approval is given by the City's Engineer. Air testing shall be in accordance with recommended practice of the Uni-Bell Plastic Pipe Association Publication UNI-B-6-79.

4. Final testing of each section shall be observed and approved by the City.

## C. Manhole Testing

1. Vacuum Testing: All lift holes and exterior joints shall be plugged with non-shrink grout shall be placed in horizontal joints prior to testing. All pipes entering the manhole shall be plugged. Stub-outs, manhole boots, and pipe plugs shall be secured to prevent movement while the vacuum is drawn. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump shut off, with all valves closed, the for the vacuum to drop to 9 inches of mercury shall not be less than 3 minutes. Test shall be repeated after repairs have been made.

## D. Mandrel Testing (Deflection Testing)

Test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of five percent. If a pipe section fails to pass the deflection test, the problem shall be corrected, and a second test shall be conducted after the final backfill has been in place an additional 30 days. The line shall be re-tested low air pressure test for leakage.

(3-4)

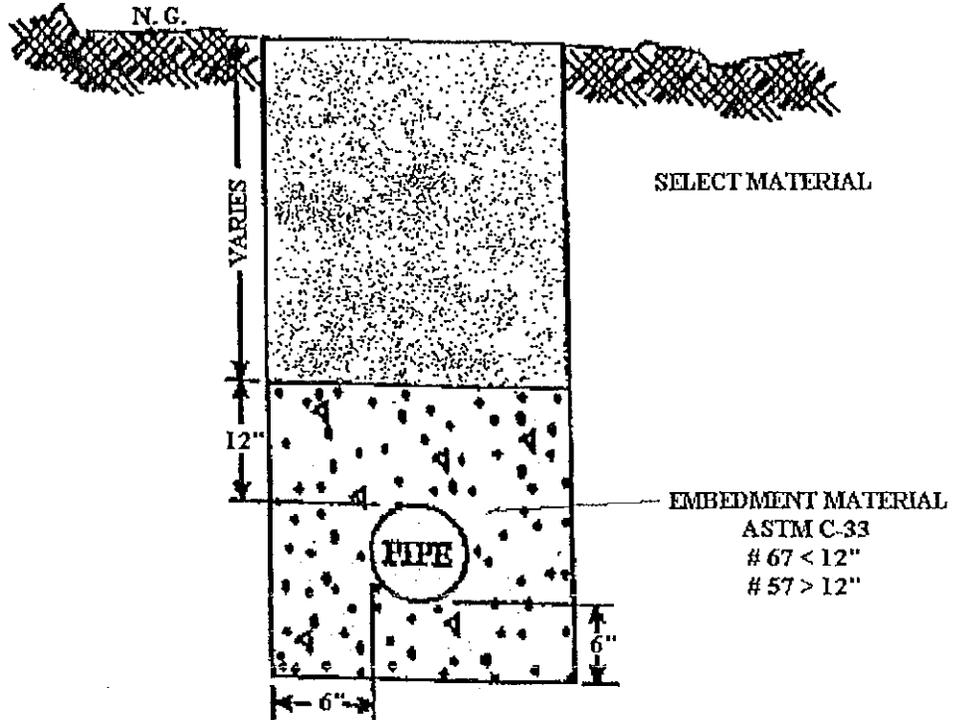
ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

SANITARY SEWER SYSTEM DETAILS

Details		Detail No.	Page
Bedding and Backfill	(REVISED)	SS-1A	3-6
Concrete Encasement		SS-2	3-7
Standard and Deep Service Connection		SS-3	3-8
Pre-Cast Concrete Manholes	(REVISED)	SS-4	3-9
Monolithic Manholes	(REVISED)	SS-5	3-10
Drop Manhole	(REVISED)	SS-6	3-11
Manhole Ring Encasement	(REVISED)	SS-7	3-12
Standard Cleanout	(REVISED)	SS-8	3-13
R.O.W. Trench Detail		SS-1B	3-14

(3-5)

ADOPTED BY COUNCIL 4/28/02  
DATE(S) REVISED: 11/19/02



NOTE:  
 SELECT MATERIAL SHALL BE COMPACTED TO 95%  
 STANDARD PROCTOR WITHIN THE R.O.W. AND  
 90% COMPACTION WITHIN AN EASEMENT  
 (TEST METHOD TXDOT TEX 113-E)

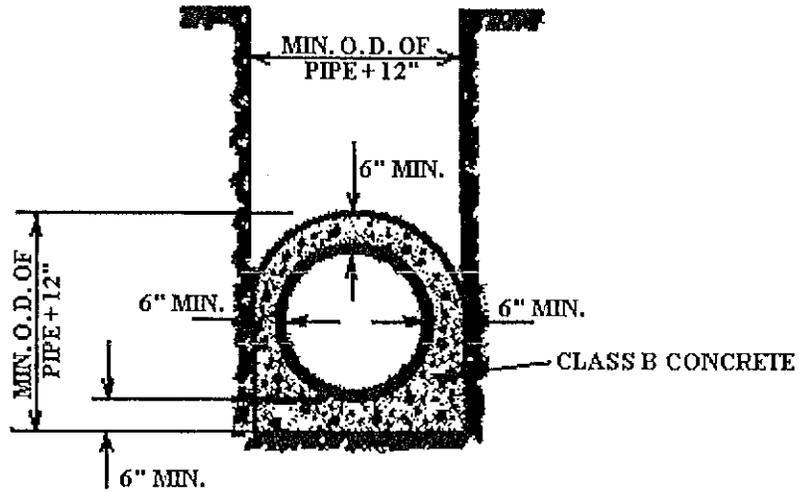
(TRENCH DETAIL SHALL BE USED WHEN TRENCH IS MORE THAN 5' BEHIND  
 CURB OR IN DEDICATED EASEMENTS THAT ARE MORE THAN 5' BEHIND CURBS)

# TRENCH DETAIL

CITY OF LOCKHART N.T.S.

SS-1A  
 (3-6)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02

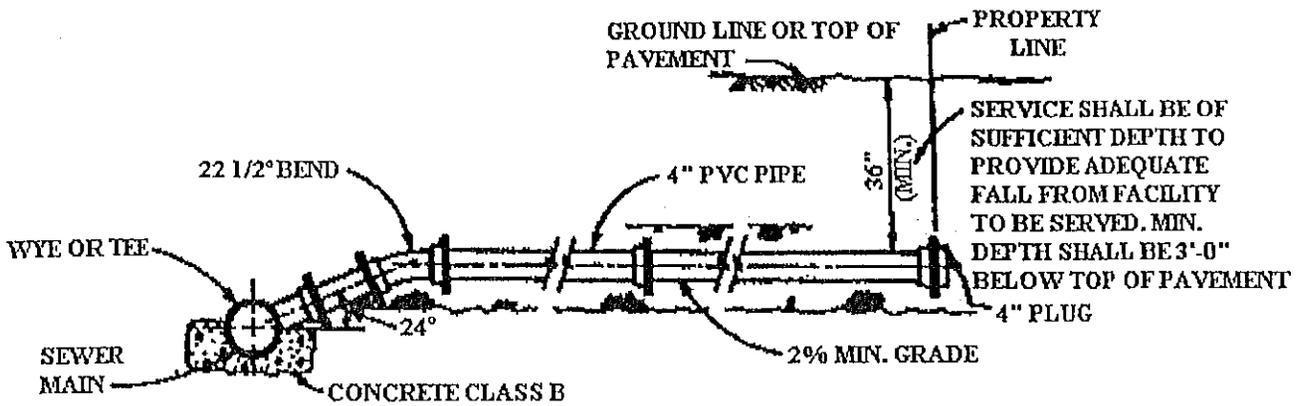


NOTE:  
 CONCRETE ENCASEMENT SHALL BE USED FOR  
 PROTECTION OF WATER MAINS WHEN REQUIRED.

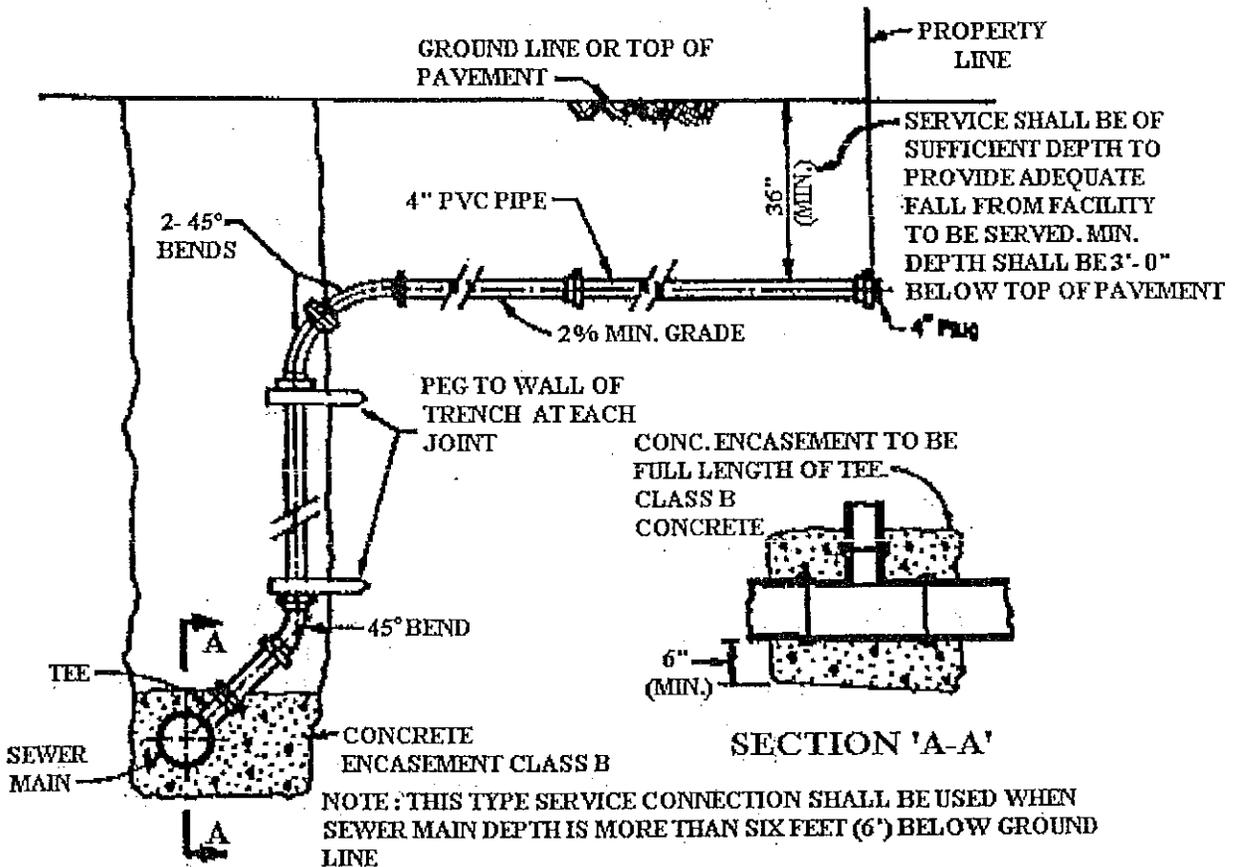
**CONCRETE ENCASEMENT**  
 CITY OF LOCKHART N.T.S.

SS-2  
 (3-7)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



## STANDARD SERVICE CONNECTION



## DEEP SERVICE CONNECTION

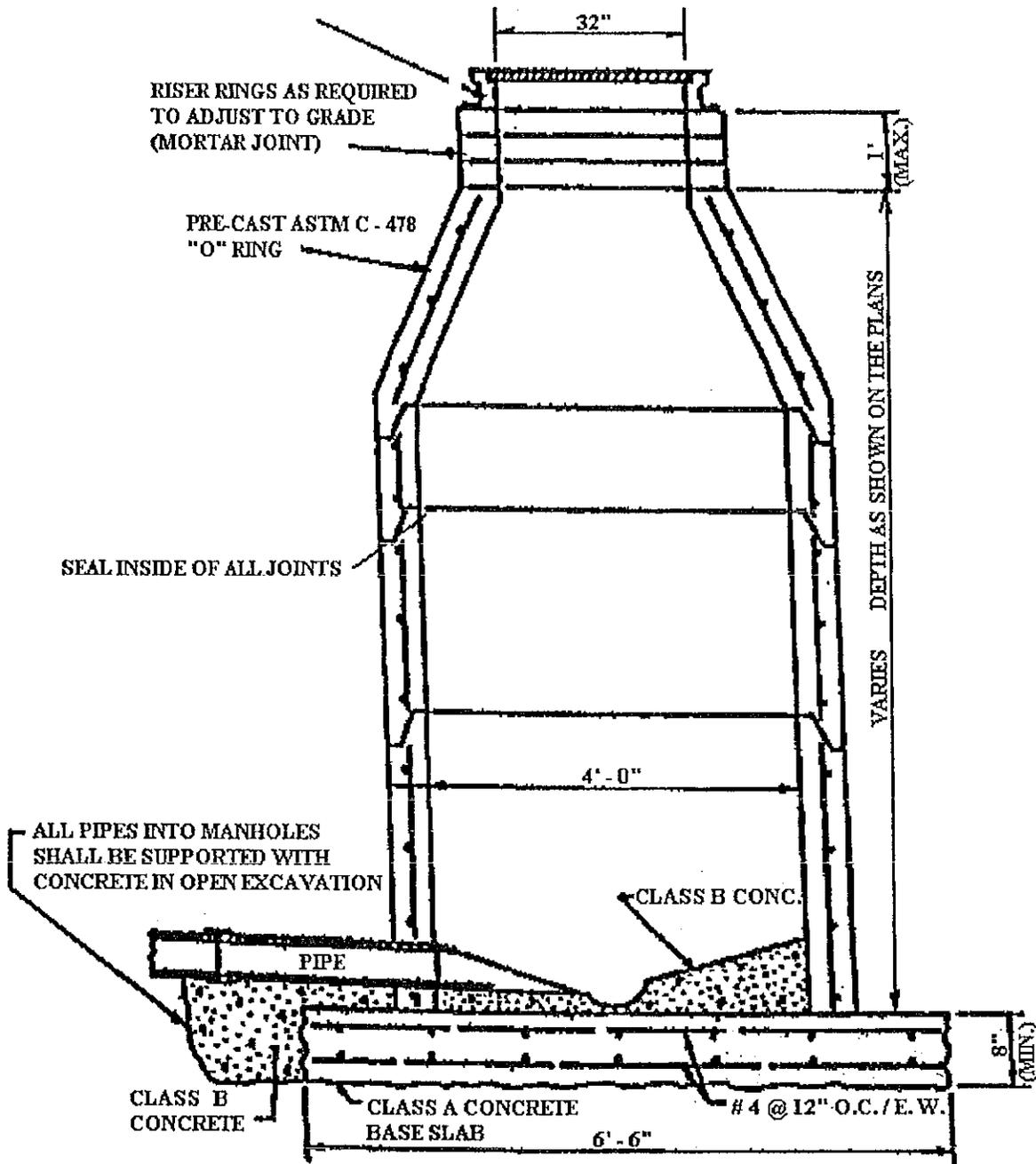
CITY OF LOCKHART N.T.S.

SS-3

(3-8)

ADOPTED BY COUNCIL 4/28/87

DATE (S) REVISED: 11/19/02



# PRECAST CONCRETE MANHOLE

CITY OF LOCKHART

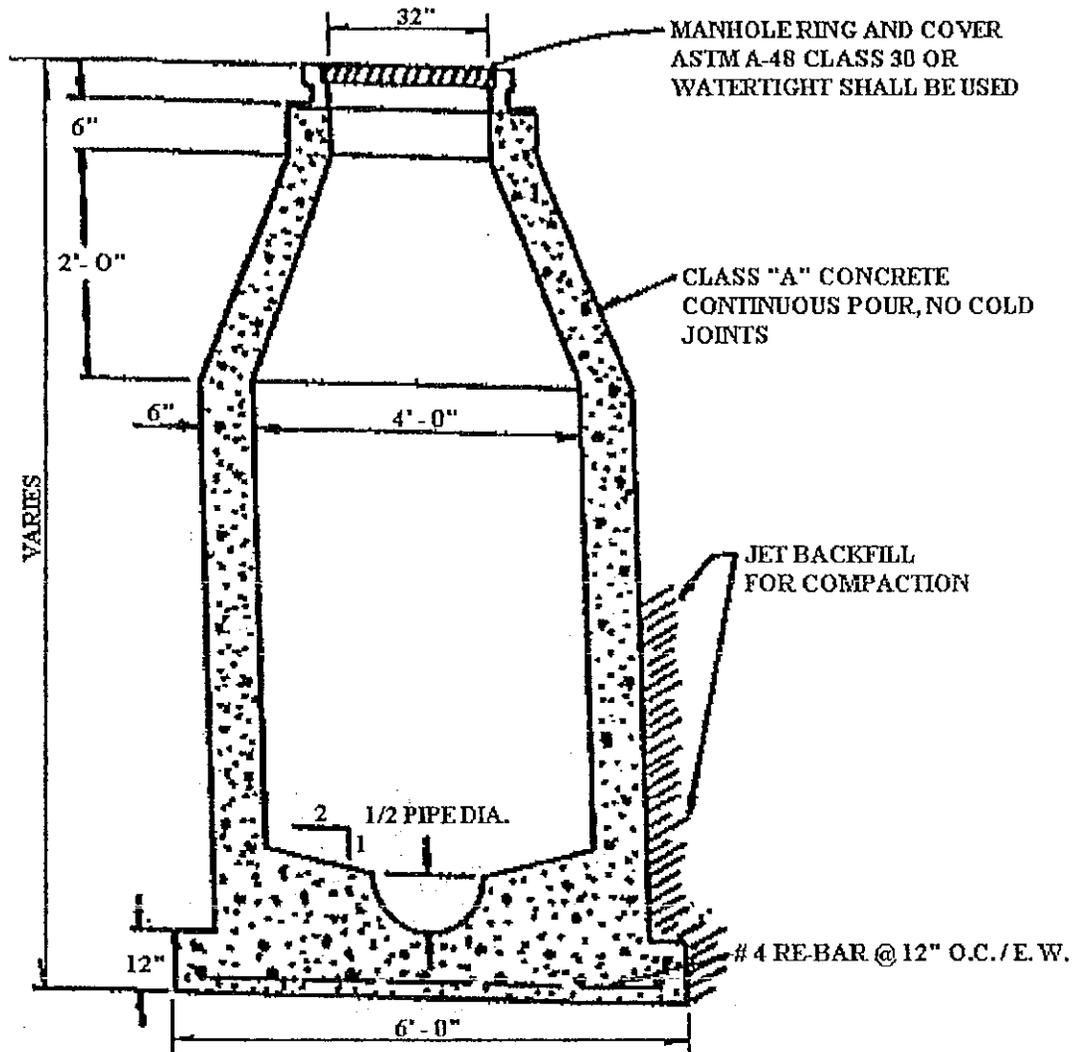
N.T.S.

SS-4

(3-9)

ADOPTED BY COUNCIL 4/28/02

DATE (S) REVISED: 11/19/02



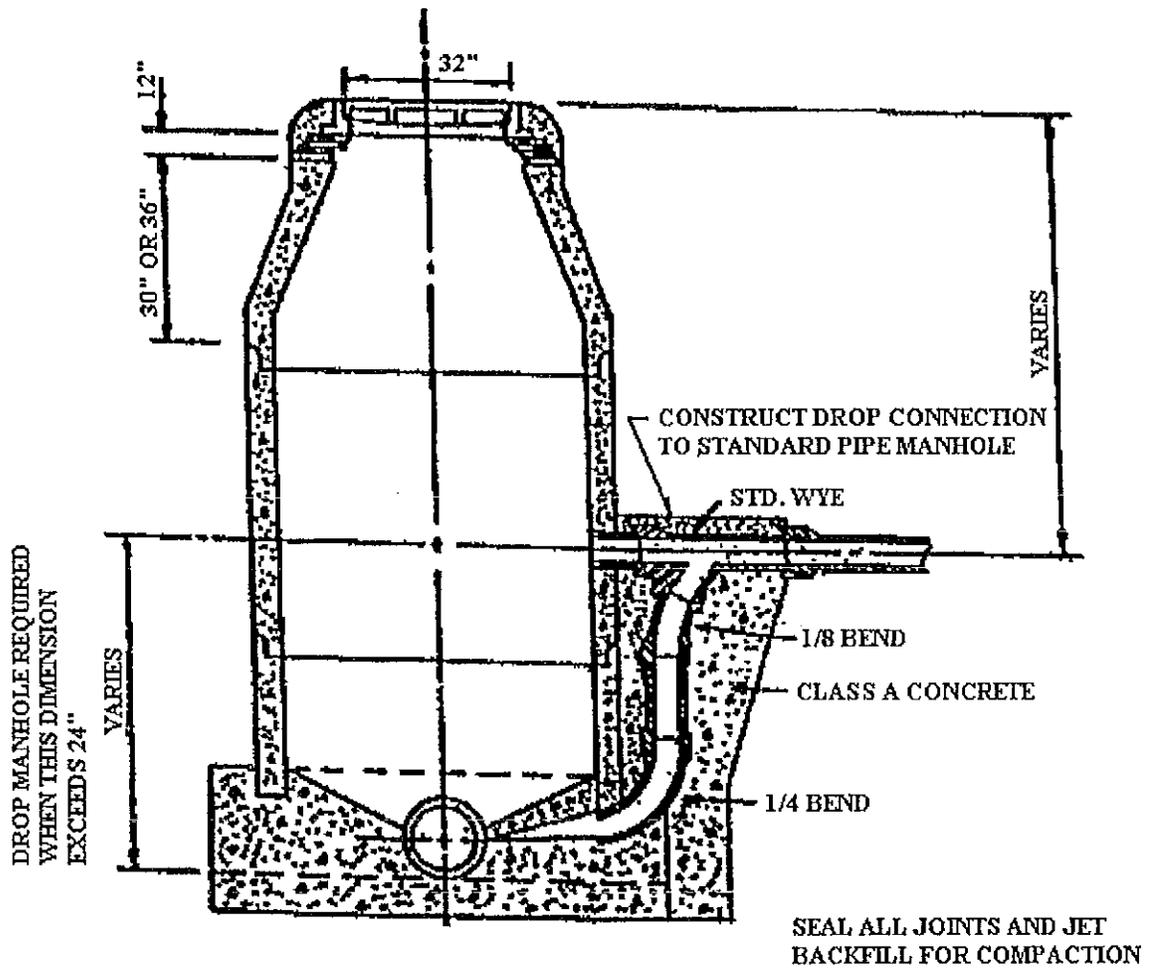
# MONOLITHIC MANHOLE

CITY OF LOCKHART

N.T.S.

SS-5  
(3-10)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02

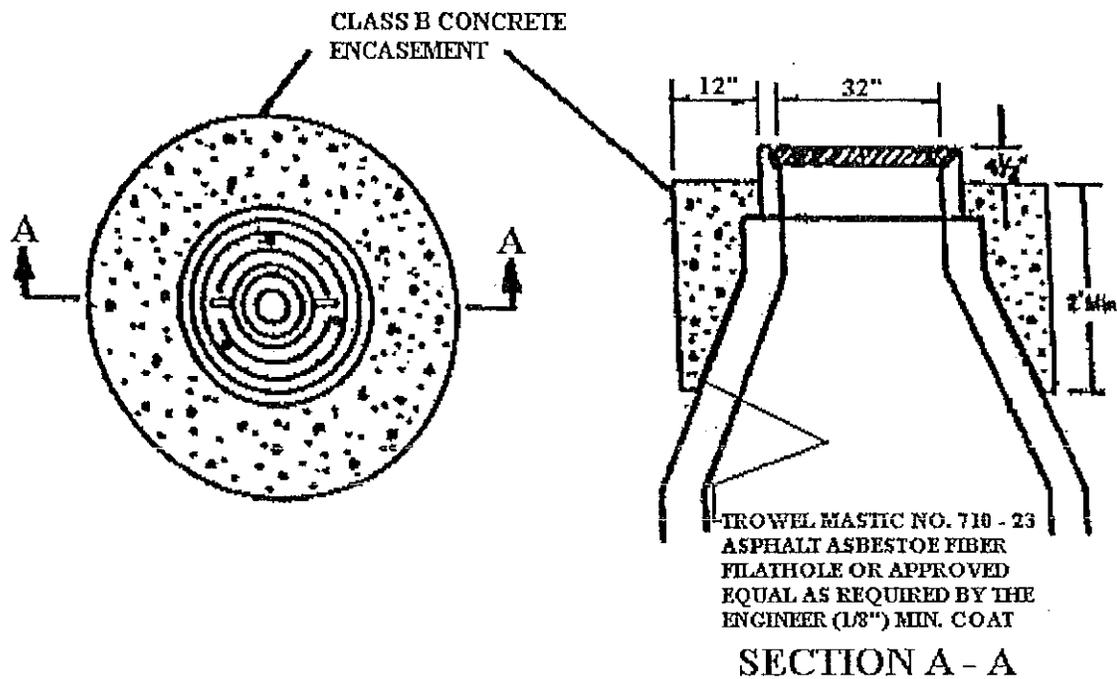


# DROP MANHOLE

CITY OF LOCKHART . N.T.S.

SS-6  
(3-11)

ADOPTED BY COUNCIL 4/28/02.  
DATE (S) REVISED: 11/19/02

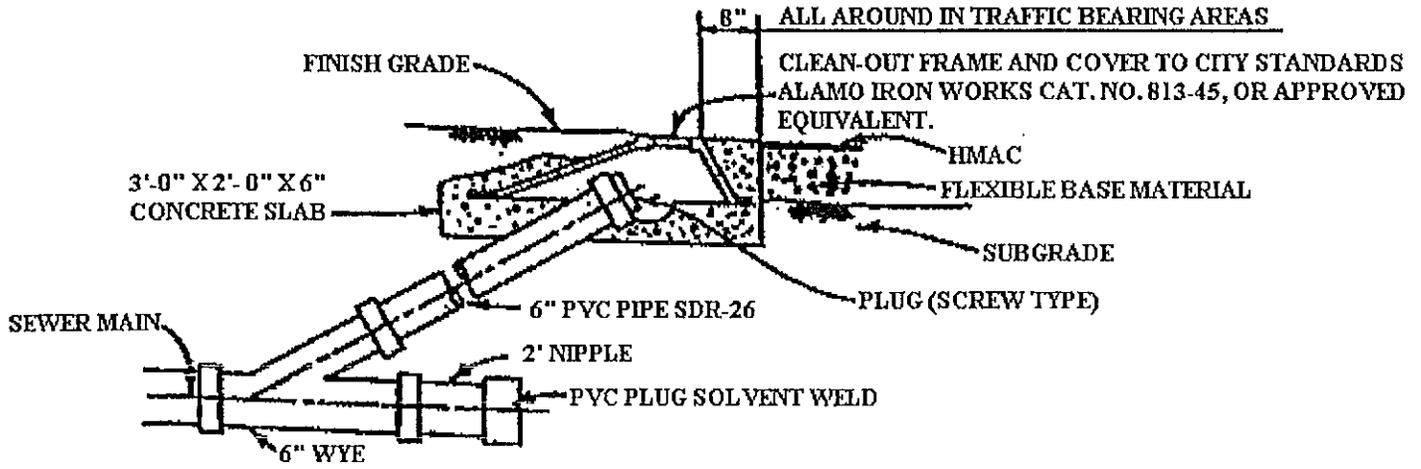


NOTE: MANHOLE RING ENCASEMENT IS  
 REQUIRED ON ALL MANHOLES

**MANHOLE RING ENCASEMENT DETAIL**  
 CITY OF LOCKHART N.T.S.

SS-7  
 (3-12)

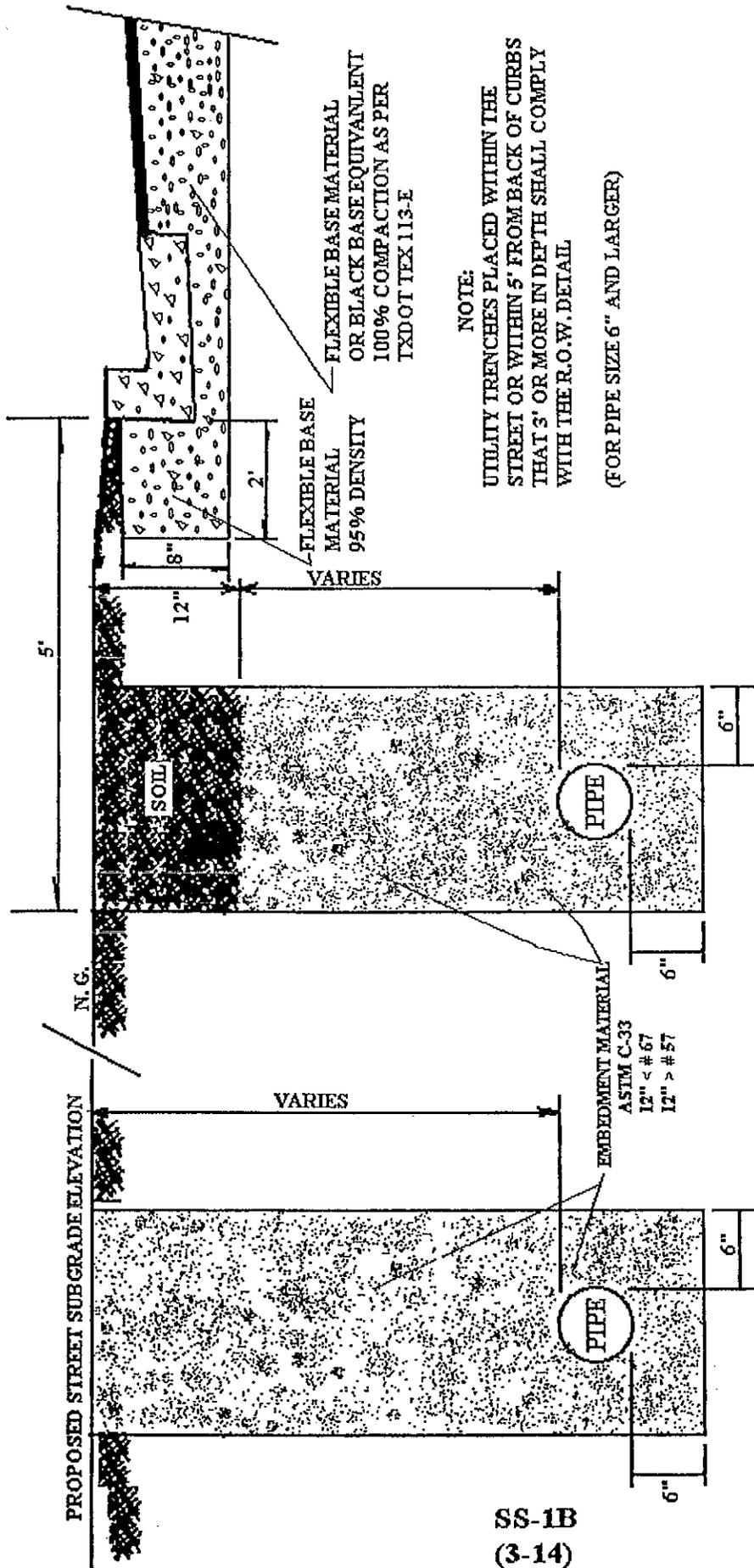
ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



**CLEAN-OUT DETAIL**  
 CITY OF LOCKHART N.T.S.

SS-8  
 (3-13)

ADOPTED BY COUNCIL 4/28/87  
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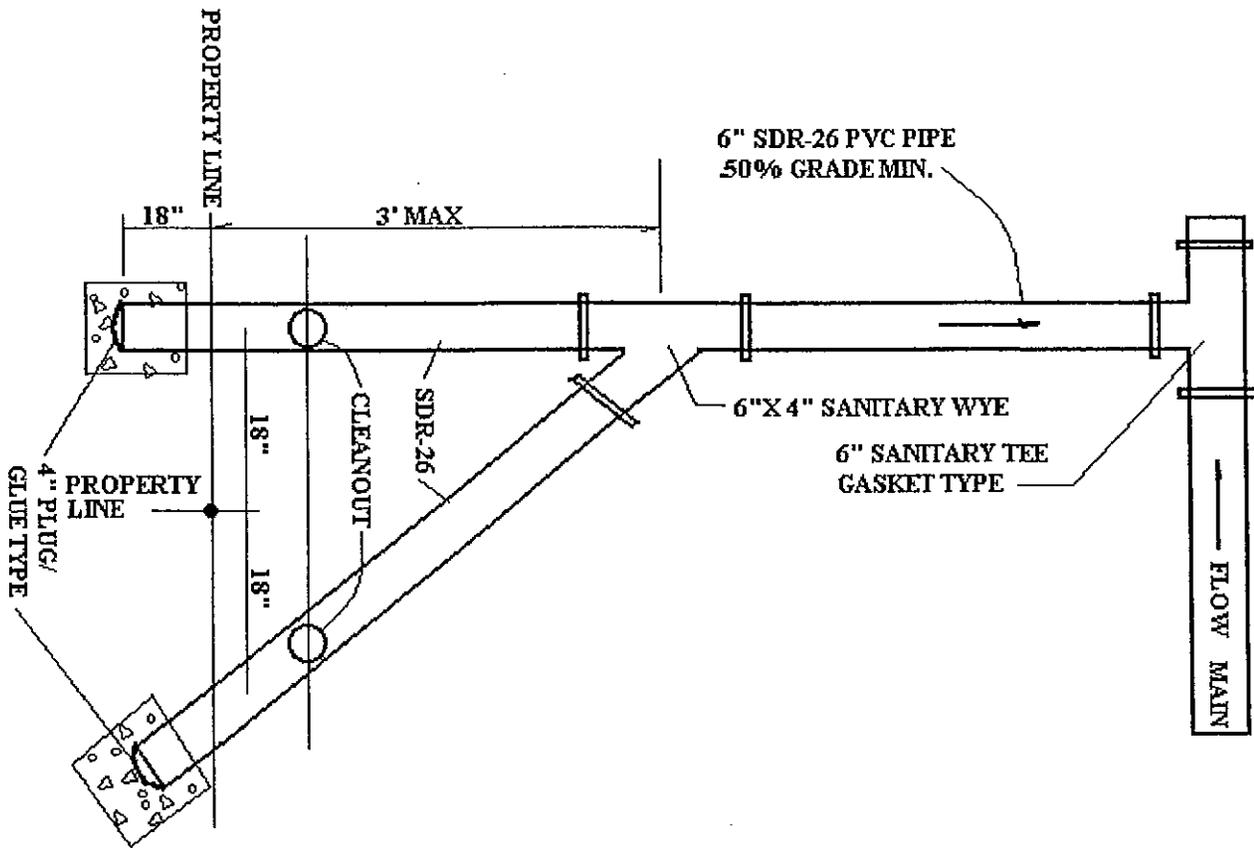


**NOTE:**  
 UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5' FROM BACK OF CURBS THAT 3' OR MORE IN DEPTH SHALL COMPLY WITH THE R.O.W. DETAIL (FOR PIPE SIZE 6" AND LARGER)

**R.O.W.**  
**TRENCH DETAIL**  
 CITY OF LOCKHART N.T.S.

SS-1B  
 (3-14)

ADOPTED BY COUNCIL 4/28/02  
 DATE (S) REVISED: 11/19/02



# DUAL SERVICE CONNECTION

CITY OF LOCKHART

N.T.S.

SS-9  
(3-15)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 4- STREET, SIDEWALK, AND DRAINAGE STRUCTURE STANDARDS

1. STREET DESIGN REQUIREMENTS

A. No streets shall be designed having a slope of less than 0.40 feet per 100 feet.

B. Maximum grades and degrees of curvature:

1. Major road/arterial street: 6% - 15 degrees

2. Collector Street: 6% -20 degrees

3. Minor Street:

60 foot R.O.W.; 6% -20 degrees

50 foot R.O.W.; 10% -60 degrees

C. Street shall have standard concrete curb and gutter.

D. All stub streets will terminate with a header and barricade. See requirements (S-11/S-18)

E. The minimum pavement requirements for streets shall be as follows approved by the City Engineer:

<u>Street Classification</u>	<u>35 PI or Less</u> <u>More than 35 PI</u>	
1. For Residential (Minor) Asphalt Streets		
Base or Structural Equivalent minimum	8"	12"
Asphalt Thickness Type D or as approved	1 ½"	2"
2. For Collector Asphalt Streets		
Base or Structural Equivalent minimum	10"	14"
Asphalt Thickness Type D or as approved	2"	2"
3. For Major Road/Arterial Streets		
Base or Structural Equivalent minimum	12"	16"
Asphalt Thickness Type D or as approved	2"	2"

II. SURFACING WITH FLEXIBLE BASE MATERIAL

A. Flexible Base Material

1. Flexible base material shall be composed of crusher-run broken stone and shall be constructed with a maximum of six inch (6") compacted lifts.

2. The materials shall be obtained from a source acceptable to the TDHPT, shall be crushed, and shall consist of durable particles of stone mixed with soil binders as specified herein. Should a stockpile be required, it shall be made up of layers of processed material and the material shall be loaded for delivery by making successive vertical cuts through the entire depth of the stockpile. Approval of material by the City is required.

3. The processed material, when properly slaked and tested by standard laboratory methods, shall meet the following requirements:

Retained on 13/4" sieve 00%  
Retained on 7/8" sieve 10% to 35%  
Retained on 3/8" sieve 30% to 50%  
Retained on No.4 sieve 45% to 65%  
Retained on No.40 sieve 70% to 85%  
Passing a No.200 sieve 10% to 20%

4. Material passing the No.40 sieve is the soil binder and shall meet the following requirements:

The liquid limit shall not exceed 30%  
The plasticity index shall not exceed 12%  
The linear shrinkage shall not exceed 7%

NOTE: The linear shrinkage shall be calculated from the volumetric shrinkage at the liquid limit.

#### B. Construction Methods

1. Preparation of Sub-Grade: Flexible base shall not be place until the Contractor has verified that the new sub-grade has been prepared and compacted to the typical sections, lines and grades indicated on the appropriate construction drawings. Before the base material is placed, the sub-grade shall have been tested at a depth of 6" and found to be within the optimum moisture with at least 95% of standard proctor density being obtained as per current TxDOT Test Method Tex 113-E. All areas and "nest" of segregated coarse or fine material shall be corrected or removed and replaced with well graded material. Proof rolling shall be at the direction of the project engineer or authorized representative. The entirely of prepared surfaces to be tested by this method shall be proof rolled by a minimum of one pass of the proof roller tires. When alternate equipment is proposed and only an axle meets minimum requirements, only the qualifying axle shall be used to proof roll. If the operation of the proof roller shows an area (s) to be unstable, the substandard area shall be brought to satisfactory stability and uniformity by additional curing, compaction, or by removal and replacement of unsuitable materials. The replacement material shall be re-tested for density and proof rolled. Flexible base shall be placed two feet (2') behind the curb, with additional flexible base behind the curb 4" below top of curb (8" in depth) and two foot (2') Wide. Four inches (4") of top soil shall be placed for finish grade, slope to drain to the street. (See Detail S-A1)

2. First and Intermediate Lifts -Flexible base material deposited upon the sub-grade shall be spread, shaped and rolled the same day unless otherwise authorized by the City, in which case the City will provide directions for avoiding damage from the delay. This lift shall be wetted, bladed, and rolled until a minimum of 100% density has been attained as per TDHPT Method Tex 113-E.

3. Final Lift -Construction methods for the final lift shall be the same as prescribed for the first lift with the addition of the following:

a. Any deviation, in the finished surface in excess of 1/4 inch, in cross-section or in a length of 16 feet measured longitudinally, shall be corrected by loosening, adding or removing material, reshaping, and re-compacting by sprinkling and rolling.

b. The completed flexible base shall have a minimum compacted depth as specified.

(4-2)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

III. TYPE D HOT MIX ASPHALTIC CONCRETE PAVEMENT

A. General

1. Asphaltic concrete pavement shall consist of a surface course to be composed of a compacted mixture material as specified herein and shall be constructed on a flexible base constructed in accordance with the standards set out above.

2. The Asphaltic mixture, prime coat, or tack coat shall not be placed when the air temperature is below 45 degrees and falling, but may be place when the air temperature is above 40 degrees and is steady or rising.

3. All materials and design of mixes shall be subject to the approval of the City and, when tested in accordance with these specifications and methods outlined in TDHPT Bulletin C-14 shall have the following laboratory density and stability:

Percent of Density		Optimum Density	Percent of Stability
Min.	Max.		Not Less Than
95	99	97	30

B. Materials

1. Aggregates

a. Aggregates shall meet the grading requirements as follows:

Passing 1/2" sieve	100%
Passing 3/8" sieve	95 to 100%
Passing 3/8" sieve, retained on #4 sieve	20 to 50%
Passing #4 sieve, retained on #10 sieve	10 to 30%
Total retained on #10 sieve	50 to 70%
Passing #10 sieve, retained on #40 sieve	0 to 30%
Passing #40 sieve, retained on #200 sieve	4 to 25%
Passing #80 sieve, retained on #200 sieve	3 to 25%
Passing #200 sieve	0 to 8%

b. The asphaltic material shall form 4-1/2% to 7% of the mixture weight. The course shall be gravel or crushed stone, uniform in quality throughout, shall be free from dirt, organic, or other injurious matter occurring either free or as coating on the aggregate. The rock or gravel shall have an abrasion of not more than 40 by weight when subject to the Los Angeles Abrasion Test.

c. The fine aggregate shall consist of sand, stone screenings, or a combination of both. Sand shall be composed of sound, durable stone particles free from loams or other injurious foreign matter. Screenings shall be of the same or similar material as specified for coarse aggregate. The plasticity index of that part of the fine aggregate passing the #40 sieve shall be not more than six (6) when tested by standard laboratory methods.

2. Asphalt Cement -AC-10 shall be used in the cooler months (October through April), and AC-20 shall be used in the warm summer months of the year. The material shall be homogenous, shall be free from water, shall not foam when heated to 374°F, and shall meet the following requirements:

TEST	Viscosity		Grade
	AC-10		AC-20
	Min.	Max.	Min.
Max.			
Viscosity, 140°F Stokes	800	1200	1600
2400			
Viscosity, 275° Stokes	1.9		2.5
Penetration, 77°F, 100g. 5 sec.	85		55
Flash Point, C.O.C. F.	450		450
Solubility in trichloroethylene, %	99.0		99.0
Test on residues from thin film oven test:			
Viscosity, 140°F Stokes	3000		6000
Ductility, 77°F, 5 cms per min., cms	70		50
Spot Test	Negative		Negative

The recommended heating range of the asphaltic material during mixing and application shall be from 275°F to 325°F. For heating and storage the maximum allowable temperature is 400°F.

The asphalt shall be from a source acceptable to TDHPT and shall not be cracked.

3. Prime and Tack Coats -MC-30 cut-back asphalt shall be used for priming the base course. RC-2 cut-back asphalt shall be used for tack coat. They shall meet the following requirements:

REQUIREMENTS	MC-30		RC-2	
	Min.	Max.	Min.	Max.
Water, %	-	0.2	-	0.2
Flash Point, T.O.C., F	100	-	80	-
Furol Viscosity, sec., at 122°F			200	300
Kinematic Viscosity at 140°F, CST	30	60		
The Distillate, express as percent by volume of total distillate to 680°F, shall be as follows:				
Off at 437°F.		25	50	75
Off at 500°F.	40	70	70	90
Off at 600°F.	75	93	90	-
Residue from 680°F Distillation, Volume, %	50	-	70	-
Tests on Distillation Residue:				
Penetration at 77°F 100g 5 sec.	120	250	110	150
Ductility at 77°F, 5 cm/min., cms	100	-	100	-
Solubility in Trichloroethylene, %	99.0	-	99.0	-
Spot Test	Negative		Negative	

### C. Construction Methods

1. The prime coat shall consist of MC-30 asphalt as specified herein, applied evenly and smoothly at the rate of 0.32 gallons per square yard, at a pressure necessary for even distribution.

2. If the prime coat is allowed to become over-dry and dusty, or traffic is allowed on the prime coat, and the new hot-mix asphaltic course, in the opinion of the Engineer, will not adhere to the base course, a tack coat shall be applied. The tack coat shall consist of RC-2 cut-back asphalt, as specified herein, applied evenly and smoothly at the rate of 0.10 gallons per square yard, at a pressure necessary for even distribution.

3. The hot-mix asphaltic concrete shall arrive on the job site at a temperature between 225°F and 300°F. In no case shall hot-mix be compacted in place at a temperature less than 175°F.

4. After approval of the base by the City, the asphaltic mixture shall be applied with a spreading and finishing machine acceptable to the City that will produce a smooth and uniform textured surface. Adjacent strips of surfacing will be laid to the extent possible so that the longitudinal joints will be hot joints. Rolling will not be permitted within one foot (11) of exposed longitudinal joint until the adjacent strip has been laid, unless the adjacent strip cannot be laid before the asphaltic material laid will cool below the proper rolling temperature. Transverse joints at the end of placement, and those which have become cold, will be cut out to a vertical joint. Transverse joints for adjacent strips will be offset by two times the width of the strip.

5. Compaction of the asphaltic mixture shall be by use of the steel wheel roller followed by the tandem and/or pneumatic roller(s), each starting at the low side and progressing toward the high center or high side of the pavement. Rolling shall be continued until no further compression can be obtained and until all roller marks are eliminated.

6. No traffic will be permitted on surfacing during or after rolling until the asphaltic material has cooled sufficiently to preclude marking or damage.

### D. Testing

Prior to construction of the Type D hot-mix asphaltic concrete course a sieve analysis of the aggregate and laboratory test results of the density and stability of the hot-mix to be used on this project shall be furnished to and approved by the City.

## IV. CONCRETE PAVEMENT CONSTRUCTION

### A. Materials

1. Concrete -Concrete used in paving shall be in accordance with CONCRETE AND REINFORCING STANDARDS, Chapter 5, and as shown on the Details.

2. Reinforcing -Steel for concrete paving shall be in conformity with all requirements of CONCRETE AND REINFORCING STANDARDS, Chapter 5, and as shown on the Details.

## B. Construction Methods

1. Sub-grade- All loose material shall be removed or compacted. The sub-grade shall be shaped to conform to the required cross-section. Sub-grade shall be excavated and shaped in conformity with the typical sections shown on the Details. Before base material is placed, the sub-grade shall be thoroughly wetted, bladed, and rolled until a minimum of 95% of maximum density has been attained for a six inch (6") depth, as per TDHPT Method Tex 113-E. An independent materials testing laboratory shall determine whether the sub-grade needs to be lime stabilized. All material, equipment, and construction methods shall be in accordance with standards currently approved by the TDHPT. Three inches (3") of crushed stone base material compacted to 100% density as per TDHPT Method Tex 113-E may be used in lieu of lime stabilization.

2. Forms- Forms shall be accurately set to grade for a minimum distance of 300 feet. Form sections shall be tightly joined and keyed to prevent relative displacement. They shall be cleaned and oiled each time they are used. Forms must be inspected by the City before any concrete is placed. If forms settle and/or deflect over 1/8 inch under finishing operations, paving operations shall be stopped and the forms shall be reset to line and grade.

3. Placement -Concrete shall not be placed when the temperature is below 40°F and falling. Concrete may be placed when the temperature is above 35°F and steady or rising. Salt or other chemical additives shall not be added to concrete to prevent freezing. The contractor shall be responsible for replacing any concrete that freezes during curing. All concrete shall be constructed monolithically unless otherwise stated on construction drawings or typical sections.

4. Finishing -Where hand distribution is necessary, concrete shall be distributed by shovels. The use of rakes will not be permitted. Immediately upon unintended stoppage of a placement operation, a standard bulkhead shall be installed at right angles to the centerline of the pavement. Joint-sealing material shall be placed in sawed and other joints as required. Pavement shall be finished with a brush finish or as otherwise specified. After finishing is complete and the concrete is still workable the gutter surface shall be tested by the contractor for trueness with a ten foot (101) steel straightedge. The maximum ordinate measurement shall be 1/16 inch.

## V. CURB AND GUTTER AND VALLEY GUTTERS

### A. Materials

1. Concrete- Concrete used in construction of curb and gutter and valley gutters shall be in accordance with CONCRETE AND REINFORCING STANDARDS, Chapter 5, and as indicated on the Details.

2. Reinforcing Steel -Where reinforcing steel is required, it shall conform to the requirements given in the CONCRETE AND REINFORCING STANDARDS, Chapter 5, and as indicated on the Details.

3. Materials for machine laid curb shall conform to the requirements as specified in the CONCRETE AND REINFORCING STANDARDS, Chapter 5 except, that the slump shall not exceed one inch (1"), the concrete shall contain a minimum of 6 sacks of cement per cubic yard and the coarse aggregate when tested by approved methods shall conform to the following grading requirements:

Retained on 1/2" sieve	0%
Retained on 3/8" sieve	0-5%
Retained on #4 sieve	35-60%
Retained on #10 sieve	90-100%

#### B. Formed Curb and Gutter

Curb and gutter or separate gutter installation grades shall conform to the engineering plans and shall be constructed as shown on the Details. In not more than one hour after the concrete has been placed, a thin coating not over 1/4" thick, of finish mortar, composed of one part cement to two parts of fine aggregate, shall be worked into the exposed faces of the curb and gutter by means of a molding form. The curb and gutter shall then be finished true to line and grade with the aid of a straight edge, steel trowel, steel finishing tool, and fine brush. After the work has become firm, it is to be brushed lightly with a final crosswise brushing.

#### C. Machine Laid Curb

1. Curb and gutter or separate gutter installation grades shall conform to the engineering plans and shall be constructed as shown on the Details. To provide a continual check on the curb grade, a pointer or gauge shall be attached to the machine in such a manner that a comparison can be made between the curb and the guideline.

2. The mix shall be fed into the machine in such manner and of such consistency that the finished curb will present a well compacted mass true to the established shape, line and grade, with a surface free of voids or honey-comb. Any additional surface finishing specified and/or required shall be performed immediately after extrusion. The completed curb shall be cured for a period of not less than 72 hours.

#### D. Dummy and Expansion Joints

Dummy joints shall be formed as a 1/2 inch deep transverse tooled joint at 20 foot intervals. One-half inch expansion joints shall be installed where a curb intersects, joins, or abuts a structure as well as at not less than 600 feet intervals or in the middle of a block when block length is less than 600 feet. The joint material shall be bitumastic fiber.

#### E. Valley Gutters

Concrete valley gutters shall be constructed to carry water flows across asphalt streets only approved by the City Engineer. Storm sewer inlets and pipe shall be installed to avoid the installation of valley gutters at places other than intersections unless approved by the City Engineer. The valley gutter shall be extended to include the area formed by the intersection of the back-face of the valley gutter, the projections of the gutter face and the intersecting street, and the circular curb return.

## A. General

Sidewalks shall be four foot (41) minimum width, four inch (4") thick Class A concrete, with six inch (6") x six inch (6"), #10 welded wire mesh.

## B. Materials

Concrete used in the construction of sidewalks shall be in accordance with the specifications set out in Chapter 5, CONCRETE AND REINFORCING STANDARDS.

## C. Construction Methods

1. Sidewalks shall be constructed on a two inch (2") sand cushion over undisturbed natural soil or compacted fill.

2. Mats of wire fabric shall overlap sufficiently to maintain a uniform strength and shall be fastened securely at the ends and edges.

3. No concrete shall be placed until the City has inspected and approved the type and placement of the reinforcement steel.

4. One inch (1") deep transverse tooled dummy joints shall be placed at ten foot (10') intervals.

## VII. DRAINAGE STRUCTURES

### A. Design Requirements

1. Inlets- A minimum curb inlet length of ten feet (101) with six inch (6") throat opening shall be provided. Inlets shall be sized to achieve a capability of one (1) cubic foot per second of opening for a throat height of five inches (5").

2. Inlets to storm water drainage systems shall be provided at such locations as are necessary to prevent street hydraulic capacity being exceeded as defined in the City of Lockhart Drainage Ordinance.

3. Storm Sewers -The minimum size of storm sewers shall be 18" inches. Outfalls from storm sewers and ditches into natural drainage ways shall enter at the grade of the natural drainage channel. Drop-type outfall structures and Type B headwalls with wing-walls as specified by the standards of the TDHPT shall be provided along with energy dissipaters to control erosion.

4. Manholes -Manholes shall be provided at all changes in grade or alignment, at all sewer intersections, and at intervals of no more than 1000 feet on straight lines. Design of manholes shall conform to the Details.

5. Open Channel Design -All open channels shall be sized for design flow and shall be concrete lined unless otherwise approved by the City. Channel invert and sides shall be a minimum of five inches (5") thick with No.3 reinforcing bars at 24 inches on center each way. Side slopes shall have a horizontal/vertical ratio of two to one (2 to 1) or greater.

Detention Facilities- All detention facilities shall be constructed to meet current adopted hydraulic manual specifications and drainage. Requirements with outfall structures designed to accommodate runoff from 10, 25, 50, and 100 year events or as approved by the City Engineer. All detention facilities shall contain a concrete "trickle channel" at least 3' wide or as approved by the City Engineer. All earthen areas in such facilities shall be "hydro-mulched" or "sod covered".

### B. Materials for Drainage Structures

1. Concrete- All concrete and reinforcing steel used in drainage structures shall be in compliance with the CONCRETE AND REINFORCING standards set out in Chapter 5. Concrete shall be Class A.

(4-8)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

2. Pipe -Pipe for storm drains shall be concrete pipe in sizes as shown on the approved plans. All concrete pipes shall be RCP ASTM Specification C76. Where added strength of pipe is needed for traffic loads over minimum cover or for excessive height of backfill, extra strength pipe shall be used. Pipe shall have a minimum cover of not less than one foot (1') over the top of the pipe. All pipes shall have integral tongue and groove joints. All concrete pipe bends or fittings for horizontal or vertical changes in alignment, and all special fittings, shall be of prefabricated construction using RCP.

3. Manholes -Manholes shall be constructed as shown on the Details. Manhole covers shall be Vulcan Foundry Number VM-34, or equal, with 22 inch opening and weight of at least 240 pounds. The cover shall be marked "STORM".

4. Pipe Joint Materials:

a. Asphalt Compounds -Asphalt compounds shall consist of asphalt base, volatile solvents, and inert filler. The joint compound shall conform to the standards of the TDHPT.

b. Mortar Mix -Mortar joint mix shall be composed of one part cement or two parts of mortar sand.

C. Drainage Structure Construction

1. General

a. Batter boards shall not be used for grade control; laser beam grade control shall be the only method that will be acceptable.

b. Construction must begin at the lowest pipe elevation and continue upgrade with bells facing upgrade. Construction shall be continuous with construction of branch mains deferred until the main is constructed to the branch manholes' junction points.

c. Not more than 300 feet of trench shall be opened in advance of pipe installation and pipe shall be laid in all opened ditch by the end of the work day. A test type plug shall be installed in the open ends of all pipes at the end of each work day.

2. Trench Construction

a. Trench Width -The maximum trench width shall be six (6) pipe diameters. The trench width shall be at least 15 inches wider but not more than 21 inches wider than the outside diameter of pipe.

b. Trench Sides -The sides of the trench shall be excavated vertically to a minimum distance of one foot (11) over the top of pipe or conduit, above which point, trench sides shall be excavated as near to vertical as possible and safe.

c. Protection from Rock -When rock is encountered; a minimum of six inches (6") of granular embedment shall be placed under the pipe.

d. Installation -The pipe or conduit shall be assembled in the trench with the barrel resting uniformly on embedment or undisturbed trench floor, and to the grade specified.

3. Embedment and Backfill

a. Embedment-Specified embedment material shall be placed as shown in the trench details S-26 and S-27.

b. Inspection and Backfill -The trench may be backfilled after inspection and approval by the City.

c. Backfill Materials for trenches not to be in proposed street area, existing streets, or within 5' of the back of the curb or edge of pavement must include specified embedment material and may be backfilled with excavated materials that void of rocks and other object larger than 4" in diameter. See details S-26 and S-27. The trench may be backfilled with excavated materials when the trench does not cross a street. Backfill material shall not contain rocks or other objects larger than four inches (4") in any dimension. Backfill shall be carefully placed in the trench to avoid damage to the pipe.

d. Backfill in areas that will be in streets, existing streets or within 5' of the back of curb or edge of pavement must include specified embedment material up to the specified sub-grade elevation in the construction plans. See trench details S-26 and S-27.

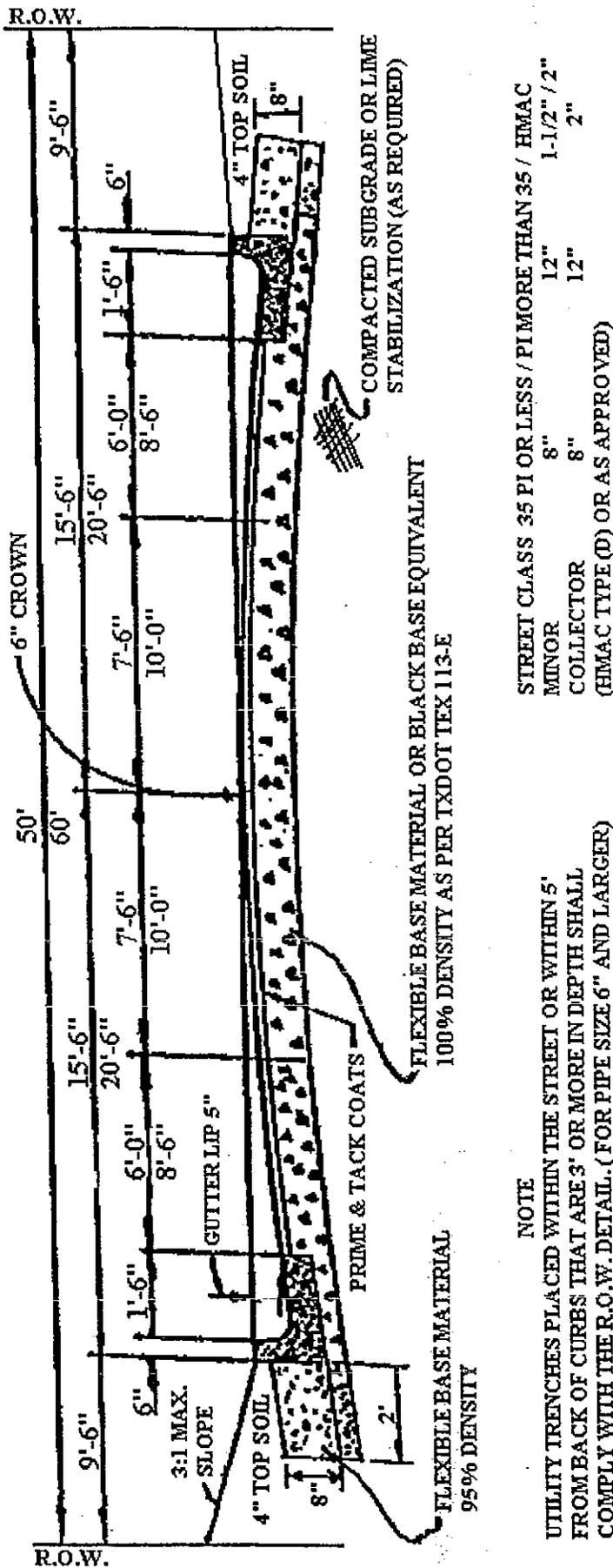
#### 4. Joints

a. Mortar Joints -The pipe shall be laid to grade in the trench. The joint areas shall be thoroughly wetted. The lower one-half (1/2) of the groove shall be packed with mortar from the interior. The remaining groove area shall be quickly packed with mortar from the exterior. A mortar bead shall be formed around the pipe joint. The bead shall extend a minimum of one inch (1") on each side of the joint and project outward a distance of one inch (1"). The inside of pipe joint shall be finished smooth with the inside of the pipe. The joint shall be protected from sun and air by an approved wet wrapping or wet oil cover for a minimum of 48 hours or until backfilled. Joints shall not be made when the temperature is 40°F or below.

b. Asphalt Compound Joints -Joints shall be made in conformance with manufacture's recommendations. The pipe shall be dry. Sufficient compound shall be placed in the groove to cause some material to be squeezed from joint when pipe is seated. The inside of pipe joints shall be wiped clean after joint connection.

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Asphalt Pavement -Typical Section of Major Road/Arterial Streets with Median	S-3	4-14
Concrete Pavement -Typical Section of Streets with 60' & 50' ROW	S-4	4-15
Concrete Pavement -Typical Section of Major Road/Arterial Street	S-5	4-16
Concrete Pavement -Typical Section of Major Road/Arterial Street with Median	S-6	4-17
Plan of Steel Layout	S-7	4-18
Plan -Joint Spacing	S-8	4-19
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NOTE  
 6" PARABOLIC CROWN EXCEPT AT INTERSECTIONS OR  
 AS APPROVED BY THE CITY ENGINEER.  
 (CROWN HEIGHT DEVIATIONS NOT PERMITTED FOR  
 DRAINAGE REASONS.)



NOTE  
 UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5'  
 FROM BACK OF CURBS THAT ARE 3' OR MORE IN DEPTH SHALL  
 COMPLY WITH THE R.O.W. DETAIL. (FOR PIPE SIZE 6" AND LARGER)

STREET CLASS 35 PI OR LESS / PIMORE THAN 35 / HMAC  
 MINOR 8" 12" 1-1/2" / 2"  
 COLLECTOR 8" 12" 2"  
 (HMAC TYPE (D) OR AS APPROVED)

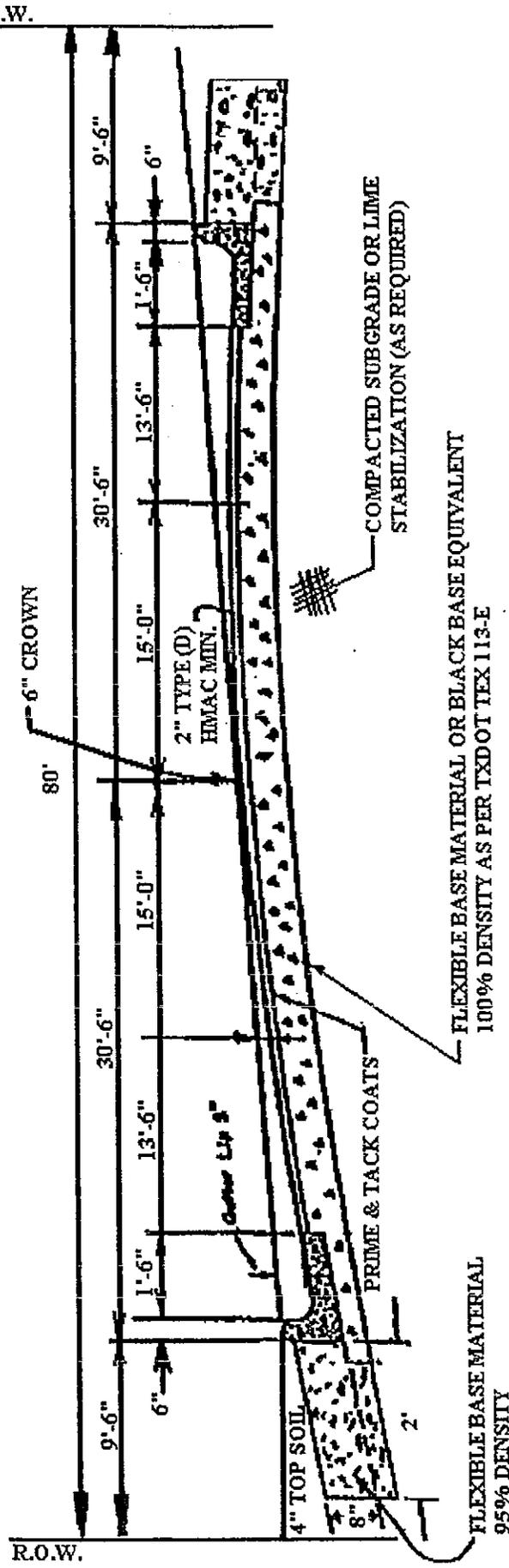
ASPHALT PAVEMENT  
TYPICAL SECTION OF STREETS WITH  
50' & 60' R.O.W.

CITY OF LOCKHART N.T.S.

3-1  
 (4-12)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/10/02

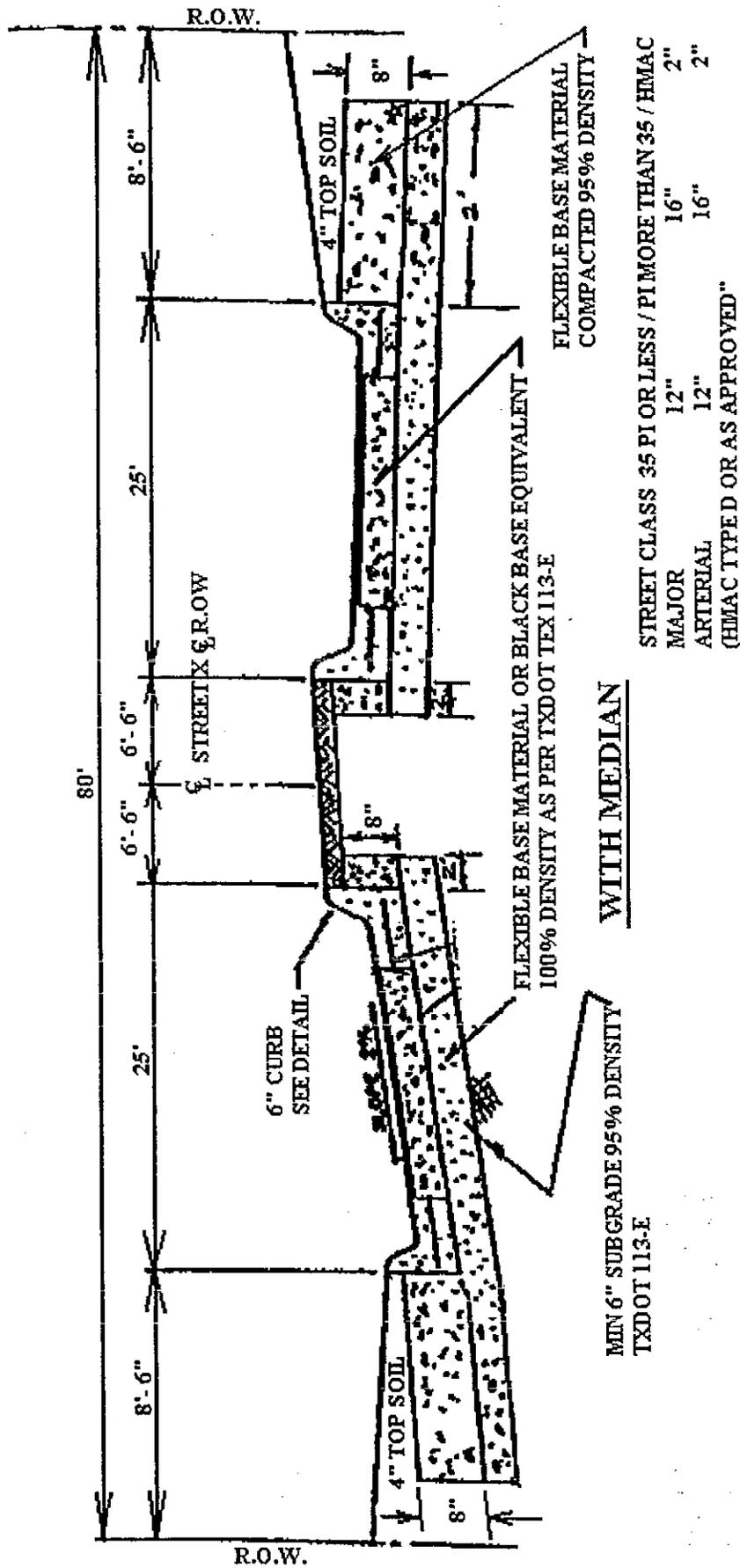
NOTE  
 6" PARABOLIC CROWN EXCEPT AT INTERSECTIONS OR  
 AS APPROVED BY THE CITY ENGINEER. (CROWN HEIGHT  
 DEVIATIONS NOT PERMITTED FOR DRAINAGE REASONS)



NOTE  
 UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5'  
 FROM OF CURBS THAT ARE 3' OR MORE IN DEPTH SHALL  
 COMPLY WITH THE R.O.W. DETAIL. (FOR PIPE SIZE 6" AND LARGER)

STREET CLASS	35 PI OR LESS / PI MORE THAN 35 / HMAC
MAJOR	12" 16" 2"
ARTERIAL	12" 16" 2"
(HMAC TYPED OR AS APPROVED)	

**ASPHALT PAVEMENT**  
**TYPICAL SECTION OF MAJOR / ARTERIAL STREETS**  
**CITY OF LOCKHART**  
**N.T.S.**



**NOTE**

UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5' FROM BACK OF CURBS THAT ARE 3' OR MORE IN DEPTH SHALL COMPLY WITH THE R.O.W. DETAIL. (FOR PIPE SIZE 5" AND LARGER)

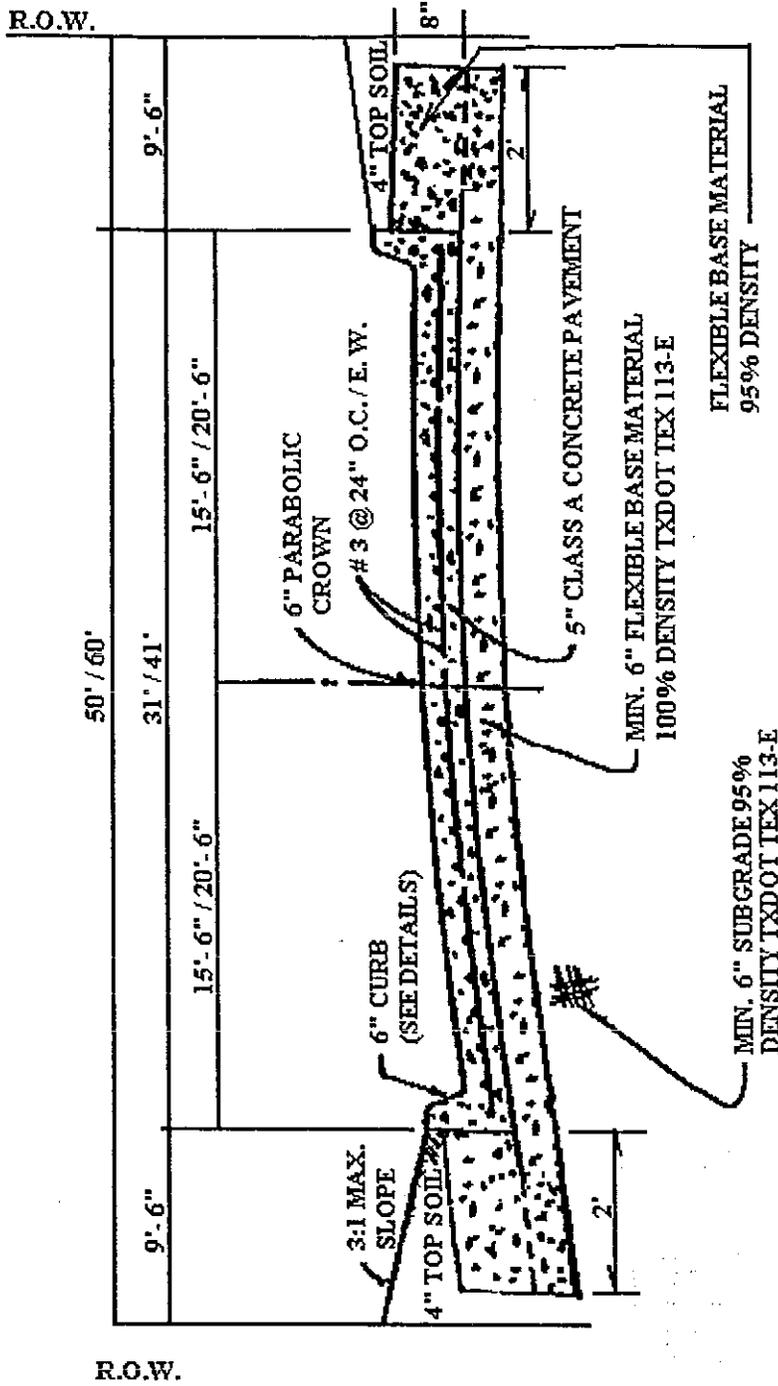
**ASPHALT PAVEMENT**

**TYPICAL SECTION OF MAJOR / ARTERIAL STREETS  
CITY OF LOCKHART  
N.T.S.**

S-3  
(4-14)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02

NOTE  
 6" PARABOLIC CROWN EXCEPT AT INTERSECTIONS OR  
 AS APPROVED BY THE CITY ENGINEER.  
 (CROWN HEIGHT DEVIATIONS NOT PERMITTED FOR  
 DRAINAGE REASONS.)



BOTH CURBS AT SAME ELEVATION

**CONCRETE PAVEMENT**  
**TYPICAL SECTION OF STREETS WITH**

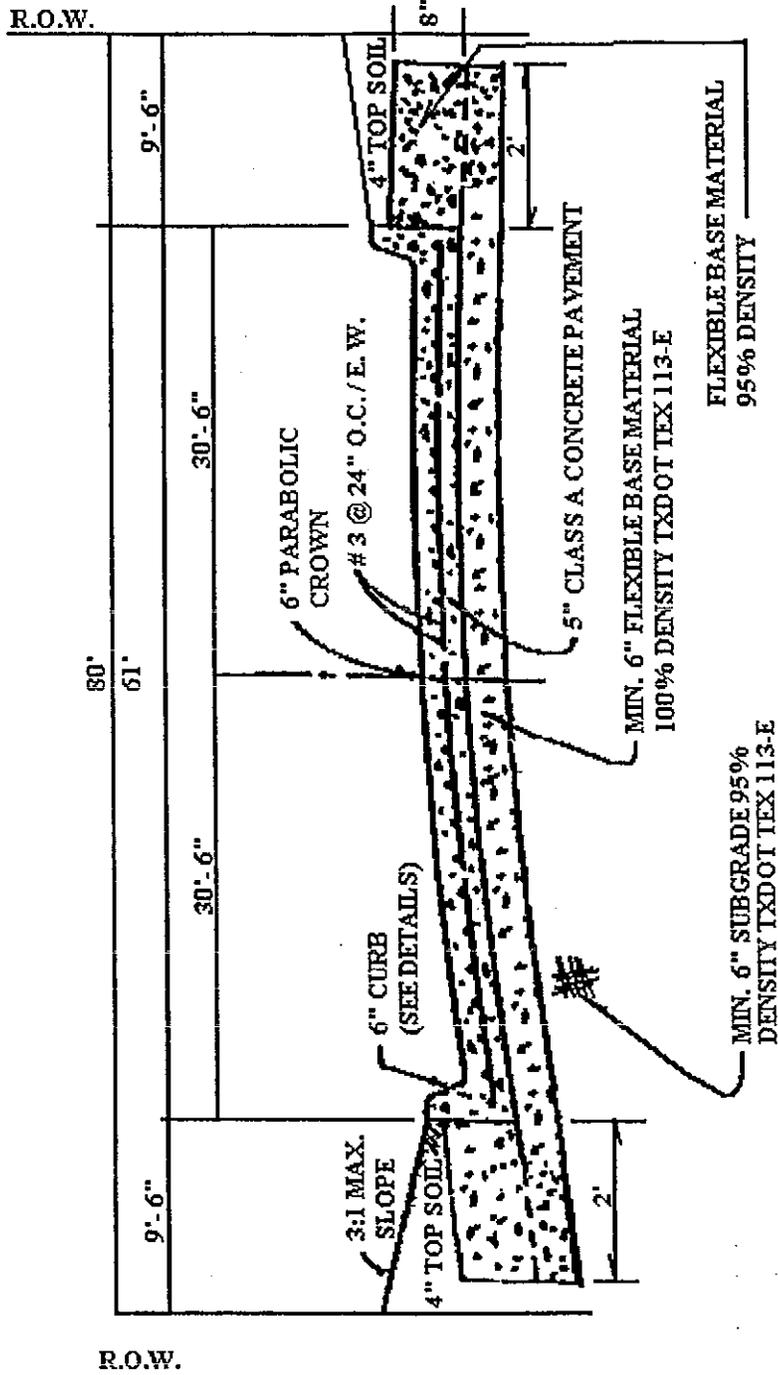
**50' & 60' R.O.W.**

CITY OF LOCKHART N.T.S.

S-4  
 (4-15)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02

NOTE  
 6" PARABOLIC CROWN EXCEPT AT INTERSECTIONS OR  
 AS APPROVED BY THE CITY ENGINEER.  
 (CROWN HEIGHT DEVIATIONS NOT PERMITTED FOR  
 DRAINAGE REASONS.)



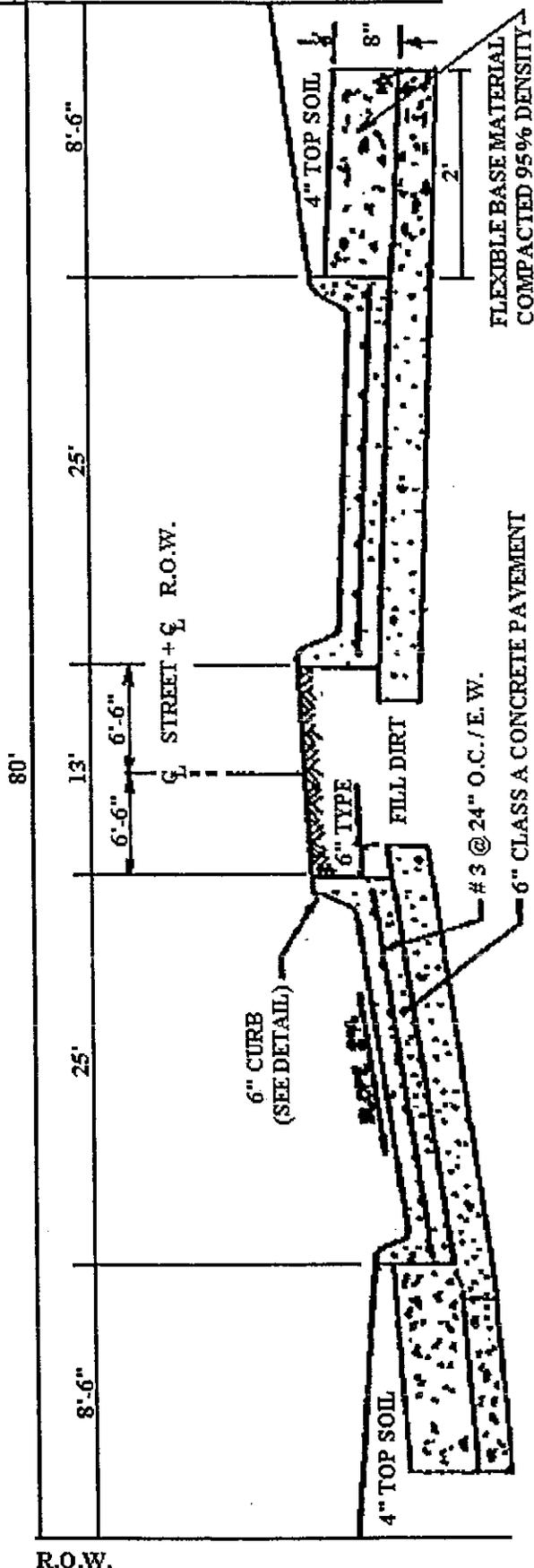
BOTH CURBS AT SAME ELEVATION

**CONCRETE PAVEMENT**  
**TYPICAL SECTION OF MAJOR / ARTERIAL STREETS**  
 CITY OF LOCKHART N.T.S.

S-5  
 (4-16)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02

R.O.W.



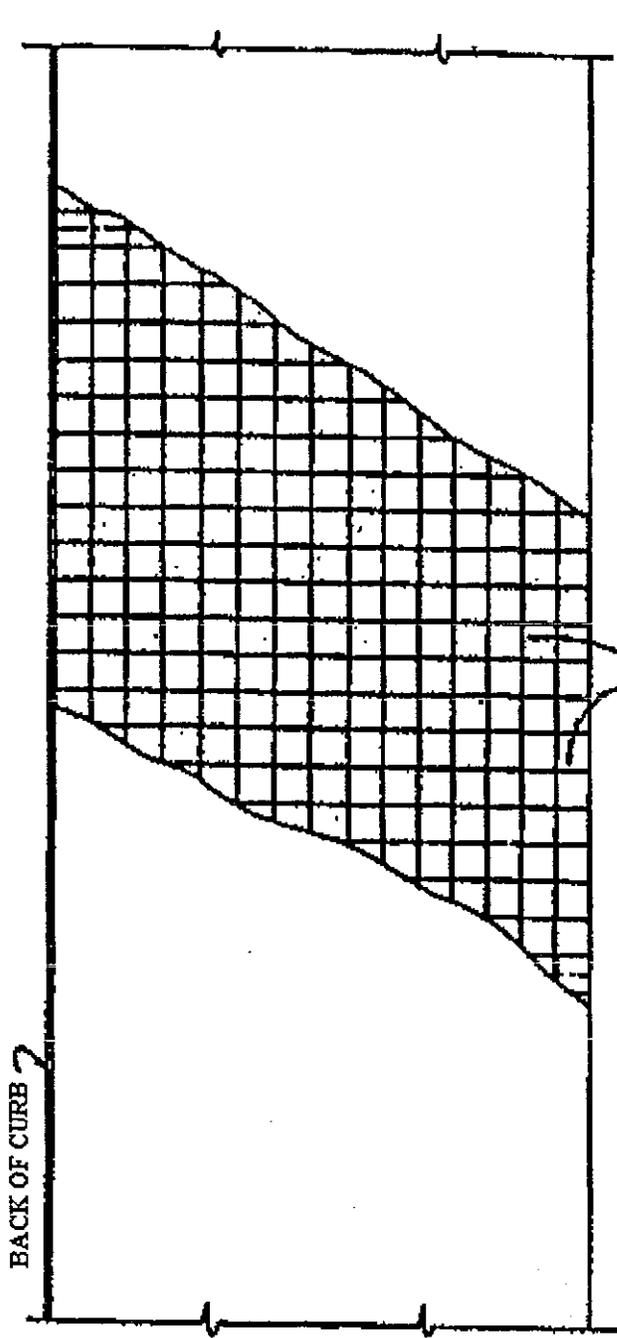
MIN. 6" SUBGRADE 95% DENSITY IXDOT TEX 113-E  
 MIN. 6" FLEXIBLE BASE MATERIAL  
 100% DENSITY IXDOT TEX 113-E

UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5' BACK OF CURBS THAT ARE 3' OR MORE IN DEPTH SHALL COMPLY WITH THE R.O.W. DETAIL. (FOR PIPE SIZE 6" AND LARGER)

**CONCRETE PAVEMENT**  
**TYPICAL SECTION OF MAJOR / ARTERIAL STREETS**  
**WITH MEDIAN**  
 CITY OF LOCKHART N.T.S.

S-6  
 (4-17)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



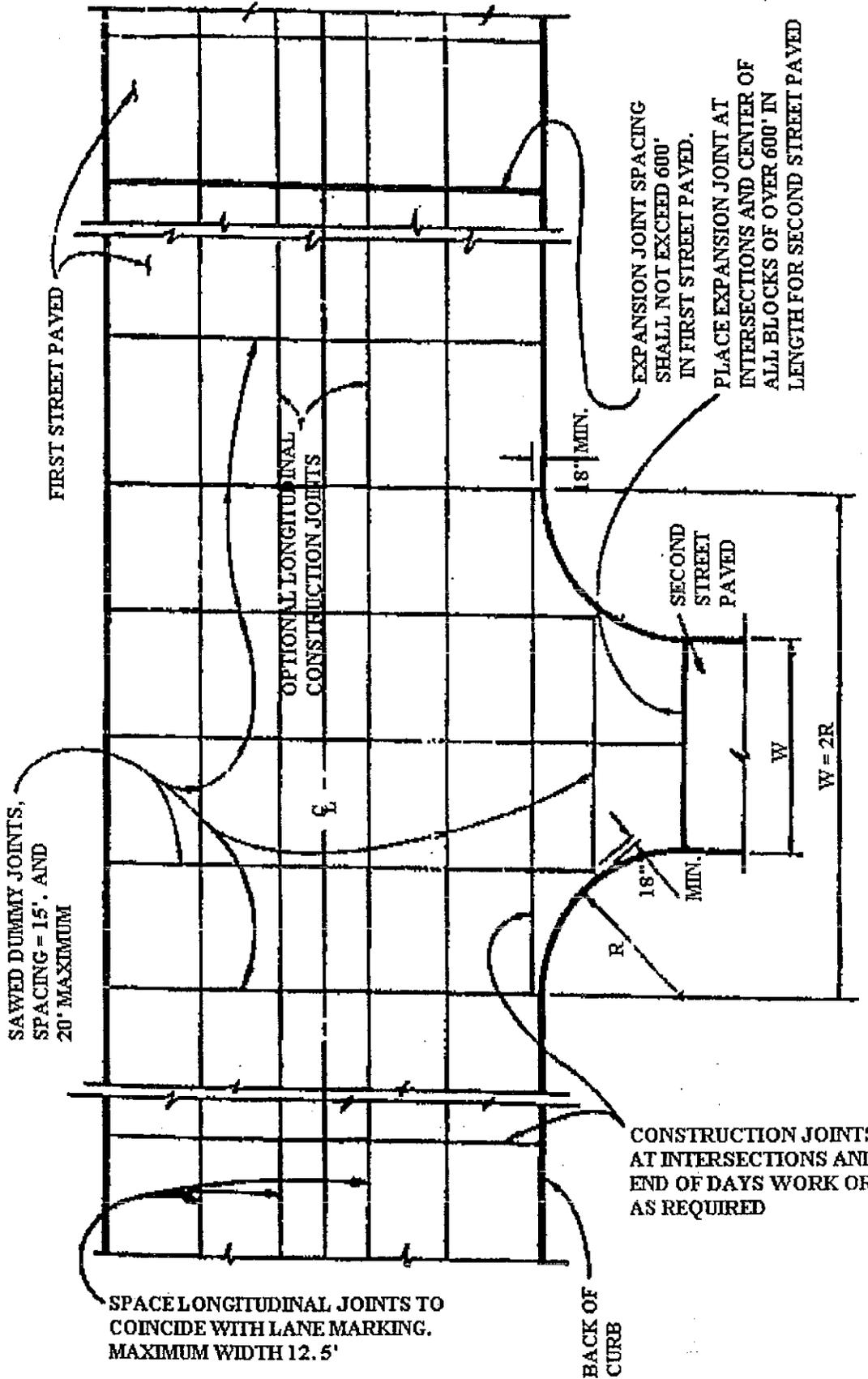
NOTE: THE REINFORCING STEEL SHALL EXTEND THROUGH BOTH DUMMY AND CONSTRUCTION JOINTS. LAP BARS 40 DIAMETERS AND 11E.

# 3 @ 24" O.C. / E.W.

**PLAN OF STEEL LAYOUT**  
 CITY OF LOCKHART  
 N.T.S.

S-7  
 (4-18)

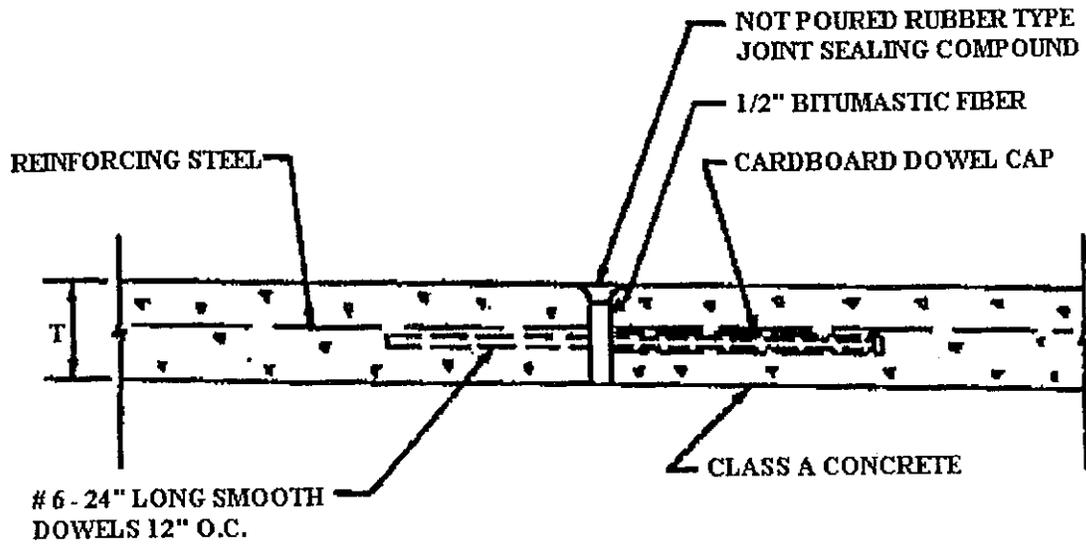
ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



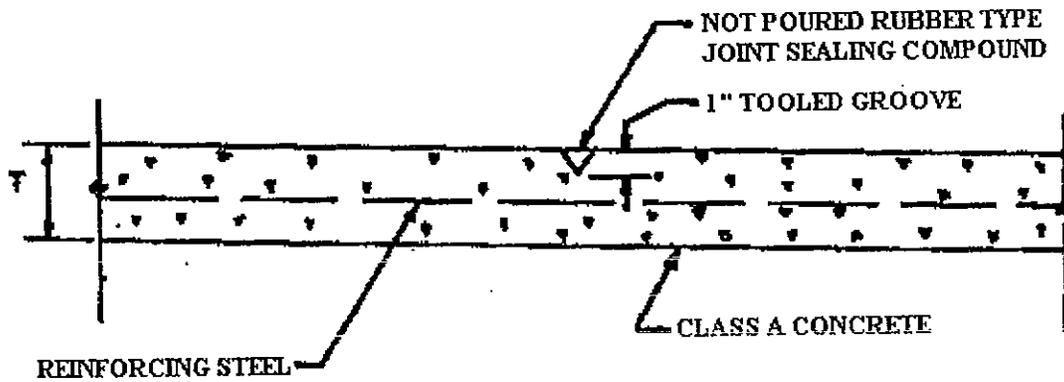
**PLAN - JOINT SPACING**  
 CITY OF LOCKHART  
 N.T.S.

S-8  
 (4-19)

ADOPTED BY COUNCIL 4/28/02  
 DATE (S) REVISED: 11/19/02



EXPANSION JOINT



DUMMY JOINT

T = CONCRETE PAVEMENT THICKNESS

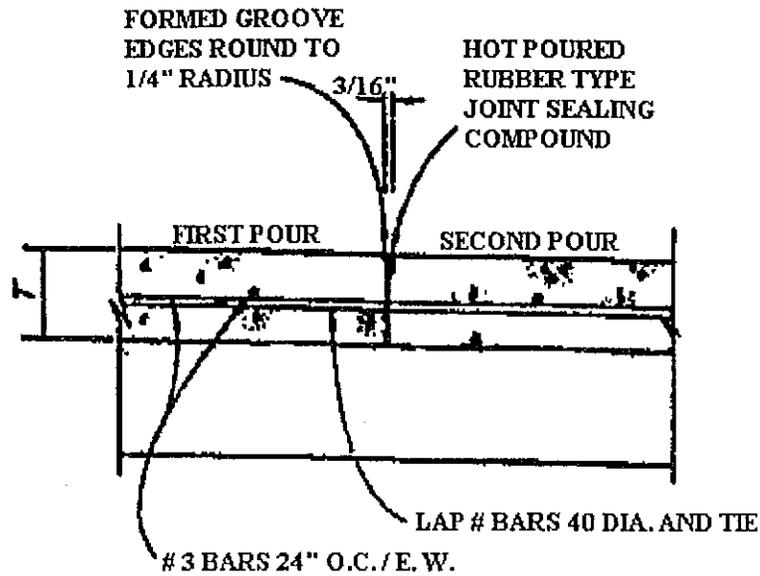
EXPANSION & TOOLED DUMMY JOINT

CITY OF LOCKHART

N.T.S.

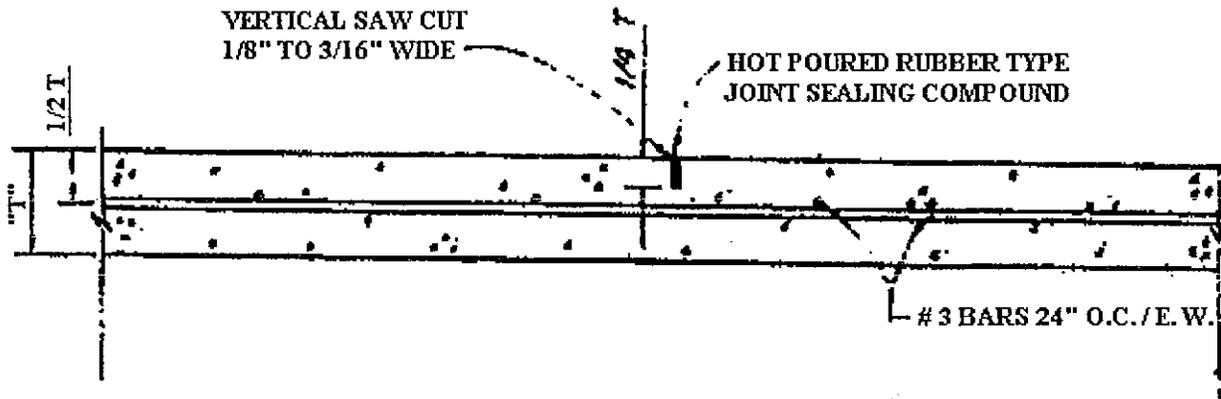
S-9  
(4-20)

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## LONGITUDINAL CONSTRUCTION JOINT

N.T.S.



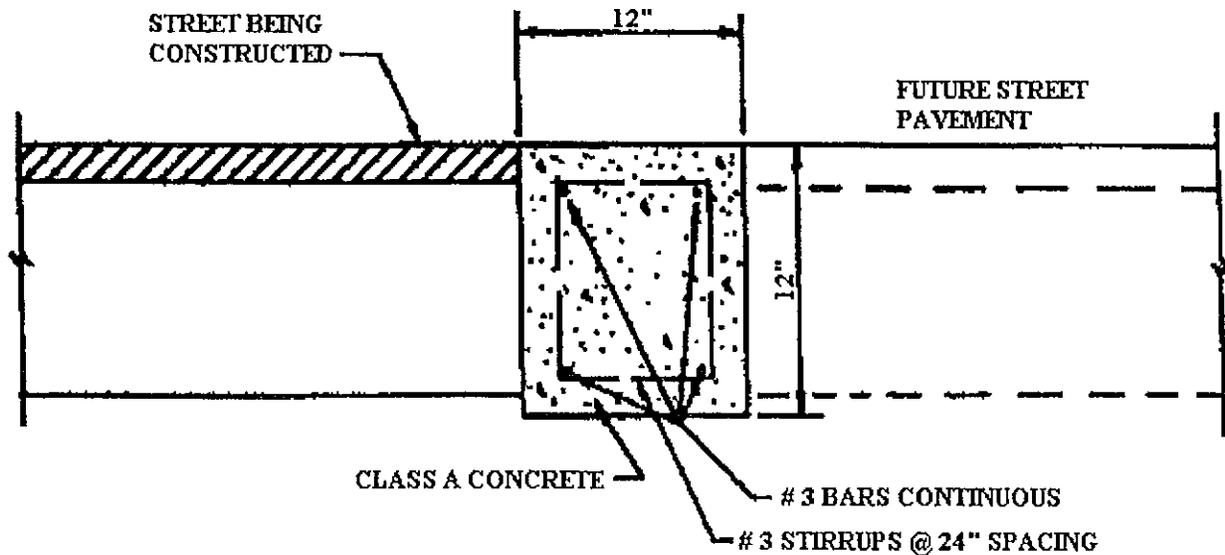
## SAWED DUMMY JOINT

CITY OF LOCKHART

N.T.S.

S-10  
(4-21)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



**NOTE:**  
 WHEN EXTENDING AN EXISTING STREET THAT HAS A CONCRETE  
 HEADER THE CONTRACTOR SHALL REMOVE THE HEADER AND  
 4' OF HMAC BEHIND THE HEADER. EXISTING HMAC SHALL BE  
 SAW CUT, NEW HMAC SHALL THAN BE PLACE OVER THE  
 EXISTING BASE DURING PAVING OPERATION

(INSTALLED AT END OF ALL STUB STREETS)

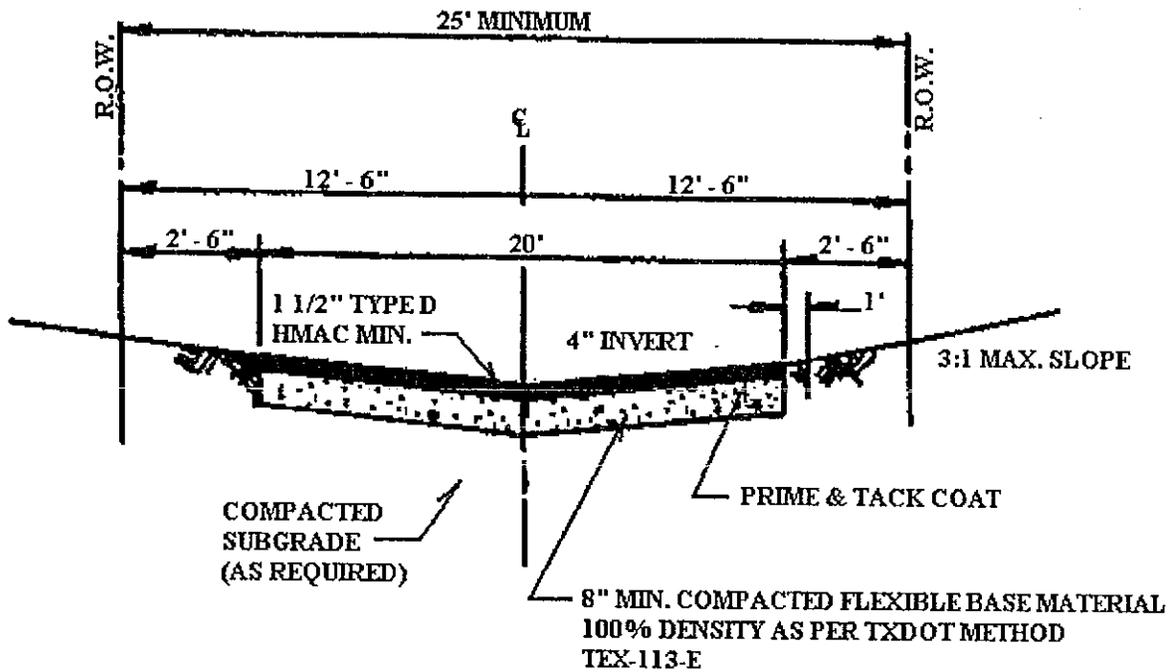
# **STREET STUB HEADER**

CITY OF LOCKHART      N.T.S.

S-11  
 (4-22)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



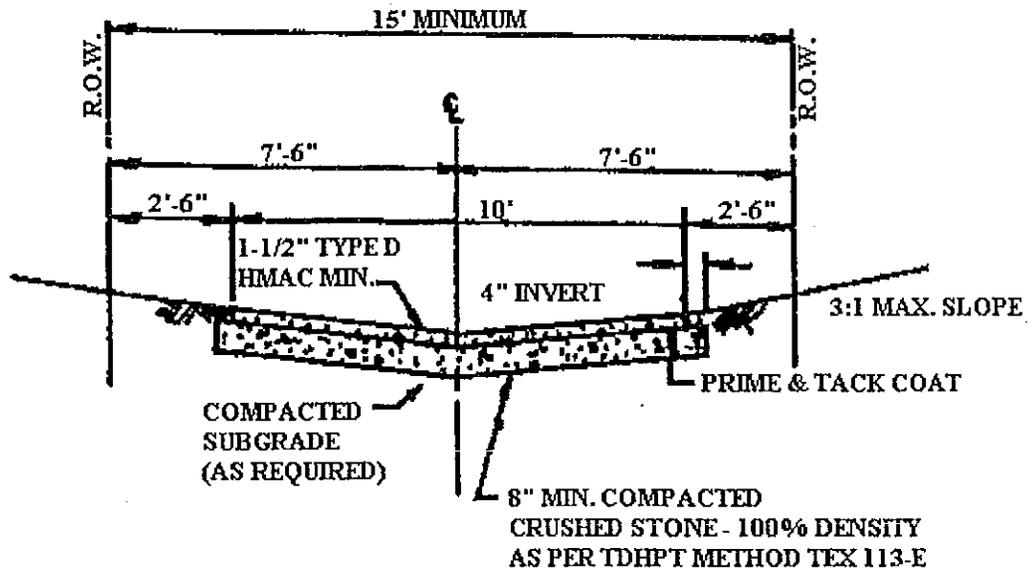


## 25' ALLEY SECTION

(ASPHALT PAVEMENT)  
CITY OF LOCKHART N.T.S.

S-13  
(4-24)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



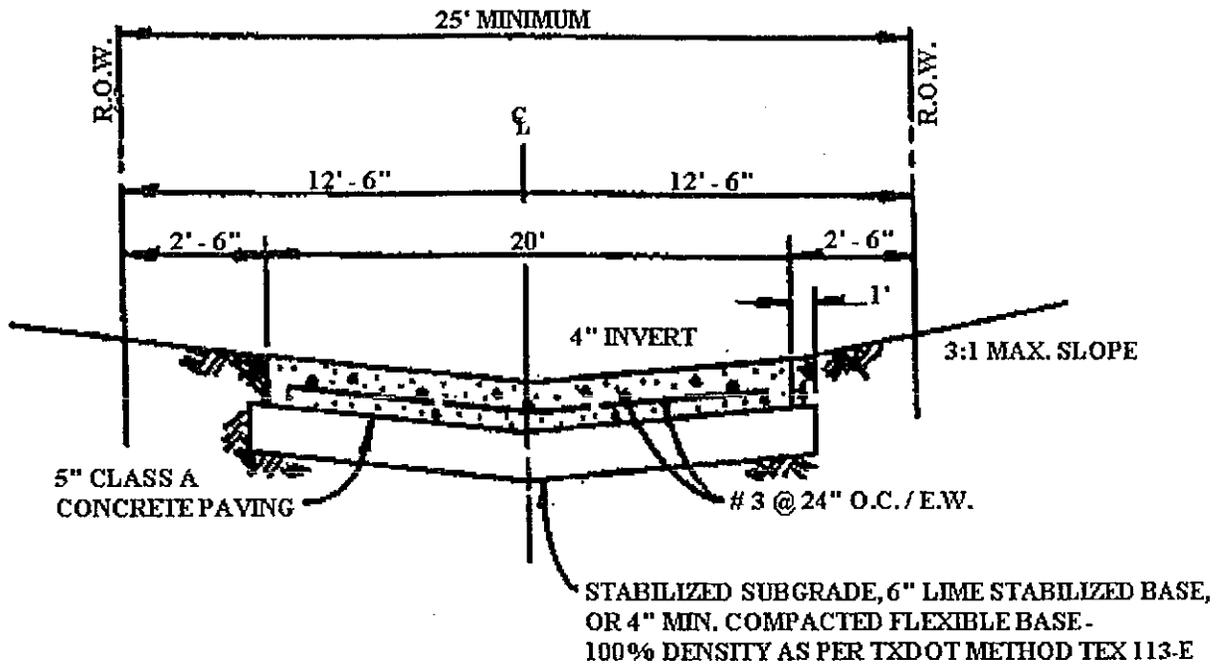
# 15' ALLEY SECTION

(ASPHALT PAVEMENT) N.T.S.

CITY OF LOCKHART

S-14  
(4-25)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



## 25' ALLEY SECTION

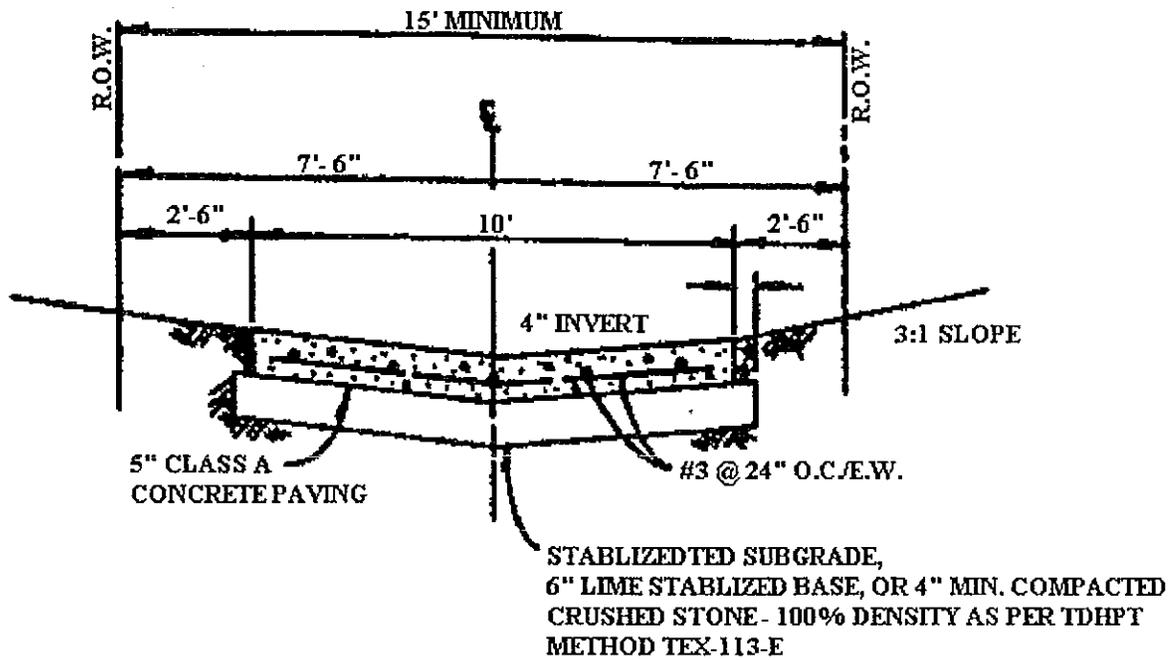
(CONCRETE PAVEMENT)

CITY OF LOCKHART

N.T.S.

S-15  
(4-26)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



## 15' ALLEY SECTION

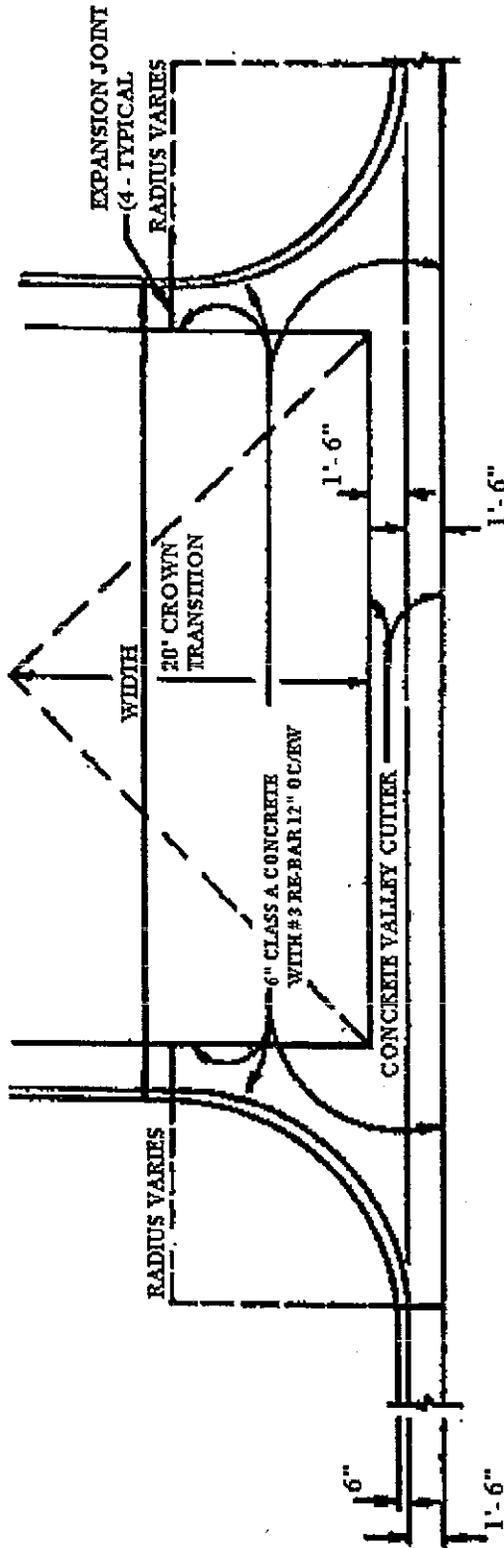
(CONCRETE PAVEMENT)

N.T.S.

CITY OF LOCKHART

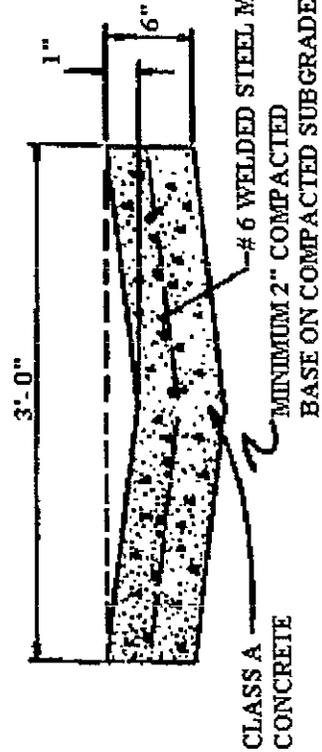
S-16  
(4-27)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/2002



NOTE: VALLEY GUTTER AND CURB SHALL BE POURED MONOLITHICALLY

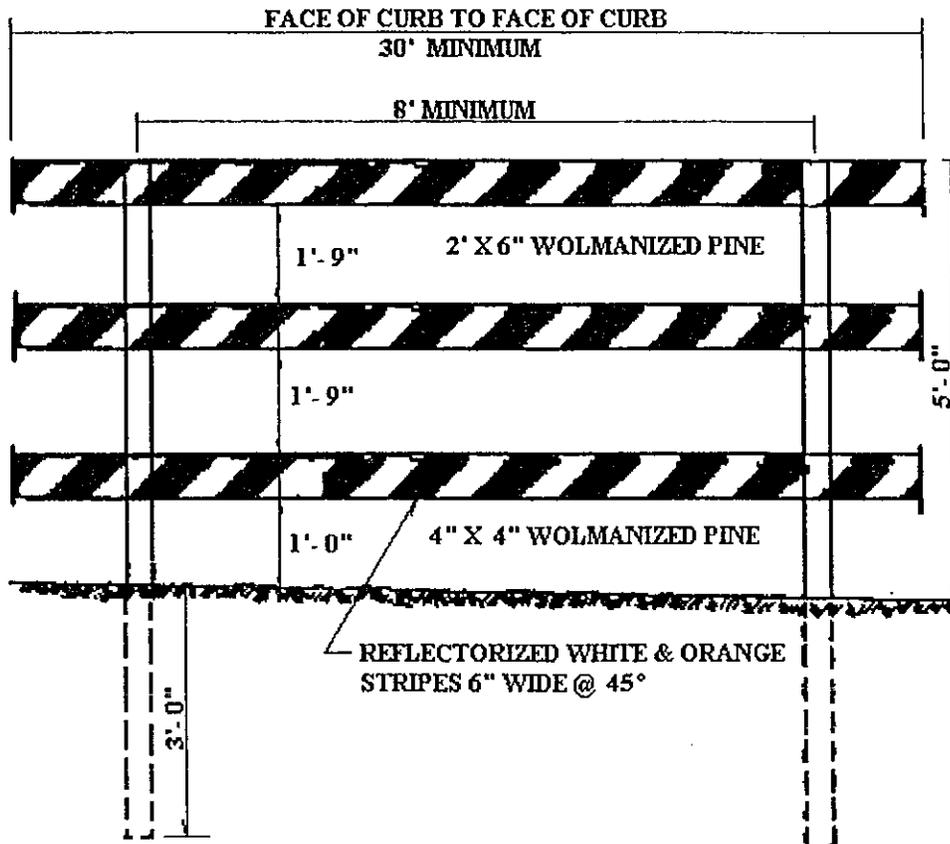
PLAN



SECTION CONCRETE VALLEY GUTTER  
CITY OF LOCKHART N.T.S.

S-17  
(4-28)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



(INSTALL AT END OF ALL STUB STREETS)

# STREET STUB BARRICADE

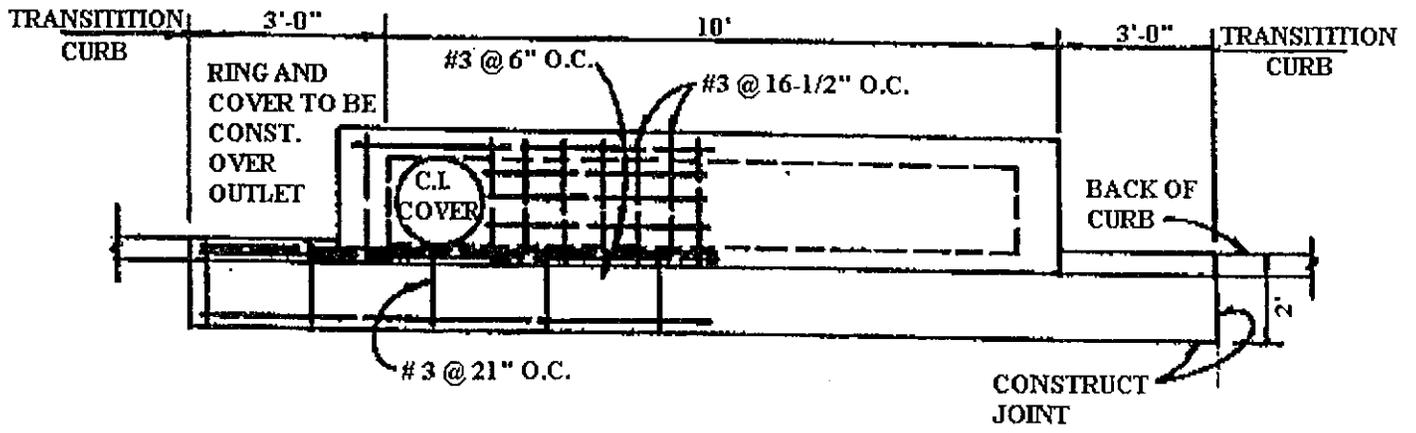
CITY OF LOCKHART

N.T.S.

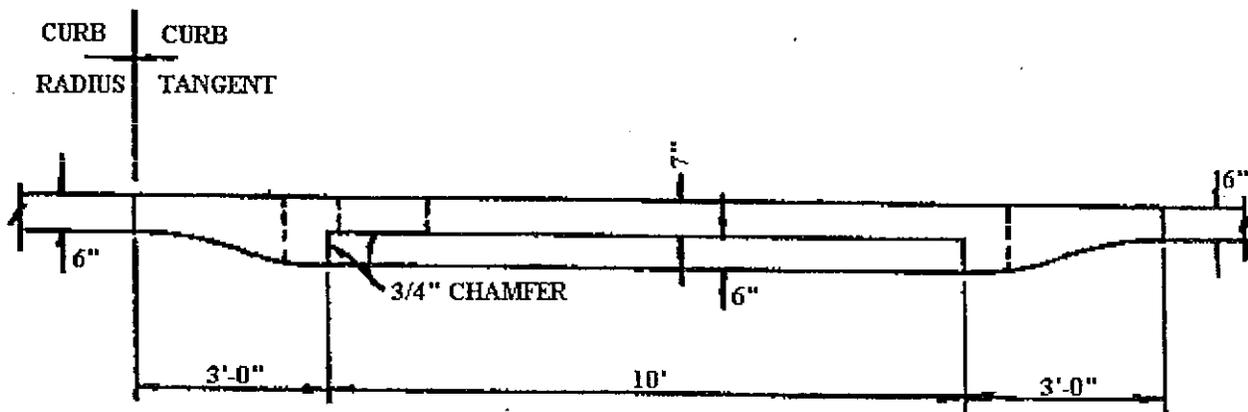
S-18  
(4-29)

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DATE (S) REVISED: 11/19/02





PLAN

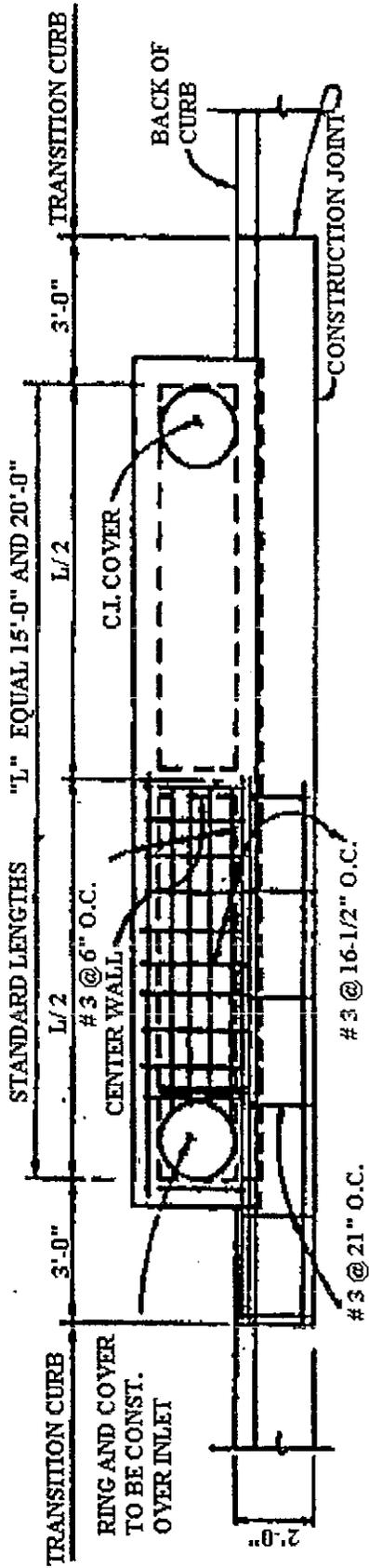


ELEVATION

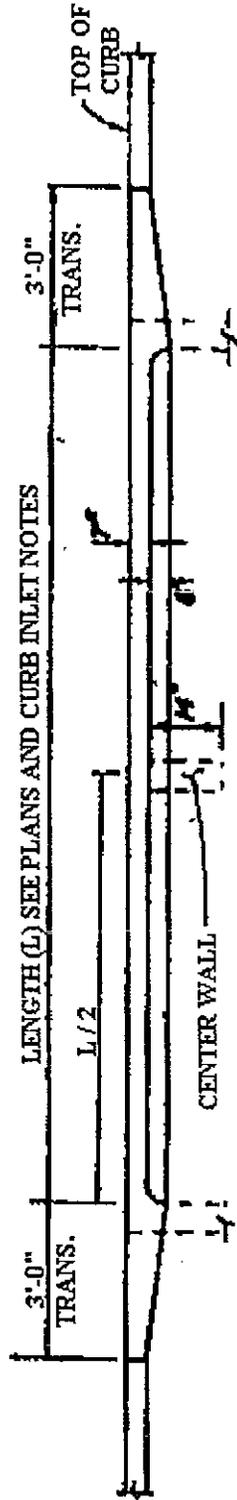
**10' CURB INLET**  
 CITY OF LOCKHART N.T.S.

S-20  
 (4-31)

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 DATE(S) REVISED: 11/19/02



PLAN



ELEVATION

# 15' & 20' CURB INLETS

CITY OF LOCKHART N.T.S.

**CURB INLET NOTES**

1. PROVIDE CENTER WALL AT MID POINT (L/2)

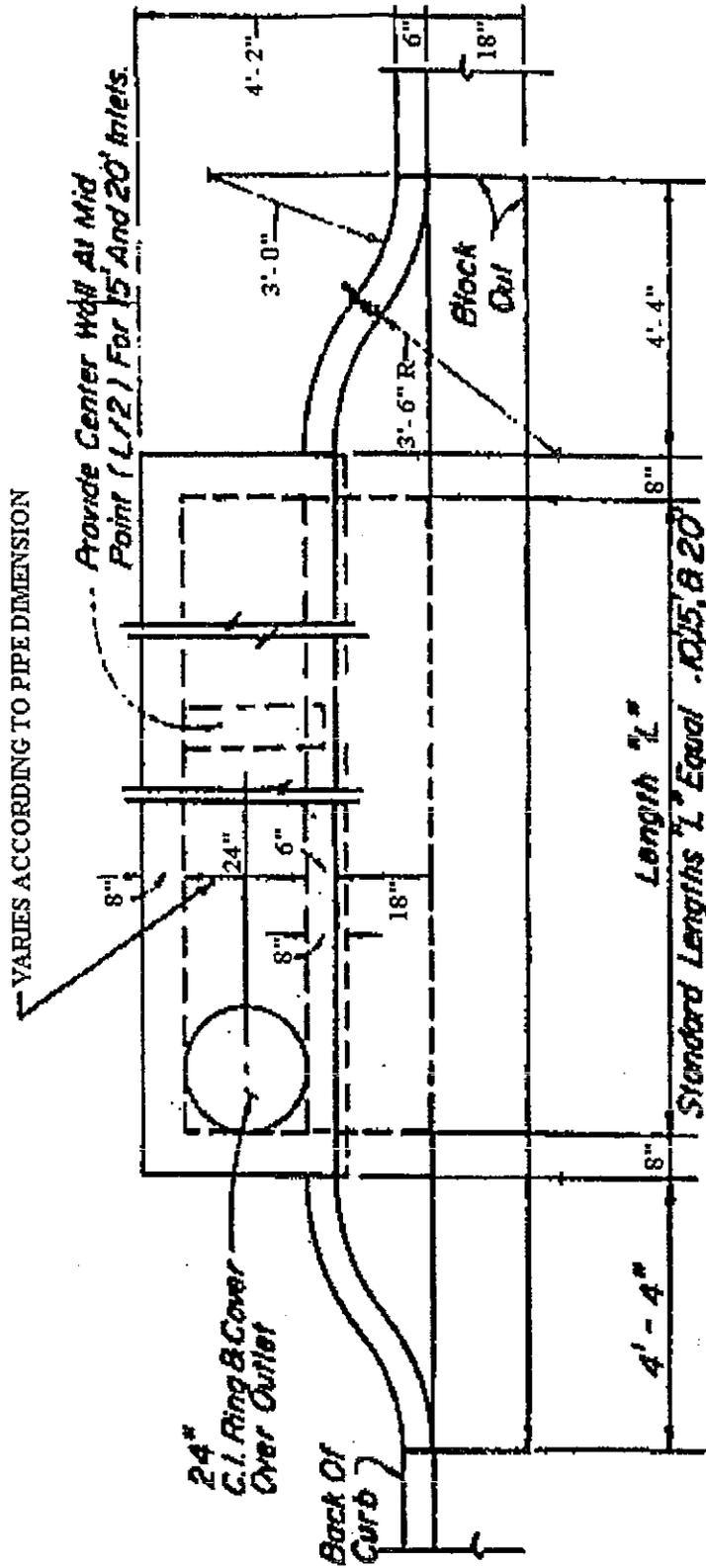
FOR 15'-0 AND 20'-0" INLETS

2. PROVIDE TWO FRAMES AND COVERS

FOR 15'-0" AND 20'-0 INLETS

S-21  
(4-32)

ADOPTED BY COUNCIL 4/28/87  
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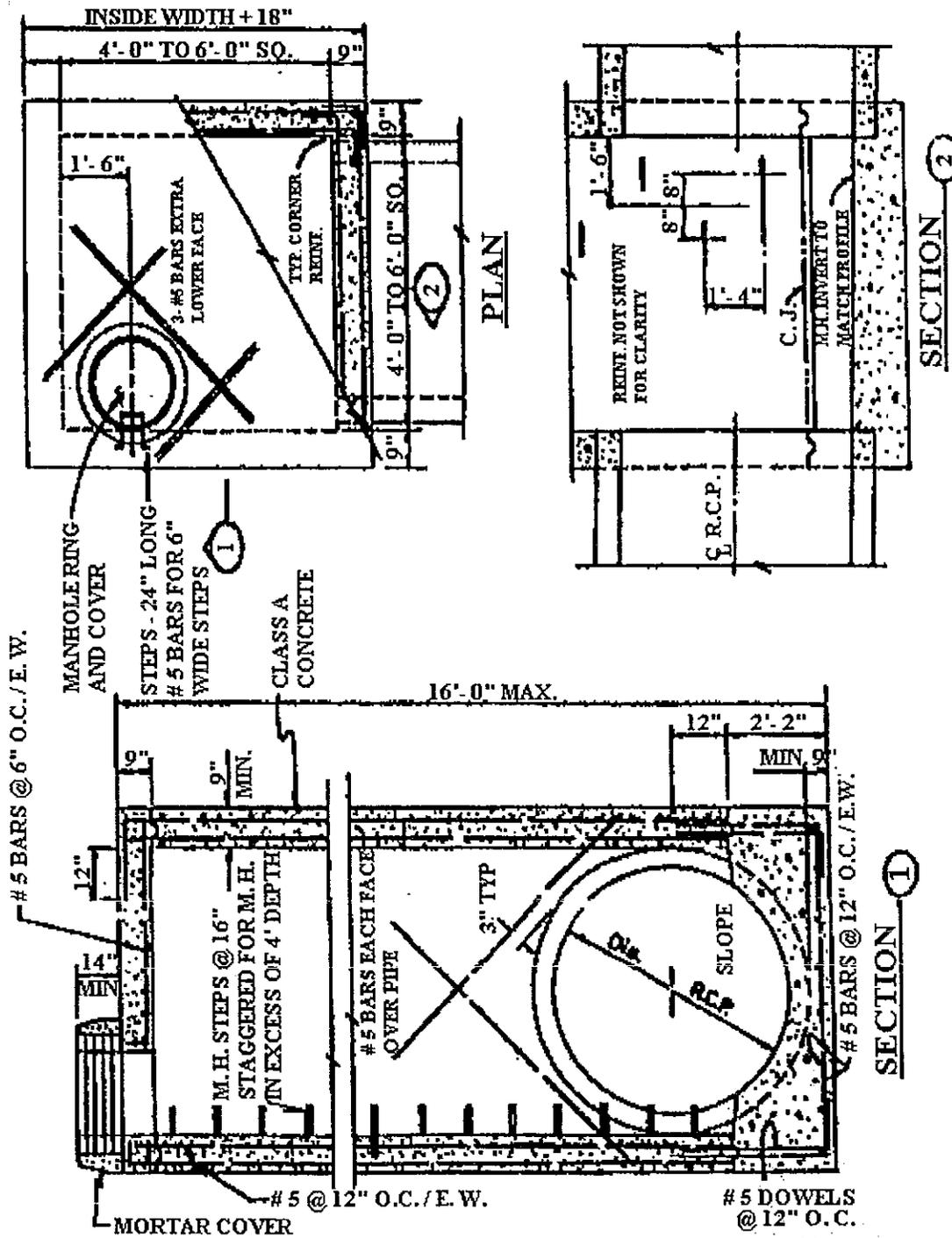


TO BE USED ON ALL STREETS THAT ARE  
WIDER THAN 31' BACK OF CURB TO BACK OF CURB

**RECESSED CURB INLET**  
CITY OF LOCKHART N.T.S.

S-22  
(4-33)

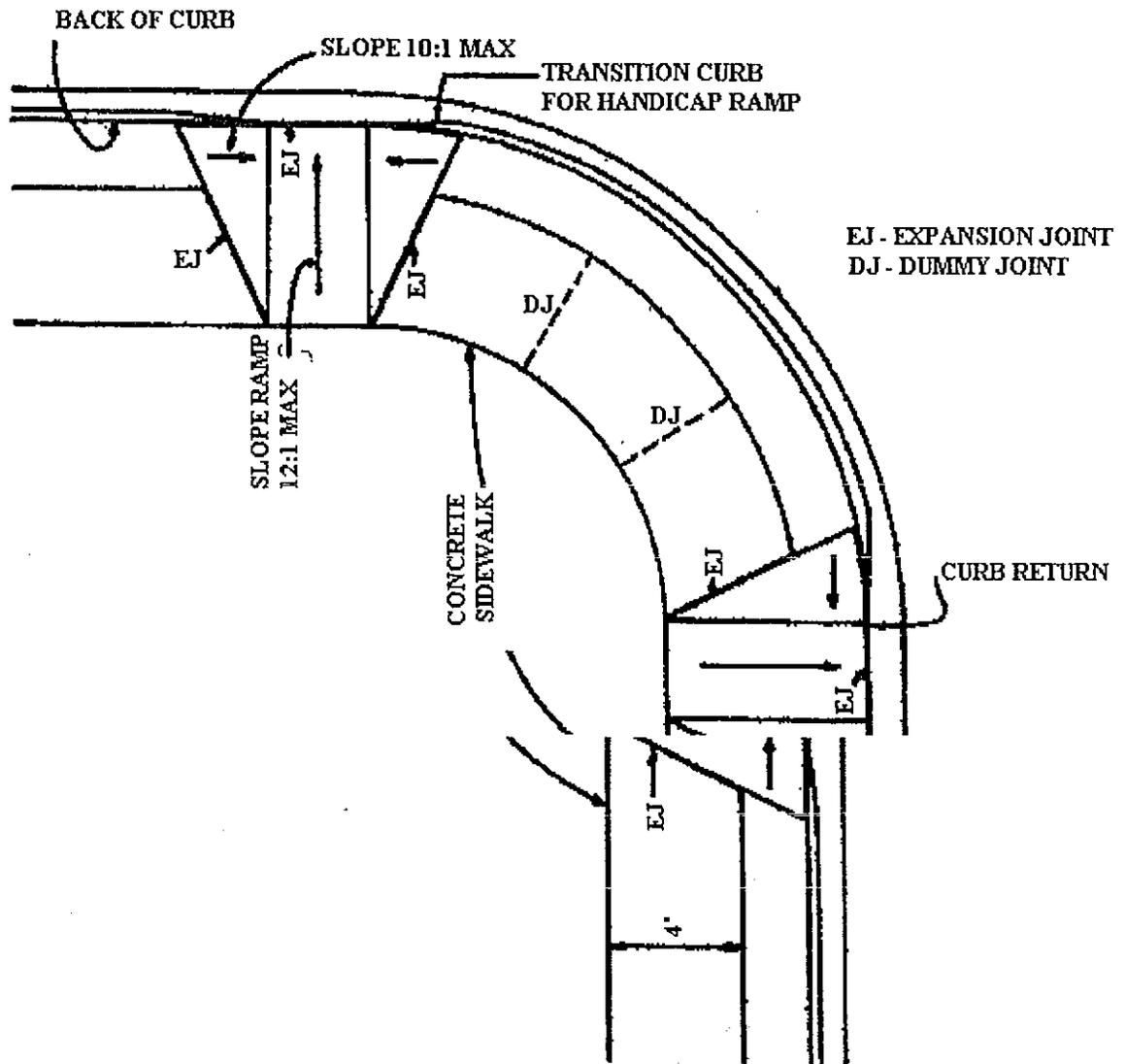
ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



4'-0" TO 6'-0" S.Q. - STORM DRAIN MANHOLE  
CITY OF LOCKHART N.T.S.

S-23  
(4-34)

ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



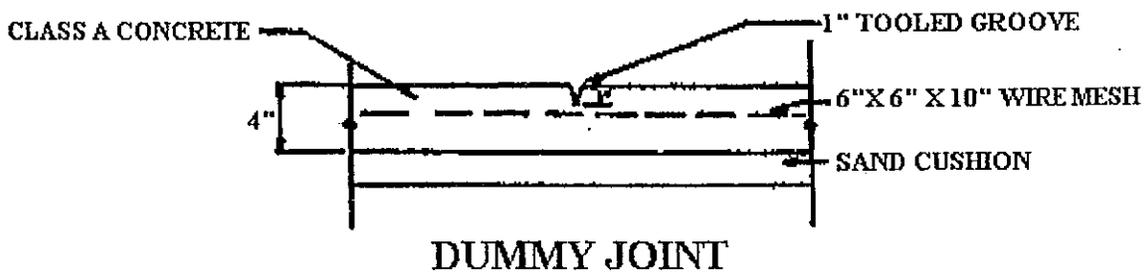
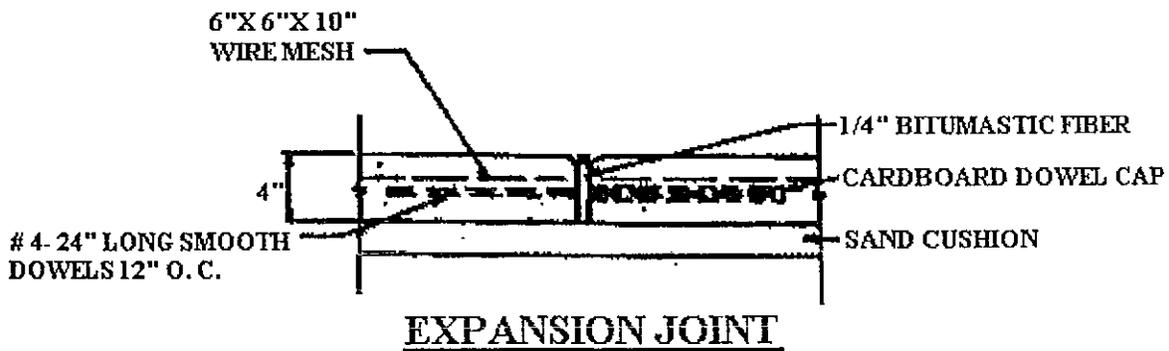
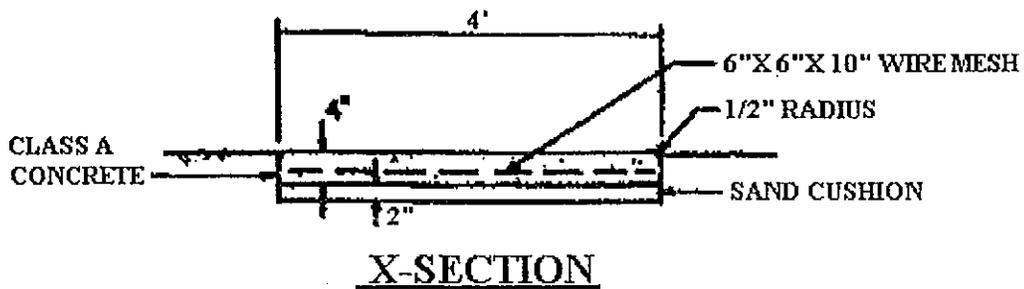
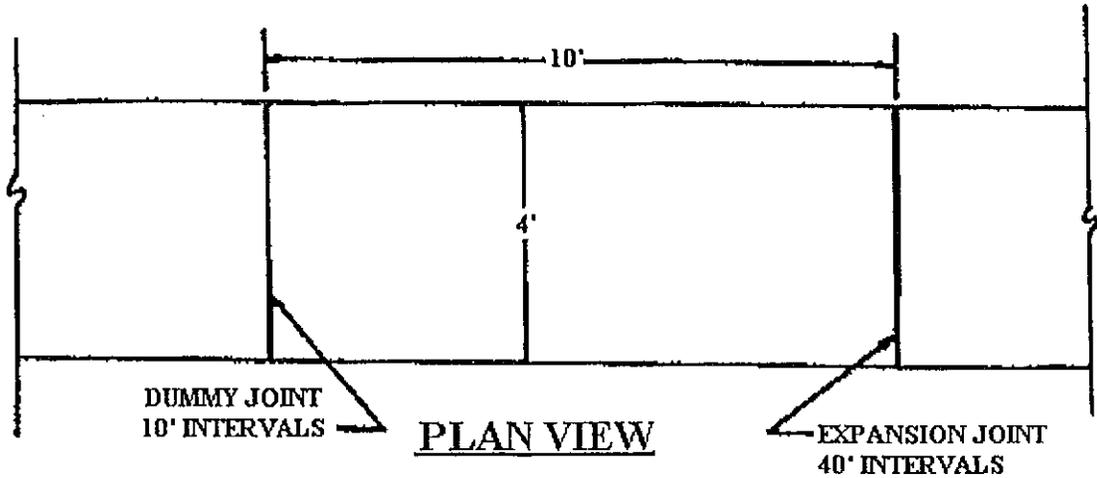
# TYPICAL HANDICAP RAMP

CITY OF LOCKHART

N.T.S.

S-24  
(4-35)

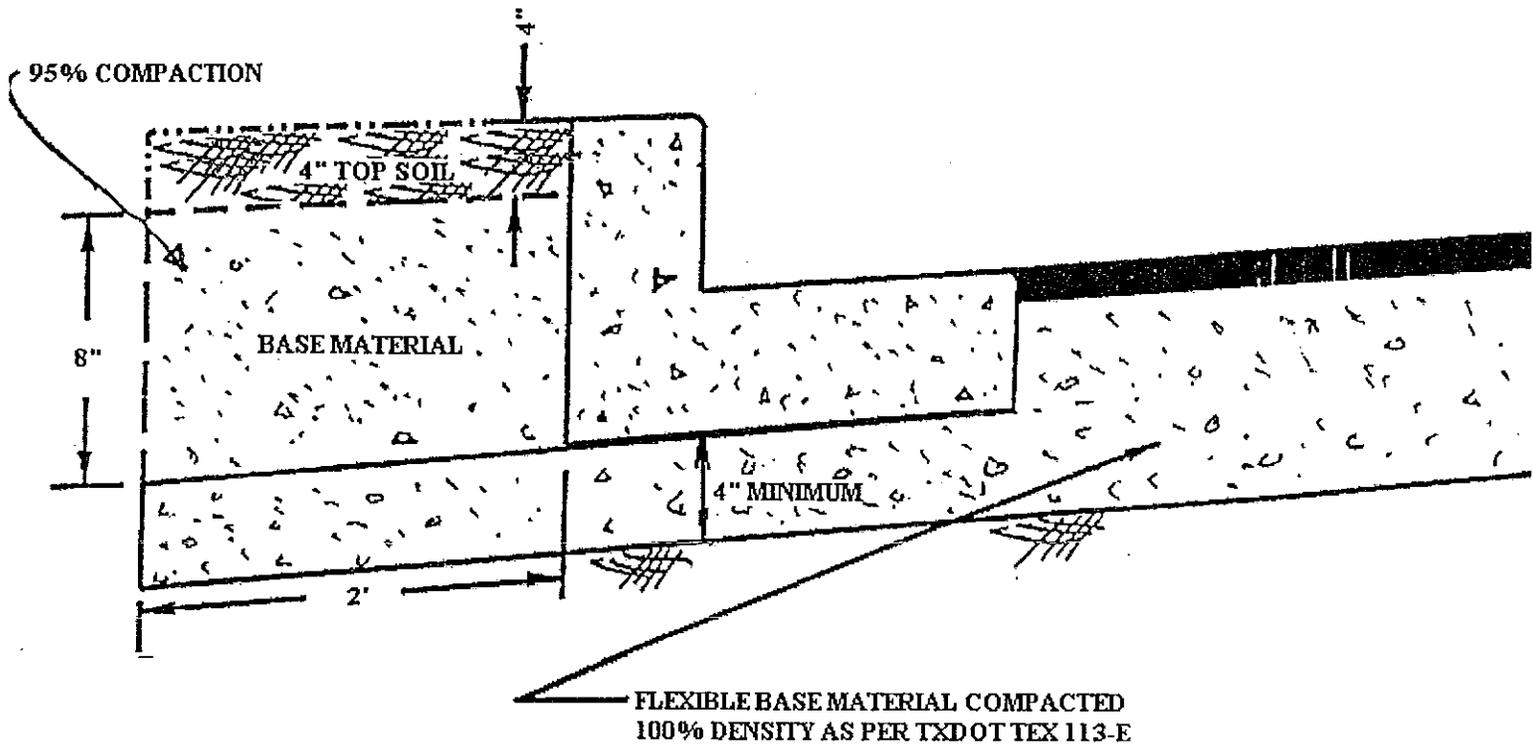
ADOPTED BY COUNCIL 4/28/87  
DATE (S) REVISED: 11/19/02



**SIDEWALK DETAIL**  
CITY OF LOCKHART N.T.S.

S-25  
(4-36)

ADOPTED BY COUNCIL 4/28/87  
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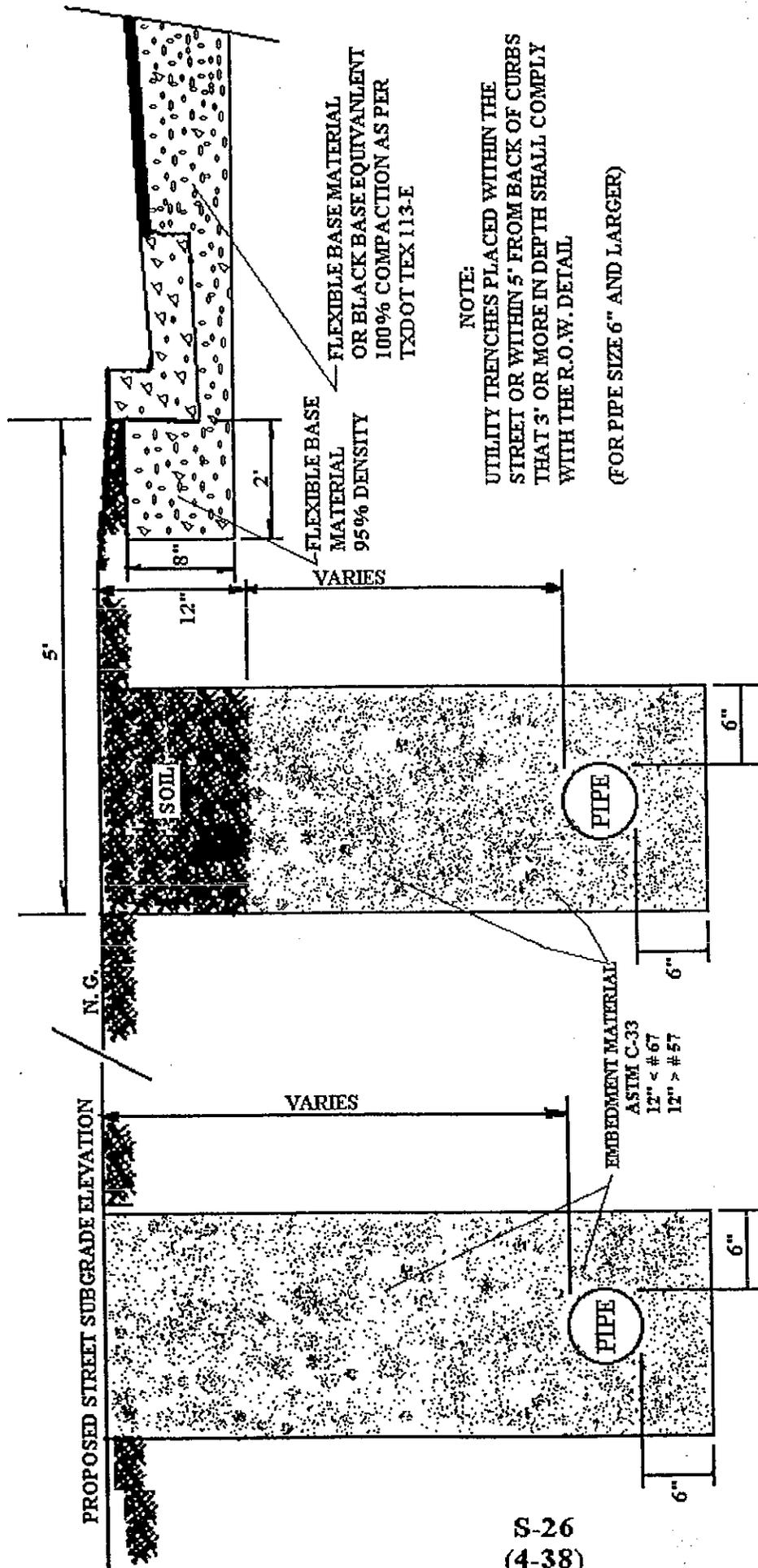
# BEHIND CURB DETAIL

CITY OF LOCKHART

N.T.S.

S-A1  
(4-37)

ADOPTED BY COUNCIL 4/28/87  
DATES (S) REVISED: 11/19/02

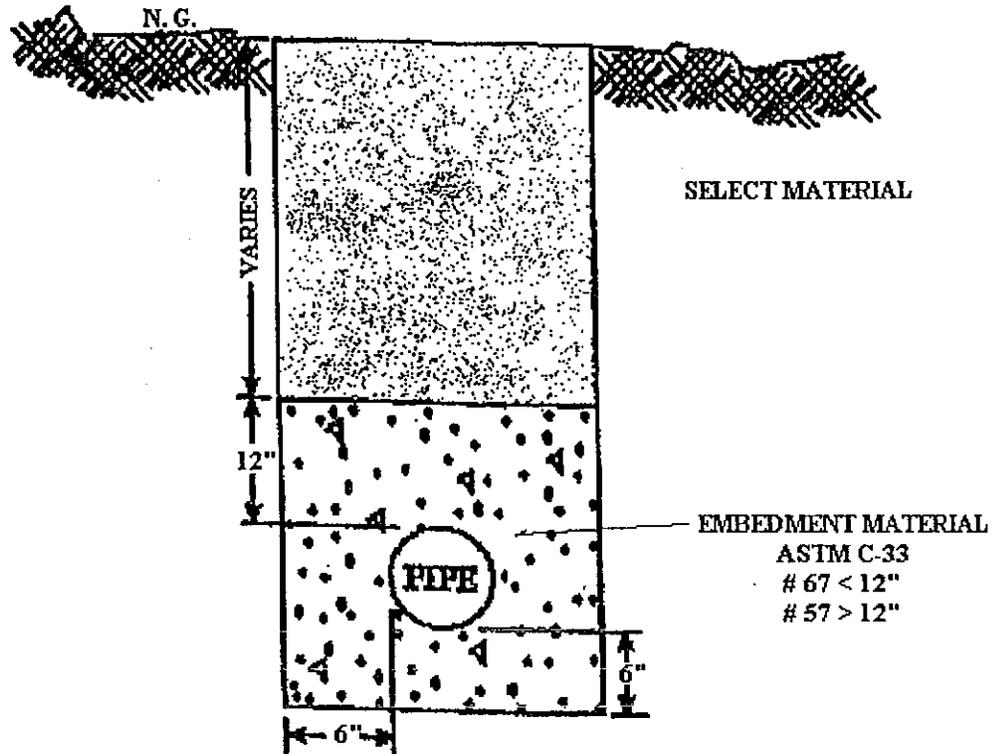


**NOTE:**  
 UTILITY TRENCHES PLACED WITHIN THE STREET OR WITHIN 5' FROM BACK OF CURBS THAT 3' OR MORE IN DEPTH SHALL COMPLY WITH THE R.O.W. DETAIL  
 (FOR PIPE SIZE 6" AND LARGER)

**R.O.W.**  
**TRENCH DETAIL**  
 CITY OF LOCKHART N.T.S.

S-26  
 (4-38)

ADOPTED BY COUNCIL 4/28/02  
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NOTE:  
 SELECT MATERIAL SHALL BE COMPACTED TO 95%  
 STANDARD PROCTOR WITHIN THE R.O.W. AND  
 90% COMPACTION WITHIN AN EASEMENT  
 (TEST METHOD TXDOT TEX 113-E)

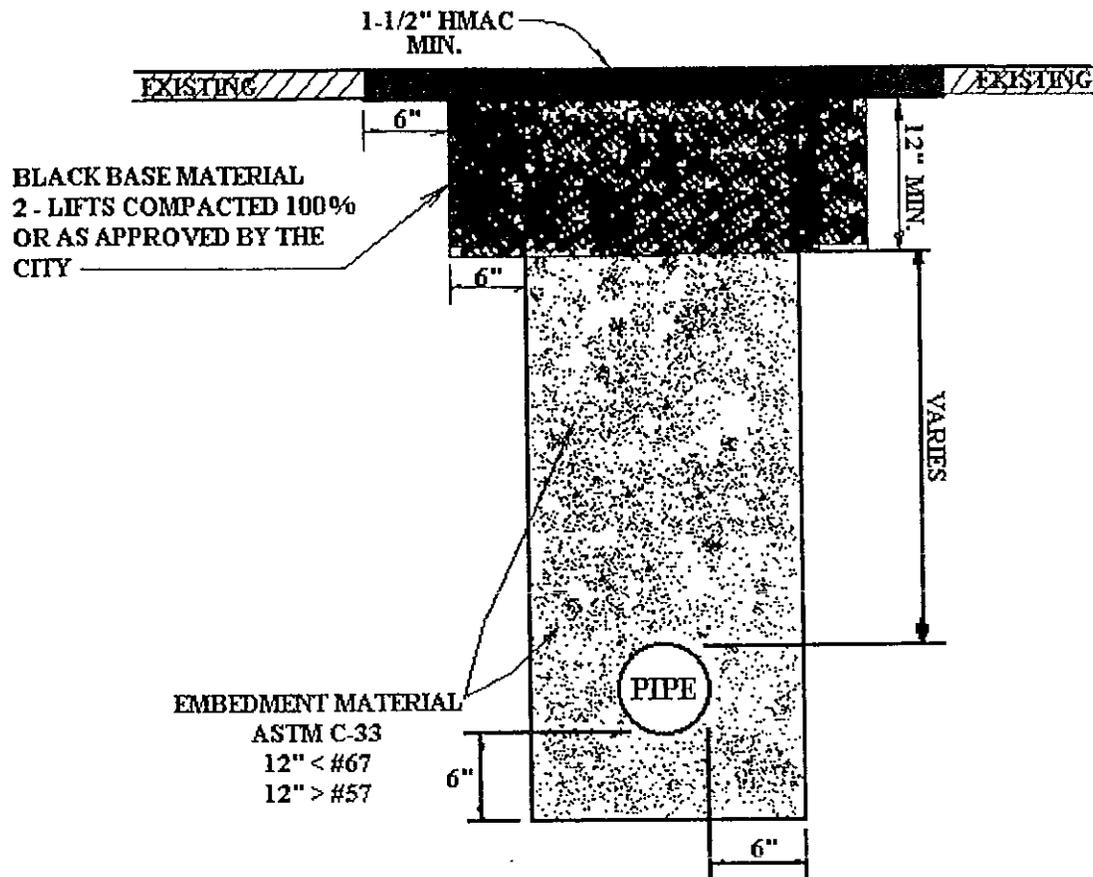
(TRENCH DETAIL SHALL BE USED WHEN TRENCH IS MORE THAN 5' BEHIND  
 CURB OR IN DEDICATED EASEMENTS THAT ARE MORE THAN 5' BEHIND CURBS)

# TRENCH DETAIL

CITY OF LOCKHART N.T.S.

S-27  
 (4-39)

ADOPTED BY COUNCIL 4/28/87  
 DATE (S) REVISED: 11/19/02



(IN EXISTING STREETS)

**TRENCH DETAIL**  
CITY OF LOCKHART N.T.S.

S-28  
(4-40)

ADOPTED BY COUNCIL 4/28/02  
DATE (S) REVISED: 11/19/02

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 5- CONCRETE AND REINFORCING STANDARDS

I. GENERAL

The materials and methods employed for the proportioning and mixing concrete used for paving and other concrete structures and materials used for reinforcing such concrete shall conform to the requirements detailed herein. The concrete shall be composed of Portland cement, mineral filler, and natural aggregates proportioned and mixed as provided herein. All concrete pours shall be confined by forming designated area. All concrete work shall be well compacted and the mortar flushed to the surface of the forms by continuous working with concrete spading implements or mechanical vibrators of an approved type. The vibrators shall be applied to the concrete immediately after deposit and shall be moved throughout the mass, thoroughly working the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms until it has been reduced to a plastic mass. Vibration shall be supplemented by hand spading if necessary to insure the flushing of mortar to the surface of all forms.

Contractor is responsible for the protection of concrete placed under any and all weather conditions.

One hour (1) escape time will be allowed between pours, concrete pours will be rejected after the time frame. Concrete shall not have a free fall more than three (3) feet.

II. CONCRETE FOR STRUCTURES

A. Materials

1. Cement- The cement shall be Type I, Type II, or Type III of a standard brand of Portland cement conforming to ASTM Specification C-150-70. Only one brand of cement will be permitted in any structure.
2. Mixing Water -The water used with the cement shall be clean and suitable for drinking or for ordinary household use.
3. Coarse Aggregate -The coarse aggregate shall consist of gravel, crushed stone, or a combination thereof. Coarse aggregate shall conform to ASTM Specification C-33-67. Gravel shall consist of durable particles of crushed or uncrushed stone of uniform quality throughout. It shall have a wear of not more than 40% when tested according to AASHTO Method T-96. Crushed stone shall consist of durable particles of stone of uniform quality and having the same wear as that required for gravel.
  - a. The coarse aggregate shall be free of an excess of salt, alkali, roots, and other objectionable matter. The grade of aggregate shall be governed by the Class of concrete as specified in Table 4 below.
  - b. The maximum size and the percentage of smaller sizes of material acceptable for the various aggregate grade numbers shall be within the following limits:

TABLE 1- COARSE AGGREGATE GRADATION CHART.  
PERCENT RETAINED

Aggregate Grade No.	Nominal Size	2-1/2 in.	2 in.	1-1/2 in.	3/4 in.	1/2 in.	3/8 in.	No. 4
1	2-1/2"	0	0-20	15-50	60-80			95-100
2	1-1/2"		0	0-5	30-65		70-90	95-100
3	1"		0	0-5	10-40	40-75		95-100
4	3/8"					0	5-30	75-100

(5-1)

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4. Fine Aggregate -Fine aggregate shall consist of natural sand and be free from broken material, foreign matter, excess salt, alkali, and vegetable matter. It shall not contain more than 0.5 percent by weight of clay lumps. Fine aggregate shall conform to ASTM Specification C-33-67.

a. To be acceptable as fine aggregate, the sizes and mix of the material shall be within the following limits:

TABLE 2- FINE AGGREGATE GRADATION CHART

Sieve	Percent Retained
3/8 in.	0%
No.4	0-5%
No.8	0-20%
No.16	15-50%
No.30	35-75%
No.50	75-90%
No.100	90-100%
No.200	97-100%

The sand equivalent shall not be less than 80%.

b. For concrete of Classes A, C, E and F, the fineness modulus shall be between 2.30 and 3.10, determined by adding the percentages by weight retained on sieves 4, 8, 16, 50 and 100 then dividing by 100.

#### B. Admixtures

1. Water reducing admixtures shall conform to Type A or Type D, as set forth in ASTM Specification C-494. Air entraining admixtures shall conform to the requirements of ASTM specification C-260. Before using an admixture, the contractor shall secure, and retain for inspection, certification from the manufacturer that the admixture meets the required specification.

2. Calcium chloride will not be permitted as an admixture.

#### C. Mix Design and Delivery

1. Design and Testing -It shall be the responsibility of the contractor to develop the mix design and to submit it to the City for approval. Testing of all mix design specimens shall be made in an independent testing laboratory.

2. Trial Batches -When trial batches of a mix design are required, they will be made and tested prior to placing the concrete on the job. A mix design from a previous or concurrent job may be used without trial batches if it can be shown that no substantial change in any of the ingredients has been made.

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

4. Water Reducing or Retarding Agents -Water reducing or retarding agents are required for hot weather placement and for continuous slab placement. Otherwise, water reducing or retarding agents may be used with all classes of concrete at the option of the contractor.

(5-2)

ADOPTED BY COUNCIL 4/28/87

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5. Batch Size -When transit mix concrete is used, the batch size shall not be less than 50% of the rated capacity of a representative truck.

6. Entrained Air- Entrained air will be required for concrete of Class A and C. The concrete shall be designed to entrain 5% air when Grade 2 coarse aggregate is used and 6% air when Grade 3 coarse aggregate is used. Concrete as placed in the structure shall contain the amounts of air as stated above with a tolerance of plus or minus 1-1/2%. Occasional variations beyond this tolerance will not be cause for rejection: When the quantity of entrained air is found to be above 7% with Grade 2 coarse aggregate, or above 8% for Grade 3 coarse aggregate, additional test beams or cylinders shall be made and tested. If these beams or cylinders pass the minimum flexural or compressive requirements, the concrete will not be rejected because of the variation in entrained air content.

#### D. Consistency

1. General -Concrete shall be of such consistency as to insure the required workability and result in compact masses with dense and uniform surfaces; the consistency of concrete mixtures shall be such that:

a. The aggregates will not segregate and mortar will cling to the coarse aggregate.

b. The concrete when dropped from the discharge chute will flatten out at the center of the pile, but the edges will not flow.

c. The concrete will not show free water.

d. The concrete will slide and not flow into place when discharged from metal chutes at an angle of 30° from the horizontal.

2. Variations -The mix design shall not be varied unless authorized by the City. In cases where the characteristics of the aggregates are such that, with the maximum allowable amount of water, the consistency requirements cannot be satisfied, the contractor may furnish additional cement, aggregates, mineral filler, or aggregate of a different character which will produce the desired results. The addition of water to the approved batch design to provide workability will not be permitted.

3. Slump Requirements -Slump requirements for designated structures shall be within the following limits:

TABLE 3- SLUMP REQUIREMENTS

	Desired Slump	Maximum Slump
Cased Drilled Shafts	5	6
Uncased Drilled Shafts	4	5
Thin Walls (9" or less)	4	5
Prestressed Members	4	5
Slabs	3	4
Caps	3	4
Column	3	4
Piers	3	4
Wall (over 9")	3	4
Underwater or Seal Concrete	5	6
Rip-rap and Miscellaneous	As directed by City	

(5-3)

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DATE(S) REVISED: 11/19/02

4. Rejection- Remedial Measures -Any concrete failing to meet the above consistency requirements will be considered unsatisfactory although the concrete meets the required slump test. In cases where the characteristics of the aggregate furnished are such that, with the maximum allowable amount of water, the specified slump and consistency requirements are not met, the contractor may provide additional cement or aggregates of an improved grading, to cause the concrete to meet the slump and consistency requirements.

E. Classification

Concrete shall be classified as set forth below. Class A shall be utilized if engineering plans do not designate the classification to be used in a particular structure.

TABLE 4- CONCRETE CLASSES

Class	Sacks of Cement per C.Y.	Min. Comp. Strength (28 Day)	Min. Beam Strength (7 Day)	Maximum W/C Ratio	Coarse Aggregate Grade No.
A	5	3000	500	6.5	2-3-4*
B	4	2000	330	8.0	2-3-4*
C	6	3600	600	6.0	1**-2-3
D	3	1500	250	11.0	2-3-4*
E	6	3000	500	7.0	2-3

\* Must have prior approval of City's Engineer before Grade 4 aggregate may be used.

\*\* Grade I may be used in foundation only, provided foundation does not include drilled shafts.

Concrete of Classes A and C shall be air entrained.

F. Testing of Concrete

1. During the progress of the work, an independent testing laboratory shall cast cylinders and/or test beams for testing of compressive and/or flexural strength. The City may waive the actual testing for small structures such as for manholes, culverts, inlets, or small riprap placements; however, no such waiver shall be given if the placement equals or exceeds 25 cubic yard.

2. If testing is required before removal of forms or falsework, the cylinders or beams shall be cured at the jobsite and in the same method as the concrete which the test sample represents. Tests made for design strength concrete shall be cured in accordance with TDHPT Bulletin C-11.

3. Quality control shall be based on seven day compressive strengths which are compatible with the strengths of the design mix. A new batch design shall be made if these tests do not meet the expected design strengths.

### G. Placement Conditions

1. The concrete shall be mixed in quantities required for immediate use. Concrete shall be placed within the time limits, corresponding to the temperature limits, set out below. Re-tempering of the mix will not be permitted.

Air Temp. or Concrete Temp.	Maximum Time in Mixer
40°F to 74°F	90 Minutes
75°F to 89°F	60 Minutes
90°F and above	45 Minutes

2. In threatening weather, which may result in conditions which will affect the quality of the concrete, the City may order postponement of the work. Where work has started and changes in weather conditions require protective measures, the contractor shall furnish adequate shelter to protect the concrete against damage from rainfall or freezing temperatures.

### III. REINFORCING STEEL

#### A. Description

The provisions of this section shall govern the furnishing and placing of reinforcing steel where indicated in these specifications and/or as shown on the Details.

#### B. Materials

1. General -Except where otherwise designated on the plans, all bar reinforcement shall be deformed and shall conform to ASTM Specification A-615, Grades 40, 60, or 75; and shall be open hearth, basic oxygen, or electric furnace new billet steel.

2. Spiral Reinforcement -Spiral reinforcement shall be smooth (not deformed) bars or wire of the minimum diameter shown on the plans, and shall be made by one or more of the following processes: open hearth, basic oxygen, or electric furnace. Bars shall be rolled from billets reduced from ingots and shall comply with ASTM Specification A-615, Grades 40 or 60, except for deformation. Wire shall be cold-drawn from rods that have been hot rolled from billets and shall comply with ASTM Specification A-82.

3. Wire -Wire shall conform to the requirements for cold-drawn steel wire for concrete reinforcement, ASTM Specification A-82. Wire fabric, when used as reinforcement, shall conform to ASTM Specification A-185.

#### C. Bending

The reinforcement steel shall be bent cold, true to the shapes indicated on the plans. Preferably, the bending shall be done in the shop. Irregularities in bending will be cause for rejection.

#### D. Storing

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

#### E. Splices

1. No splicing of bars, except when provided on the plans, or specified herein, will be permitted. Splices will not be permitted in the main reinforcement at points of maximum stress. When permitted in the main bars, splices in adjacent bars must be staggered a minimum of two splice lengths.

2. When splicing of reinforcement bars is permitted in the plans and specifications, the splice overlap must conform to the limits set out below.

TABLE 5- BAR SPLICING

A minimum of 12 inches of overlap is required.

Horizontal bars with less than 12 inches of concrete below the bar	20 bar diameters
Horizontal bars with more than 12 inches of concrete below the bar	35 bar diameters
Vertical Bars	30 bar diameters

3. Splices not provided for on the plans will be permitted subject to the following limitations:

- a. Applicable to Grade 40 bars only, sizes No.8 and smaller.
- b. Splices will not be permitted in bars of less than 20 feet in plan length.
- c. The bars to be placed in firm contact and firmly wired together.
- d. All such splices must have the minimum specified concrete cover.
- e. In no case will welding of reinforcement bars be permitted.

#### F. Placing of Reinforcement

1. Reinforcement shall be placed as near as possible in the position shown on the plans. Unless otherwise shown on the plans, dimensions shown for reinforcement are to the centers of the bars. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement measurement by more than one-twelfth (1/12) of the spacing between the bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-fourth inch (1/4") .Cover of concrete to the nearest surface of steel shall meet the above requirements, but shall never be less than one inch (1").

2. Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The reinforcing steel shall be spaced the required distance from the form surface by means of approved galvanized metal spacers, metal spacers with plastic coated tips, stainless steel spacers, or plastic spacers.

3. Mats of wire fabric shall overlap each other sufficiently to maintain uniform strength and shall be fastened securely at the ends and edges.

4. No concrete shall be placed until the City has inspected the assembly of the reinforcing steel and given permission to proceed.

(5-7)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED: 11/19/02

CITY OF LOCKHART, TEXAS  
CONSTRUCTION STANDARDS

CHAPTER 6- ELECTRIC DISTRIBUTION SYSTEM STANDARDS

I. .General

A. The City of Lockhart is capable of supplying primary service through the city electrical distribution system. Available voltages include, single-phase 7.2 KV and three-phase 12.47 KV.

B. In those developments having distribution and design requirements which are not adequately served by the requirements of this chapter, the developer will have an electrical distribution system designed by an engineer competent to make such design. The design plans, and details required by such system shall be certified by the design engineer and must be approved by the City prior to construction.

C. Primary underground service in overhead distribution areas will be provided where the City determines the size or service requirements of the load make such installation necessary or desirable.

D. Meter loops, whether for overhead or underground secondary service, shall not be installed on the same pole with transformers, re-closures, voltage regulators, or any other distribution devices unless approved by the City.

E. All equipment installed shall be new and shall meet the minimum requirements of the NEC.

F. All secondary current exceeding 1200 amps shall utilize a City approved weatherproof bus trough at the meter installation. Troughs on the supply side of the meter installation shall be so constructed that a City seal can be used to prevent unauthorized opening.

G. No pole, anchor, trench wall, or concrete pad shall be placed closer than 2 feet (2') to a property line.

H. All electrical facilities installed are subject to inspection by the City during any phase of construction. Prior to backfill of trenches in under-ground installation the City must inspect and approve the installation. Prior to placement of concrete the City must approve such installations. Before the system is energized, approval from the City must be obtained.

II. Overhead Service

A. Primary

In new subdivisions, the minimum conductor size shall be No. 1/0 conductor on 40 foot Class 4 poles. Larger conductors may be required by the City if determined necessary. Poles shall be placed a minimum of six feet (6) into the ground and in such location as necessary to provide service to each lot, but not more than 300 feet apart, depending upon wire size. Main line disconnects shall be installed where connection will be made to the existing system.

B. Transformers

1. The largest pole mounted transformer shall be 167 KVA.
2. The largest pole mounted transformer bank shall be three (3) 167 KVA transformer on a class 2 pole.
3. In all residential subdivisions the minimum transformer size shall be 50 KVA.
4. Permanent access shall be provided, suitable for the heavy equipment, required to service any ground mounted transformer bank.
5. Transformers shall not contain PCB's and shall be so marked.

C. Secondary

A minimum of 65 feet of secondary conductor for each lot to be served shall be furnished at each transformer pole.

D. Clearances

1. The point of attachment of a service drop to a building or other structure shall be high enough to provide the following minimum clearances:

Feature	Clearance
Sidewalk .....	10feet
Residential .....	15feet
Commercial Driveways and Parking Lots.....	18feet
Public Streets, Roads, Highways and Alleys.....	27feet

2. The point of attachment shall not be higher than 30 feet unless necessary to obtain the required clearance.
3. The City may require extra service poles be set to clear obstructions.

### III. Underground Services

#### A. Primary

In subdivisions, the minimum conductor size shall be City approved, URD Type, No.2 copper in a two inch (2") Schedule 40 conduit. Larger conductors may be required by the City of determined necessary. Pull boxes shall be installed where required to ensure that conduit ends are accessible at intervals of not more than 200feet. The developer shall furnish primary terminators where connection is made to the existing system and the City will assist termination.

#### B. Transformers

1. In all residential subdivisions the minimum transformers size shall be 50 KVA.
2. Transformers shall be furnished with primary elbows, secondary lugs, and automatic reset fault indicators for each phase on the primary elbow.
3. Transformers shall not contain PCB's and shall be so marked.
4. Each transformer will be mounted on a reinforced concrete slab.

See Details.

#### C. Secondary

1. Each junction box shall include a secondary conduit for each lot to be served, extending not less than 3 feet 3' from under the pad and in the general direction that such service is to be provided, and such other conduits as are necessary for installation of street lights and services.
2. Street light service conduit shall be minimum of 1-1/4 inch diameter.
3. CT metered services shall have minimum of a one inch (1") conduit between the pad-mounted transformer and the meter socket.
4. Single-phase riser and conduit from transformers and/or secondary pads shall have minimum size of two inch (2") for meter loops up to 200 amps, three inch (3") conduit for meter loops greater than 200 amps, and such other additional runs of conduit as may be required for larger loads. A three-phase riser and conduit from transformers and/or secondary pads shall have a minimum of three (3) each two inch (2") conduits.

#### D. Trench Safety (Added)

1. All trenches having a depth of more than five feet (5') shall be provided with a suitable form of safety system to prevent trench collapse.
2. Such safety system shall be designed by the sub-divider's or contractor's engineer to meet the Occupational Safety and Health Administration standards.
3. The contractor shall ensure the safety system is properly utilized at all times that there is a requirement for the safety system.
4. The engineer designing the safety system shall inspect such system to ensure its proper installation and utilization.

### III. Grounding

- A. A permanent ground-connection from a driven ground rod and attached to the neutral terminal of the meter socket shall be provided.
- B. The grounded neutral conductor shall be electrically continuous from the weather-head through the meter loop for all service entrance conductors. The grounded conductor shall be positively identified by the use of white tape or other suitable method.
- C. Service grounding from the ground rod to the meter socket shall use a minimum No.6 copper wire or equivalent.

(6-3)

ADOPTED BY COUNCIL 4/28/87

DATE (S) REVISED:

V. Metering, Meter Loops and Service Drops

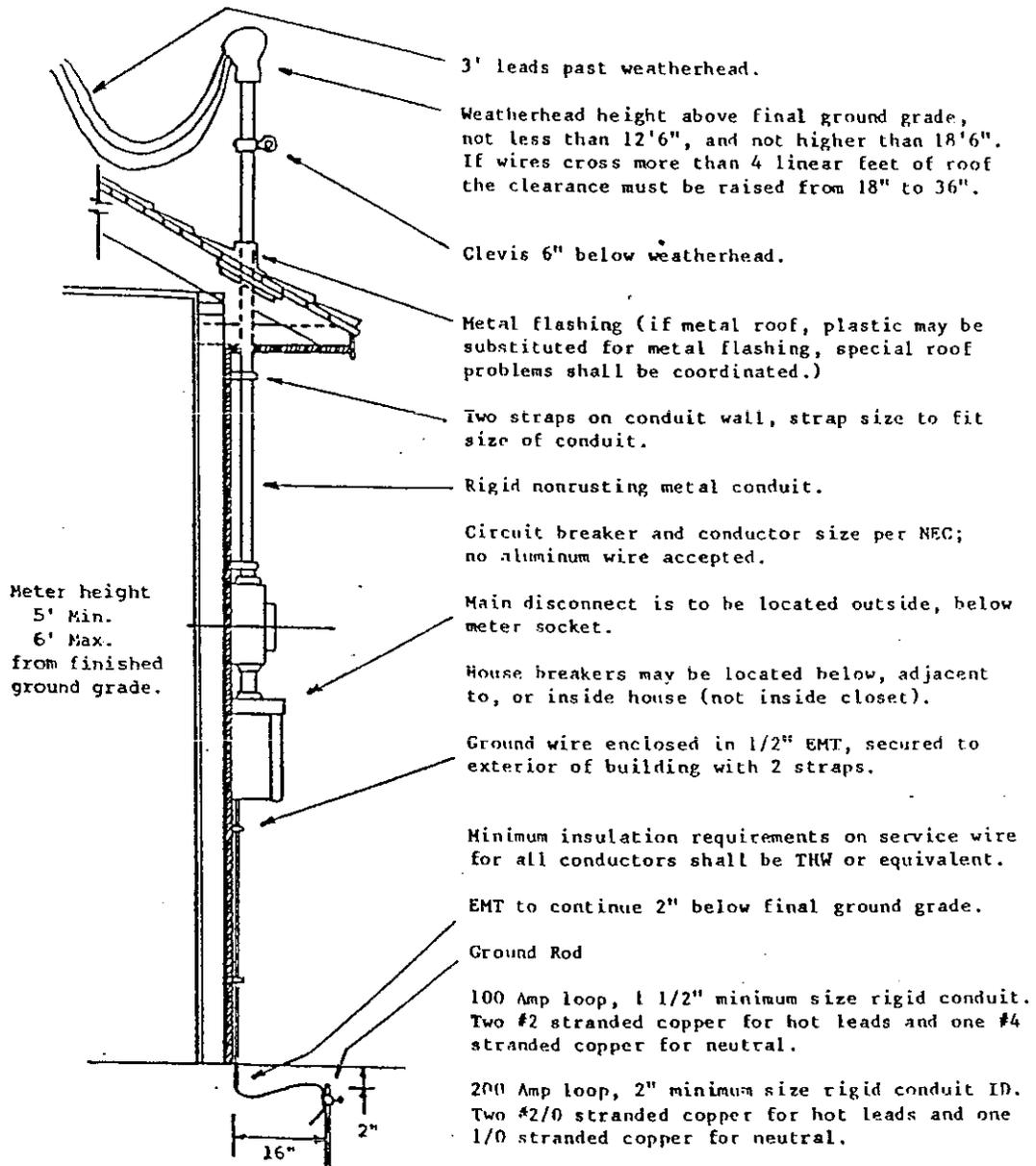
- A. The builder shall be responsible for furnishing and correctly installing all equipment for meter loops, including trough, meter sockets, riser conduit and fittings, weather-head, and sufficient approved conductors of five feet (5') minimum excess length out of the weather-head.
- B. City must inspect the meter loop from the socket to the weather-head to insure acceptable wiring and termination practices.
- C. Standard permanent poles for meter loop services shall be nominally 25 feet in height from grade, except where certain clearance conditions exist, with the meter socket between five feet and six feet (5') and (6') in height from grade, with a minimum conduit riser length to the weather-head of 15 feet.
- D. **Meter loops will no longer be set on City poles.** If a pole is required on private property, the customer will be responsible for installing a City approved pole (30-4) and for requesting and obtaining an approved inspection by the City.
- E. The developer shall furnish all C/T/ metering and meters, including primary metering. The City will assist with installation of meters.
- F. Bare or insulated wire shall be furnished and installed in service entrance as a bond between equipment ground and the City's common neutral system. The conductor shall be appropriately sized but in no case shall it be less than No. 6 copper or equivalent.
- G. A solid point of attachment for supporting the service drop on the building shall be provided.
- H. A service pole shall be set in those cases where proper clearance from ground, trees, and other obstructions can be obtained, but the distance from the transformer pole to the point of attachment is more than 100 feet.
- I. Meters will not be located where they will interfere with traffic, on sidewalks or driveways, or where they will obstruct the opening of doors or windows.
- J. Meter mounting devices shall be installed so that the disc of the meter when installed will be exactly level.
- K. When more than one meter is installed, as on duplex apartments or apartment house, the meters are to be grouped at a point accessible at all times to the City. Each meter socket shall be clearly and permanently marked by the person installing it to show the apartment and/or address to be served by the meter.

VI. Street Lights

- A. Street lights will no longer be installed on private property.
- B. In subdivisions street lights shall be furnished and installed according to the current City street light policy.
- C. The street light installation shall be a 250 watt mercury vapor fixture with a photocell switch, a 30 amp fuse, and a 250 watt high pressure sodium bulb 4' mounted at a height of 30 feet on a aluminum pole or metal pole approved by the City, with a minimum four foot (4') arm, or longer if required by the City.

## ELECTRICAL SYSTEM DETAILS

<u>DETAILS</u>	<u>Detail No.</u>
Single Overhead Service Single Phase Meter Loop	E-1
Overhead Service, Multiple Metering	E-2
Overhead to Underground Single Phase Primary Riser	E-3
Overhead Primary to Underground Single Phase Secondary Riser	E-4
Overhead to Underground with Meter at Pole Single Phase Meter Loop Installation	E-5
Overhead to Underground Mobile Home Park Meter Loop	E-6
Trench Installation (Single Phase Illustrated)	E-7
Single Underground Service Single Phase Meter Loop	E-8
Underground Secondary Service, Multiple Metering In Apartment Complex	E-9
Overhead Service Temporary Meter Loop	E-10
Underground Service Temporary Meter Loop	E-11
Typical transformer Pad	E-12
Overhead Primary to Underground 3 Phase Secondary Riser	E-13
Single Underground Service, J-Box Installation	E-14

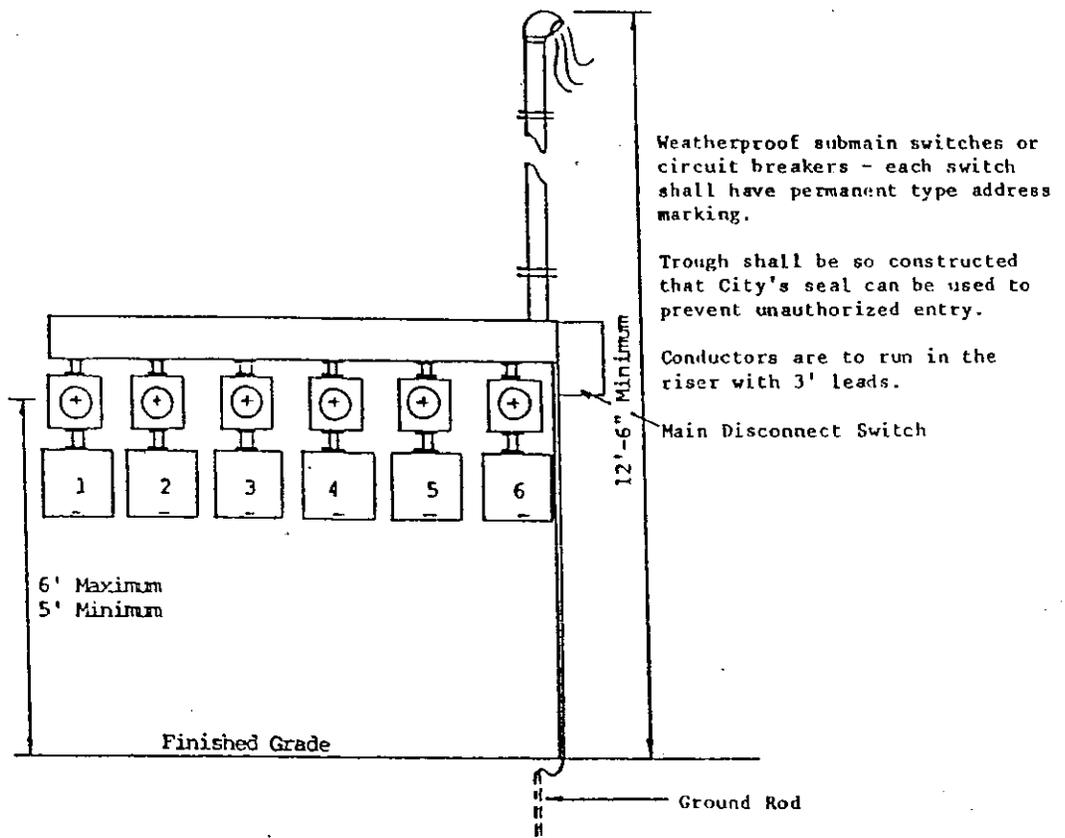


SINGLE OVERHEAD SERVICE  
SINGLE PHASE METER LOOP

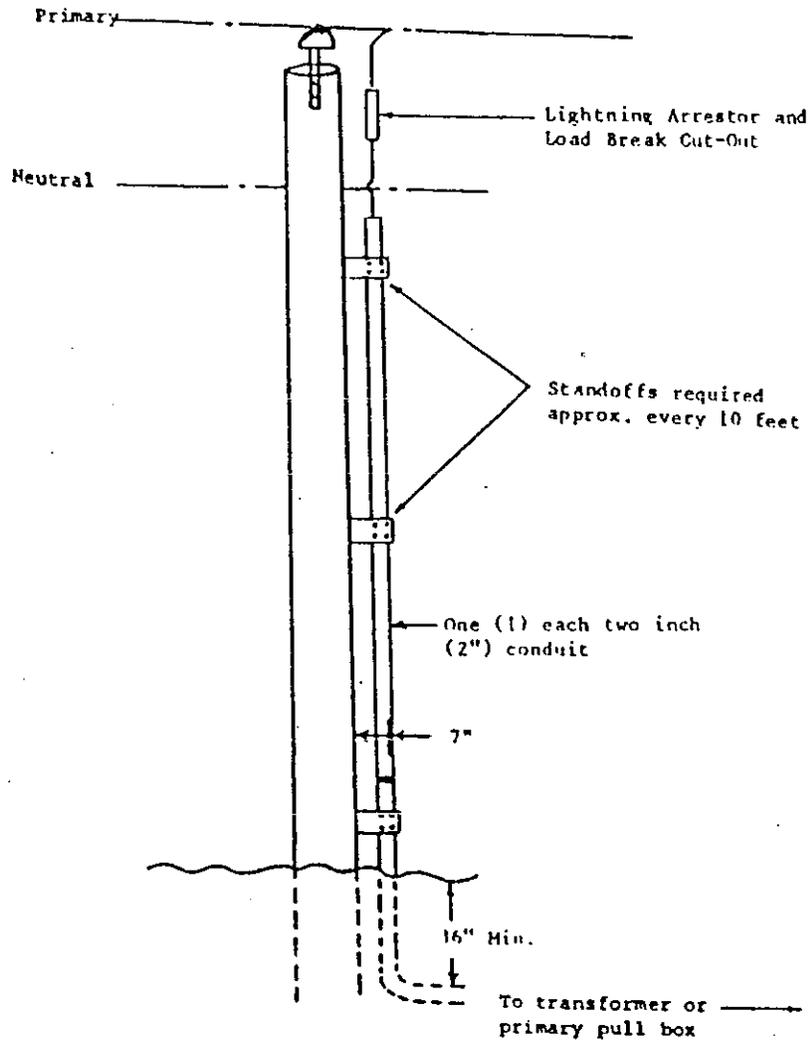
E-1

(6-6)

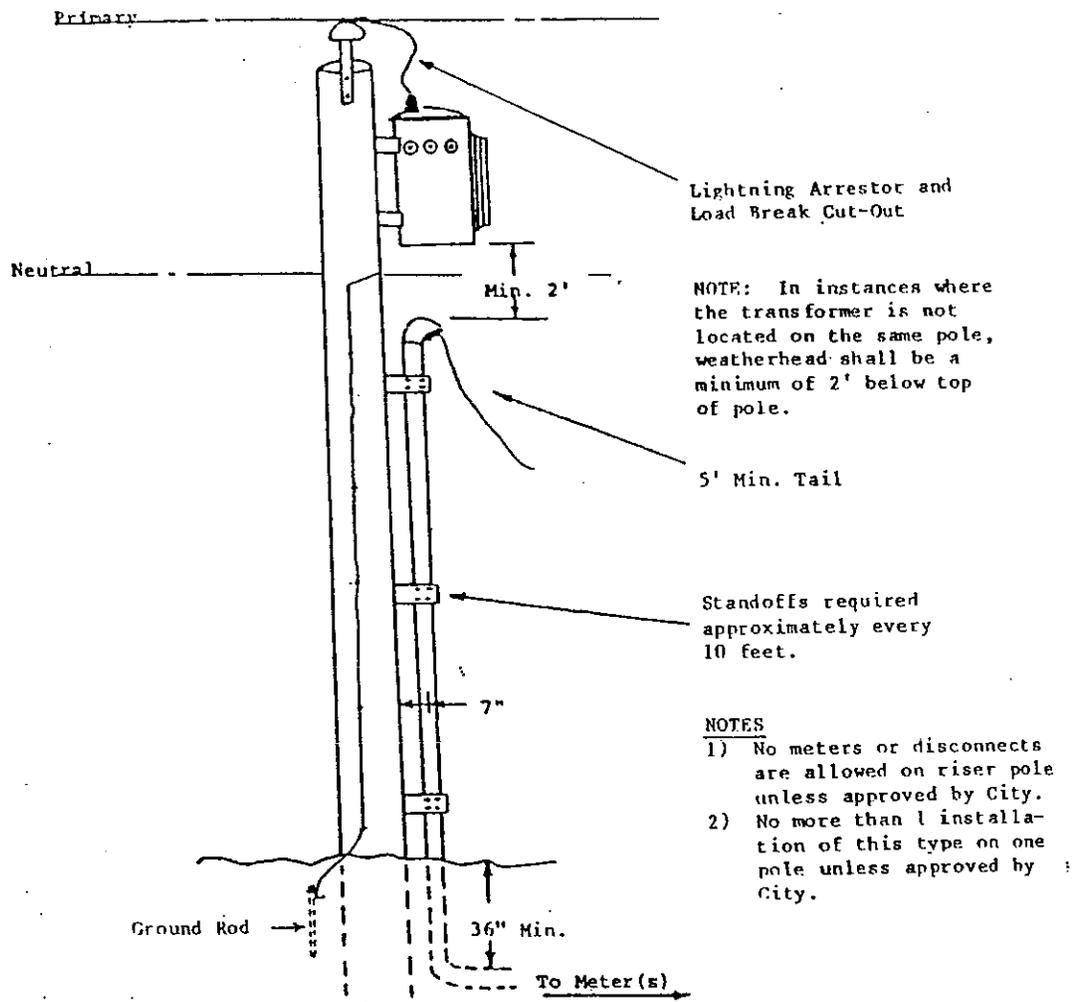
ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED:



OVERHEAD SERVICE, MULTIPLE METERING



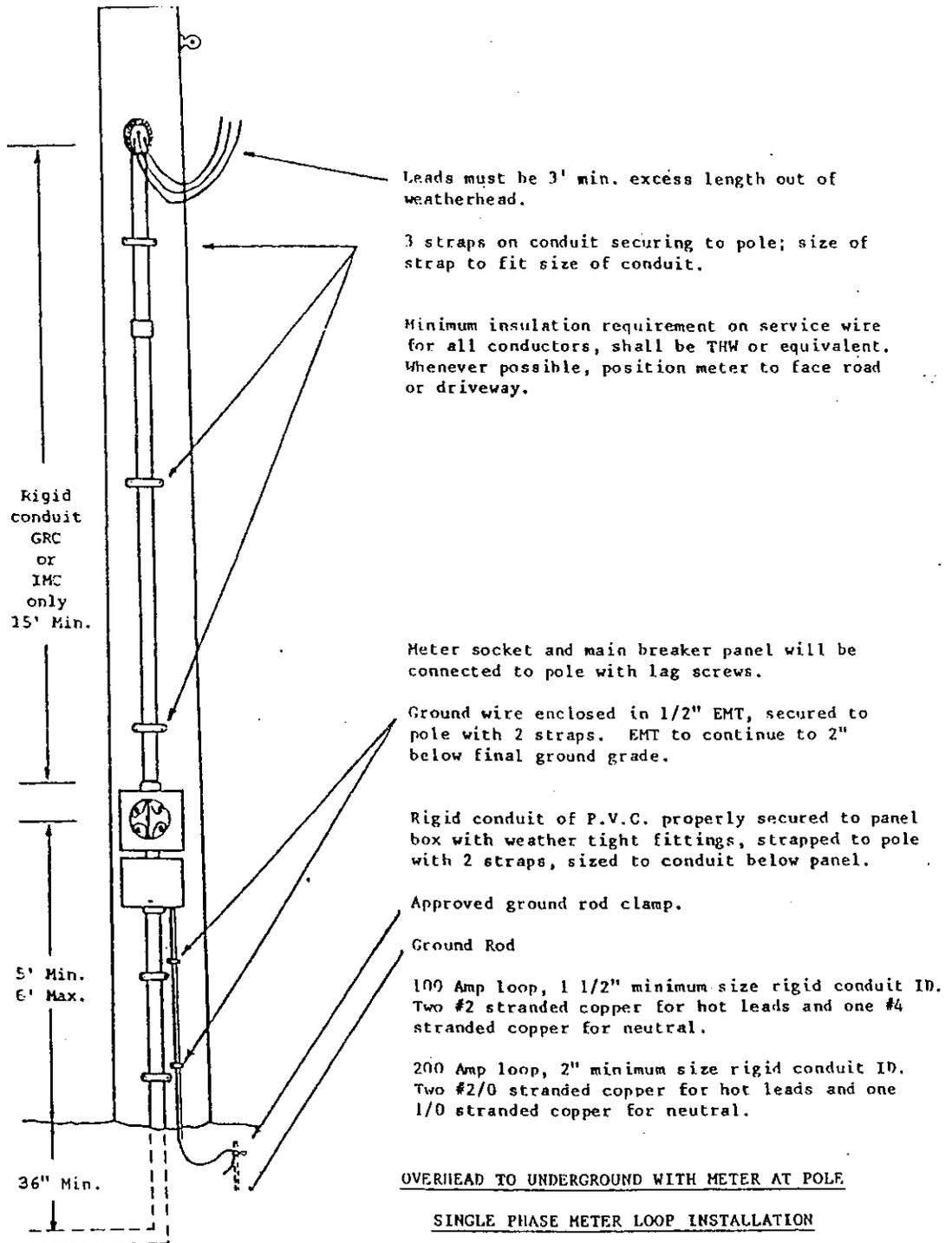
OVERHEAD TO UNDERGROUND  
SINGLE PHASE PRIMARY RISER



NOTE: In instances where the transformer is not located on the same pole, weatherhead shall be a minimum of 2' below top of pole.

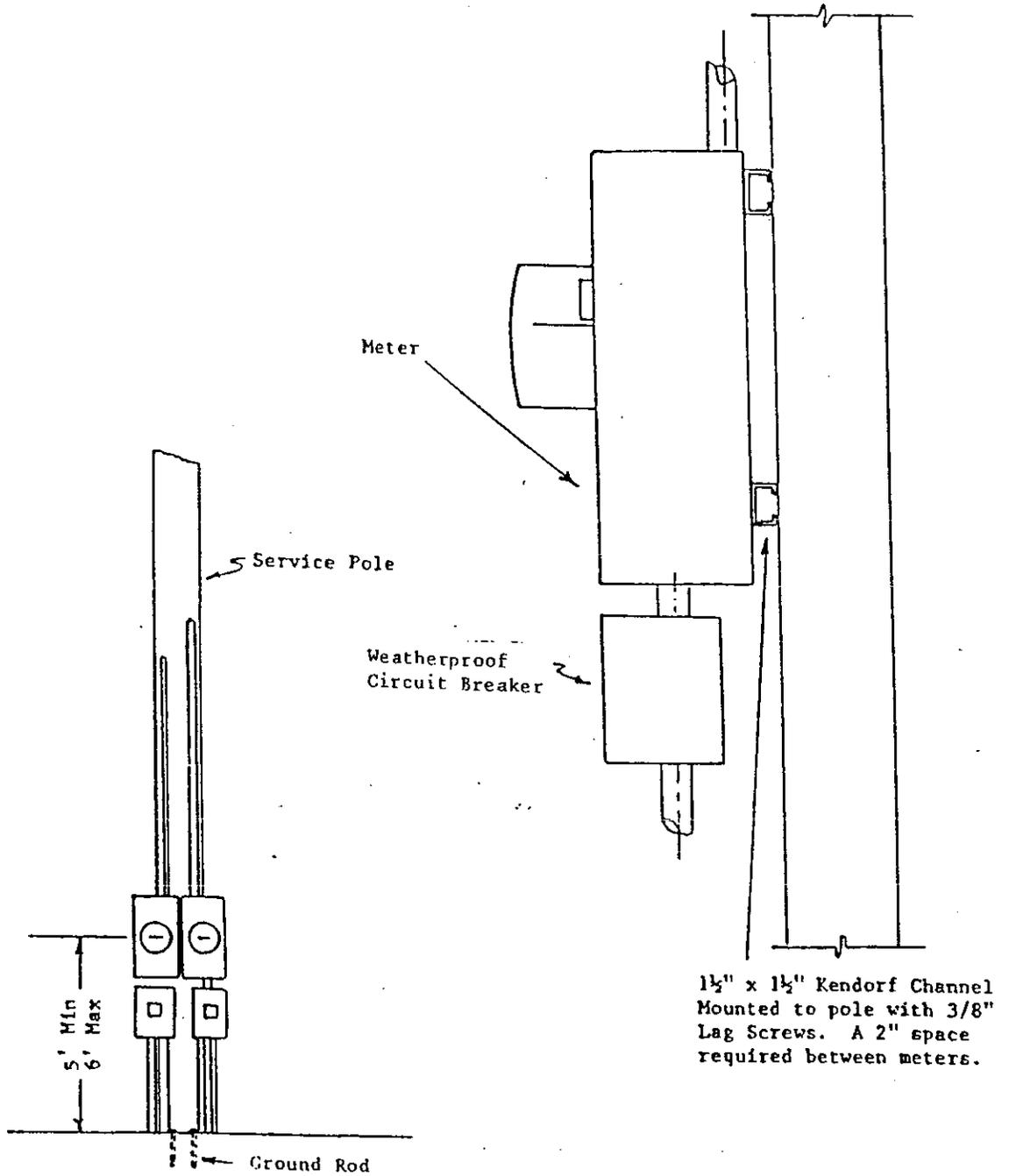
- NOTES
- 1) No meters or disconnects are allowed on riser pole unless approved by City.
  - 2) No more than 1 installation of this type on one pole unless approved by City.

OVERHEAD PRIMARY TO UNDERGROUND  
SINGLE PHASE SECONDARY RISER



E-5  
(6-10)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED;



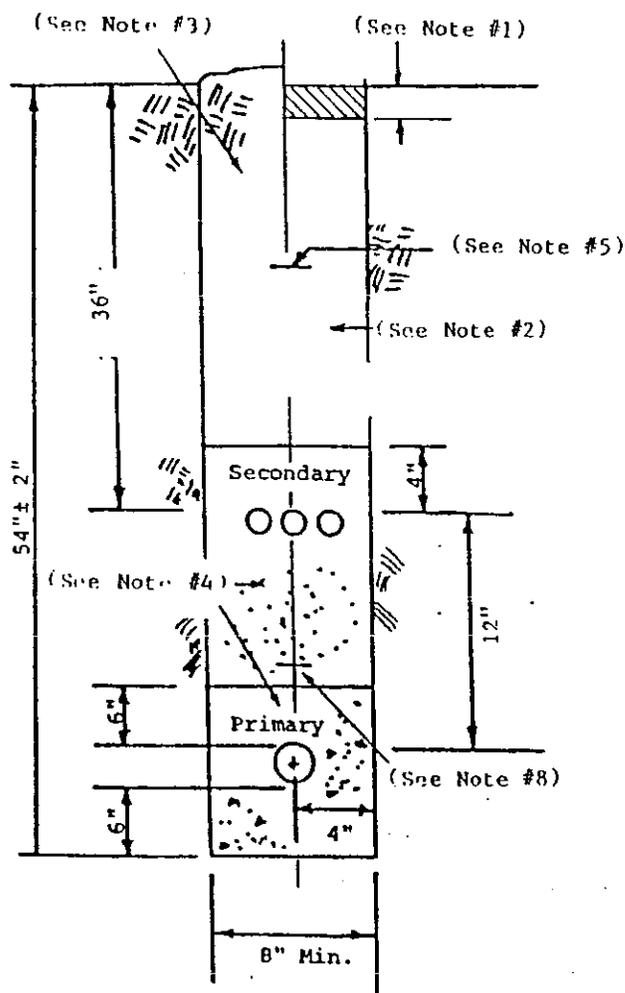
OVERHEAD TO UNDERGROUND  
MOBILE HOME PARK METER LOOP

E-6  
(6-11)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED:

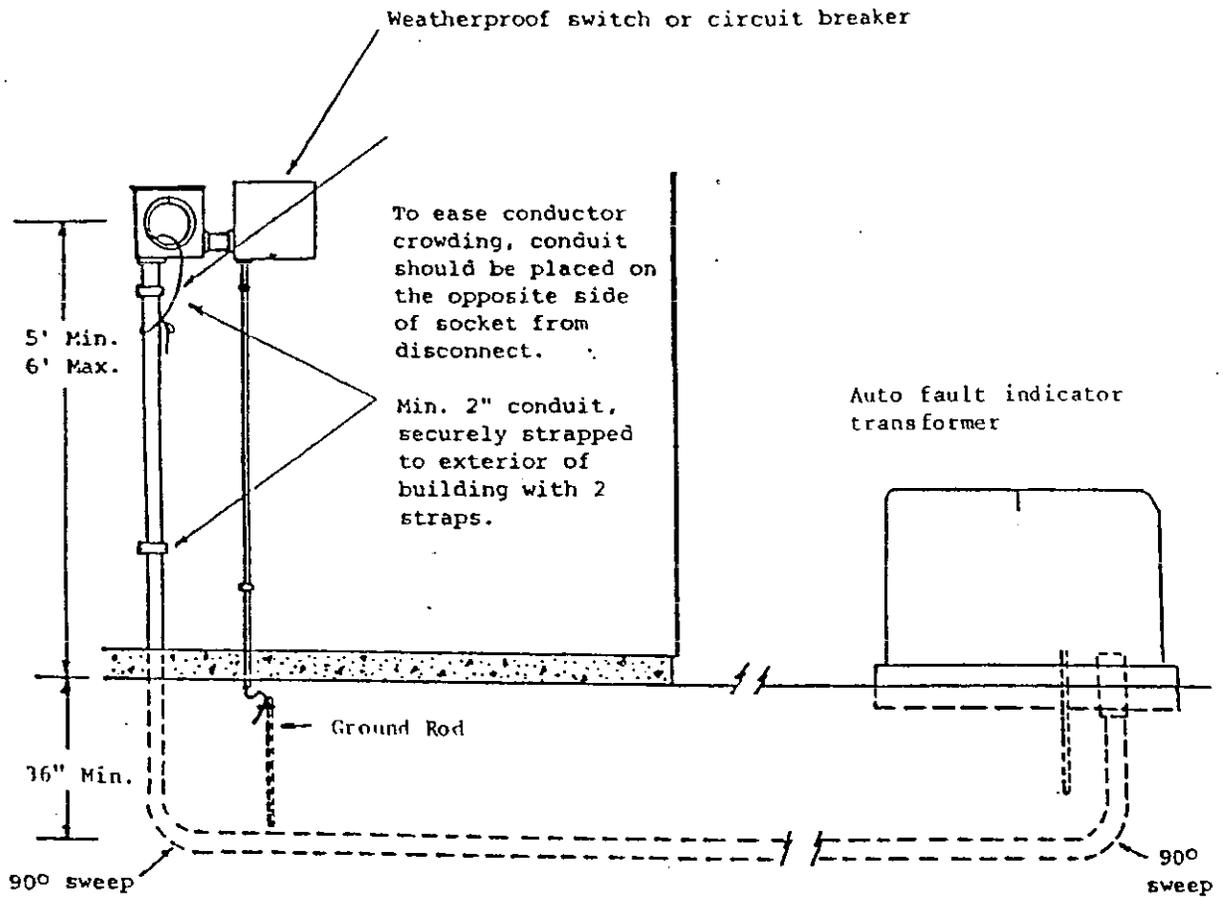
**NOTES:**

1. When crossing existing streets and driveways surface material shall be equal to material removed - minimum amounts 8" gravel, 1 1/2" asphalt, or 6" concrete.
2. Compacted crushed stone (100% as per TDHPT Method Tex 113-E), when crossing existing streets or driveways.
3. Normal Backfill from Spoil (Maximum 6" in Greatest Dimension)
4. Granular Bedding As Required
5. A yellow plastic identification tape, with black lettering, reading "BURIED ELECTRIC CABLE BELOW" will be placed in the cable trench at a depth of 12" to 13" below finished ground grade.
6. At no time will any conduit, pipe or direct burial cable, whether communications, gas or water be closer than 12" vertically or horizontally from any underground electrical conductor.
7. At no time will any electric line be connected for service if found to cross under any building foundation.
8. When cables are at more than one (1) level in the same trench additional identification tape will be placed between levels.



**TRENCH INSTALLATION**

(SINGLE PHASE ILLUSTRATED)

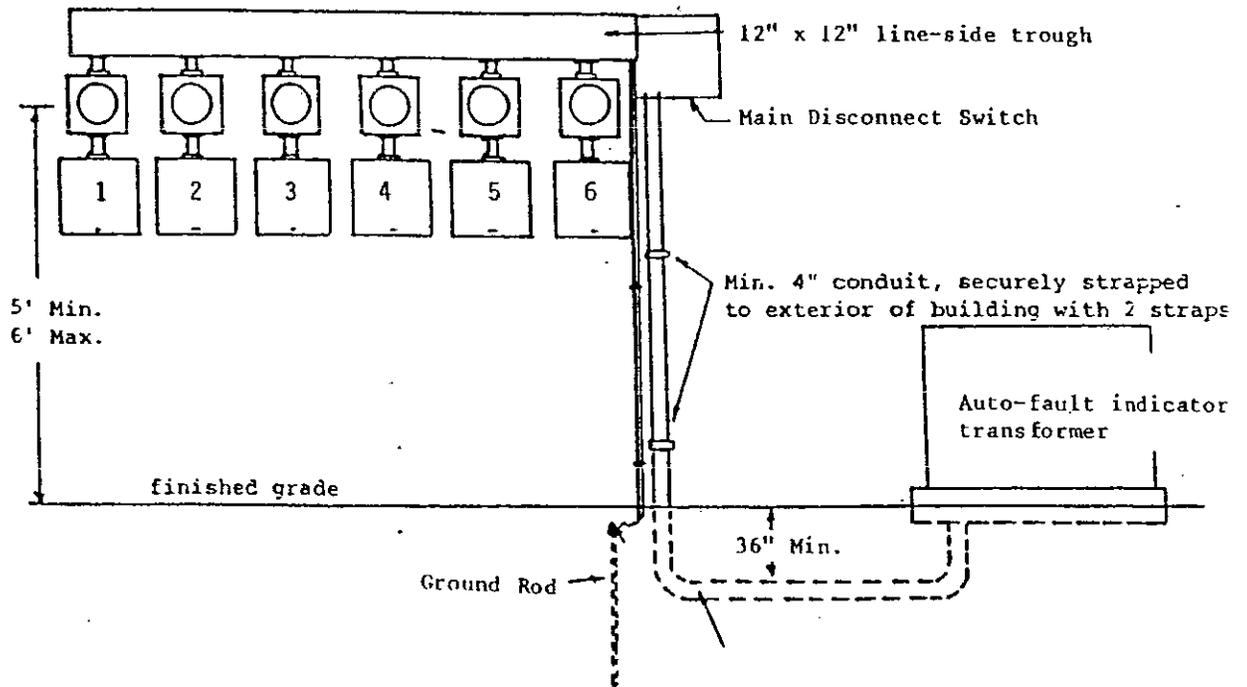


NOTE: Meter shall be mounted on side of building and at a point which is accessible to service lateral conductors, except where meter is next to transformer.

SINGLE UNDERGROUND SERVICE  
SINGLE PHASE METER LOOP

Weatherproof submain switches or circuit breakers - each switch shall have permanent type address marking.

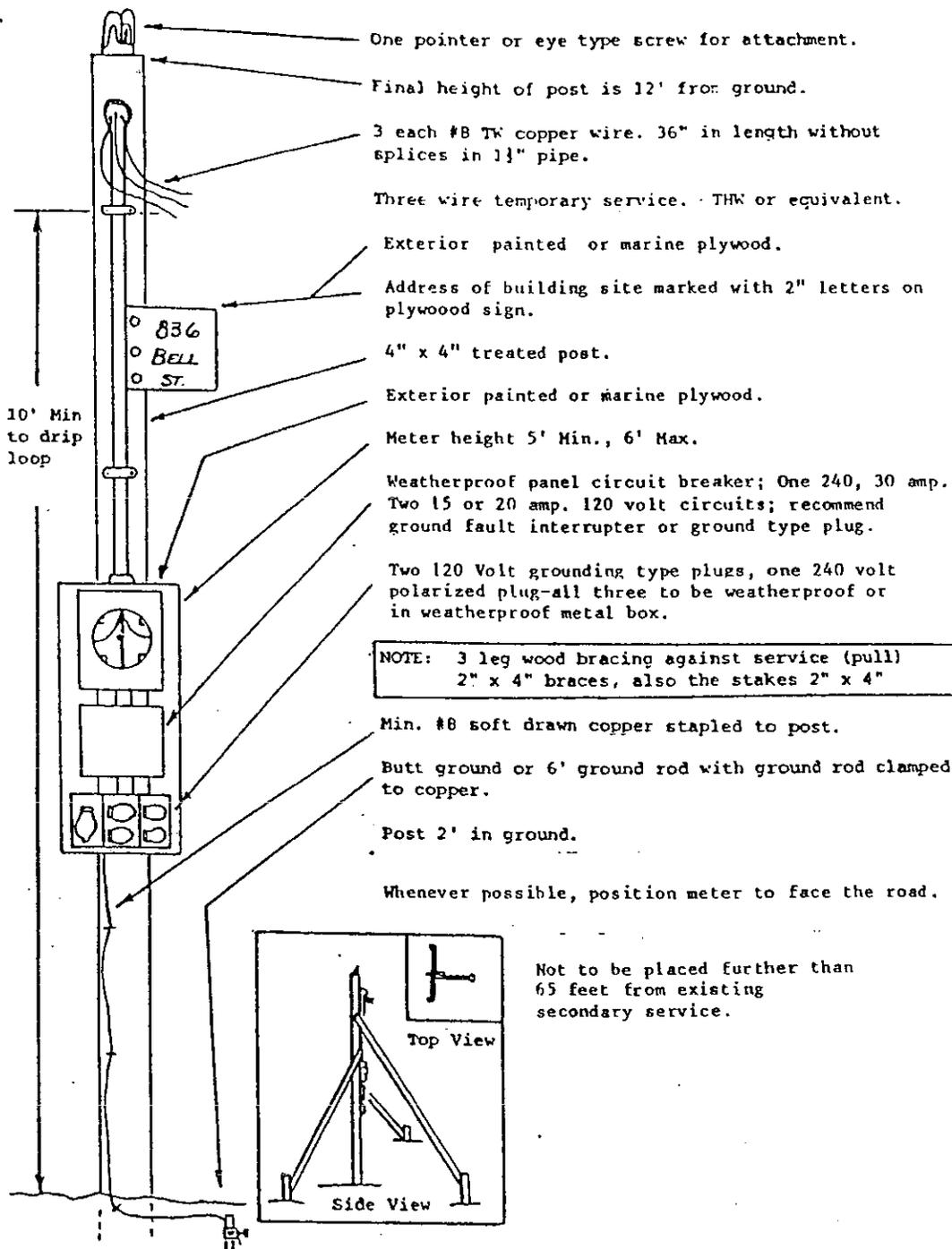
Trough shall be so constructed that the City's seal can be used to prevent unauthorized entry.



UNDERGROUND SECONDARY SERVICE, MULTIPLE METERING IN APT. COMPLEX

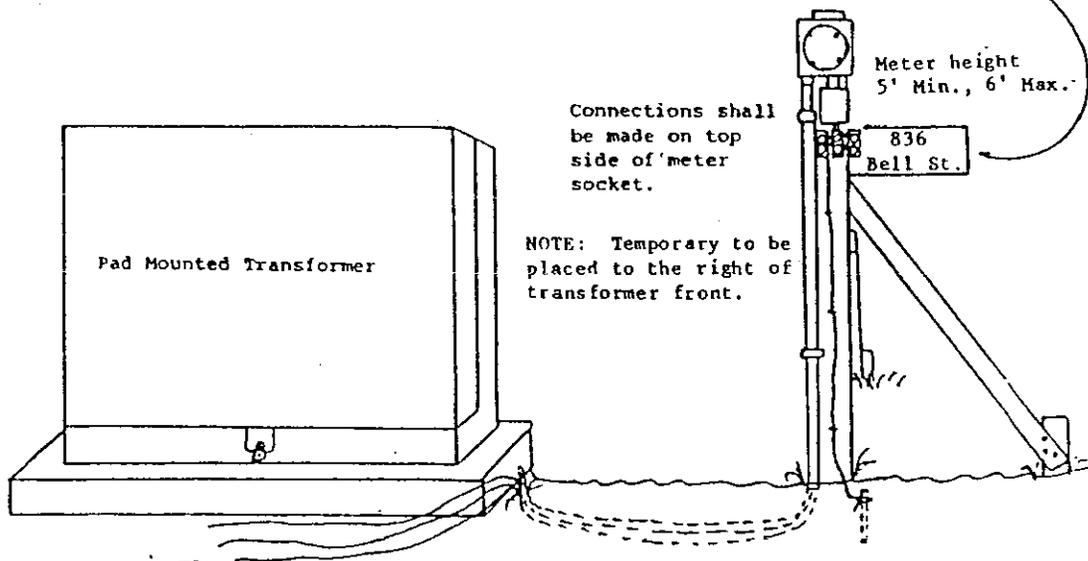
E-9  
(6-14)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED:



OVERHEAD SERVICE  
TEMPORARY METER LOOP

Exterior painted or marine plywood.  
Address of building site marked with 2" letters  
on plywood sign.



Connections shall be made on top side of meter socket.

NOTE: Temporary to be placed to the right of transformer front.

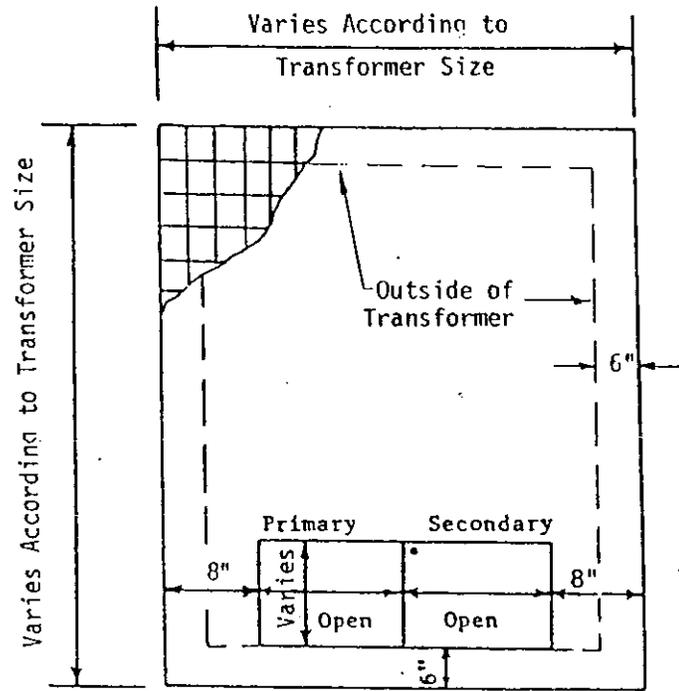
Meter height 5' Min., 6' Max.

836  
Bell St.

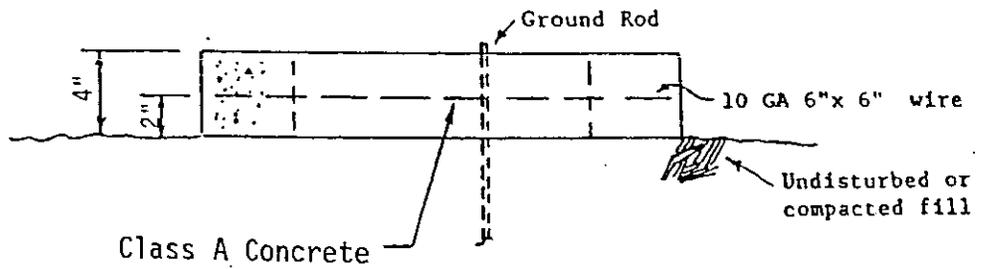
Leads to be 5' long once wire reaches Pad mounted transformer or Primary pull box.

Not more than 100 feet from existing secondary service.

UNDERGROUND SERVICE  
TEMPORARY METER LOOP



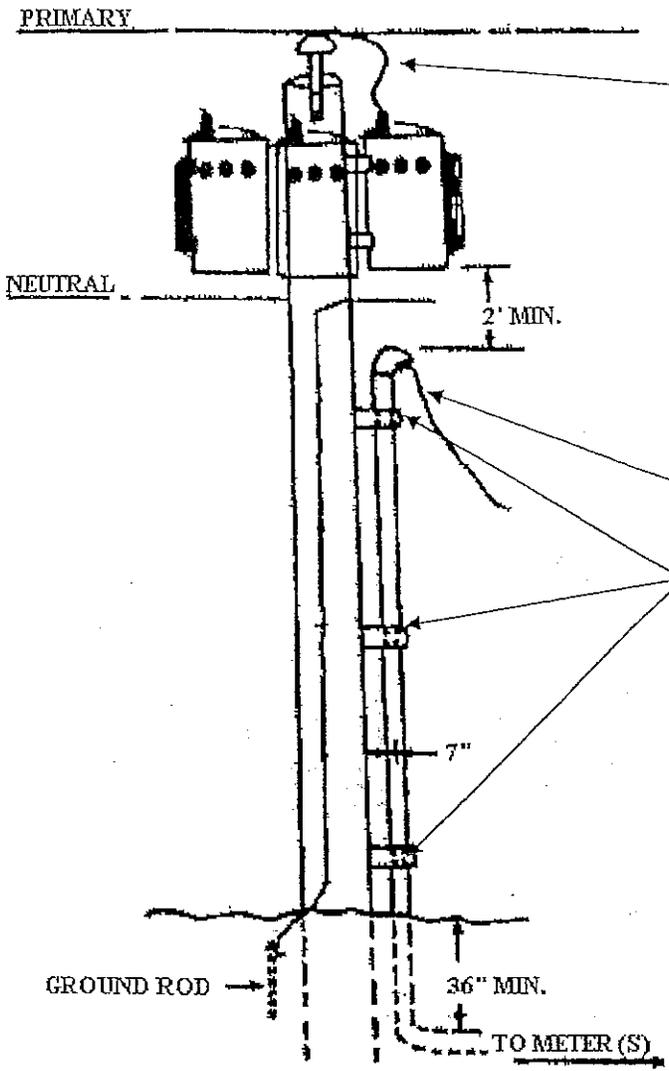
FRONT



Typical Transformer Pad

E-12  
(6-17)

ADOPTED BY COUNCIL 4/28/87  
DATE(S) REVISED:



Lightning arrester and load break cut-out.

Note: If transformer is not located on the same pole, position weatherhead a minimum of two feet (2') below transformer bank.

15 foot minimum tails

Standoffs required approximately every ten feet (10').

Notes:

1. No meters or disconnects are allowed on riser pole, unless approved by City.
2. No more than one (1) installation of this type on one pole unless approved by City.
3. 36" minimum cover over top of pipe.
4. If necessary, contractor will furnish CT's and PT's and will be installed by City Electric Department.

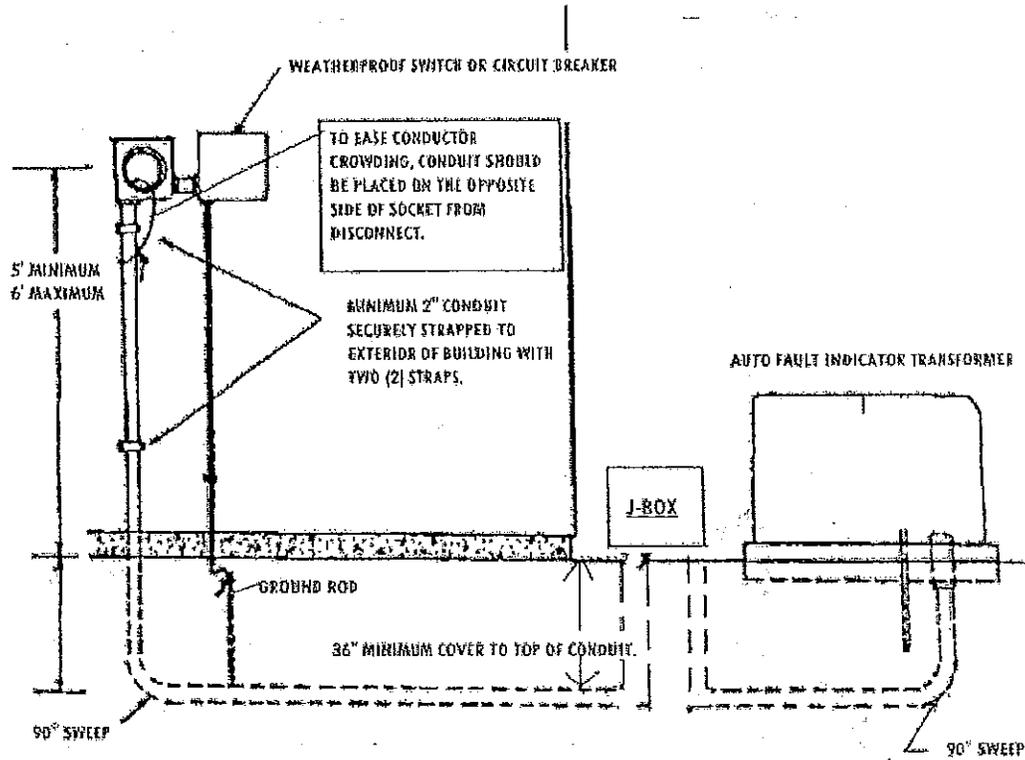
**OVERHEAD PRIMARY TO UNDERGROUND**  
**THREE PHASE SECONDARY RISER**

CITY OF LOCKHART

E -13

N.T.S.

ADOPTED BY COUNCIL 04/28/87  
 DATES REVISED: 05/18/04



NOTE: J-BOX SHALL BE PLACED STRADDLE SIDE PROPERTY LINES AND ONE FOOT (1') INSIDE OF EASEMENTS. BRING OUT YOUR SCHEDULE 40 CONDUIT EACH SIDE OF THE J-BOX FACING EACH PROPERTY LOT AND EXTEND CONDUIT FOUR FEET (4') PAST UTILITY EASEMENTS.

## SINGLE UNDERGROUND SERVICE

### J-BOX INSTALLATION

CITY OF LOCKHART

E-14

N.T.S.

ADOPTED BY COUNCIL 4/28/37  
DATE(S) REVISED: