

City of Princeton
Design Standards
and
Construction Details

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Design Standards and Construction Details

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CITY OF PRINCETON

ORDINANCE NO. 2000-01-02

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF PRINCETON ADOPTING DESIGN STANDARDS AND CONSTRUCTION DETAILS RELATIVE TO PAVING, DRAINAGE, WATER AND SEWER ; REPEALING ALL CONFLICTING ORDINANCES; PROVIDING FOR SEVERABILITY; PROVIDING A PENALTY; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the City Council of the City of Princeton, Texas, ("City") has established and created by separate ordinance, a Comprehensive Zoning Ordinance, adopted on or about March 23, 1998, the Planning and Zoning Commission and the Zoning Board of Adjustment; and

WHEREAS, the City Council is considering, simultaneously with this ordinance, a Subdivision Regulation Ordinance to regulate development in the corporate city limits of the City of Princeton and its extra-territorial jurisdiction; and

WHEREAS, the City Council deems it desirable to establish design standards and construction details relative to paving, drainage, water and sewer, to ensure proper development within the City of Princeton and its extra-territorial jurisdiction; and

WHEREAS, the City Council of the City has reviewed the Design Standards and Construction Details set forth on the attached Exhibit "A", which is incorporated herein by reference as if fully set forth herein.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF PRINCETON, TEXAS:

Section 1. *Incorporation of Premises.*

That all of the above premises are found to be true and correct and are incorporated into the body of this Ordinance as if copied in their entirety.

Section 2. *Adoption of Design Standards and Construction Details.*

The City Council of the City hereby adopts the Design Standards and Construction Details set forth on the attached Exhibit "A," as the design standards and construction details relative to paving, drainage, water and sewer, governing development in the City and its extra-territorial jurisdiction.

Section 3. *Repeal of Conflicting Ordinances.*

This Ordinance shall be and is hereby declared to be cumulative of all other ordinances of the City of Princeton, and this Ordinance shall not operate to repeal or affect any of such other ordinances except insofar as the provisions thereof might be inconsistent or in conflict with the provisions of this Ordinance, in which event such conflicting provisions, if any, in such other ordinance or ordinances are hereby repealed.

Section 4. *Severability.*

If any section, article, paragraph, sentence, clause, phrase or word in this Ordinance, or application to any person or circumstance is held invalid or unconstitutional by a Court of competent jurisdiction, such holding shall not affect the validity of the remaining portions of this Ordinance; and the City Council hereby declares it would have passed such remaining portions of the Ordinance despite such invalidity, which remaining portions shall remain in full force and effect.

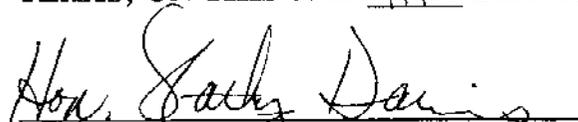
Section 5. *Penalty*

Any person violating the terms and provisions of this ordinance shall, upon conviction, be punished by a fine of not more than Five Hundred Dollars (\$500.00) and each and every day this ordinance is violated shall constitute a separate offense.

Section 6. *Providing an Effective Date.*

The ordinance shall become effective immediately upon its passage

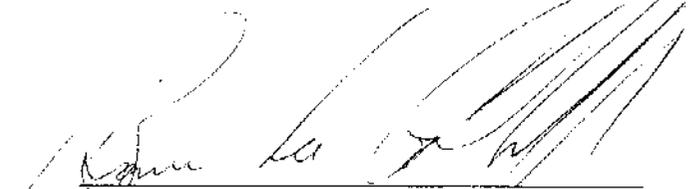
**PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF PRINCETON,
TEXAS, ON THIS THE 11th DAY OF January, 2000.**


KATHY DAVIS, Mayor

ATTEST AND
CORRECTLY ENROLLED:


ASHLEY MITCHELL, City Secretary

APPROVED AS TO FORM AND LEGALITY:



BONNIE LEE GOLDSTEIN, City Attorney

**CITY OF PRINCETON
ORDINANCE NO. _____**

Exhibit "A"

**CITY OF PRINCETON
DESIGN STANDARDS AND CONSTRUCTION DETAILS**

AS ADOPTED BY CITY COUNCIL

OF THE CITY OF PRINCETON

Paving

General Requirements

1.1 Introduction: The "Paving Design Standards" - are designed to implement the provisions of the Subdivision Ordinance and to provide for the orderly, safe, healthy and uniform development of the area within the corporate city limits and within the area surrounding the City, extraterritorial jurisdiction (ETJ). =

The Standard Specifications for Construction and the Standard Details are supplemental and are made a part of the Paving Design Standards. These documents are to be considered as the minimum requirements of engineering design. The adherence to the requirements of these documents and/or the approval by the City and its agents in no way relieves the developer of the responsibility for adequacy of design, which may require more stringent standards than these, the completeness of plans and specifications or the suitability of the completed facilities. In unusual circumstances, the City may determine that designs other than those of the Standards are necessary and will inform the developer of such requirements before the final engineering review.

The developer shall notify the City, in writing, of any deviations from the requirements set forth in the Paving Design Standards, Standard Specifications for Construction or Standard Details.

1.2 Paving Design Standards: The Paving Design Standards, as adopted by the City Council, are set forth herein. These standards shall be considered as the minimum requirements,

and it shall be the responsibility of the developer to determine if more stringent requirements are necessary for a particular development. It is not intended that the Paving Design Standards cover all aspects of paving construction for any given development. For those elements omitted, the developer will be expected to provide a design for facilities in accordance with good engineering practice utilizing first class construction workmanship and materials.

1.3 Standard Specifications for Construction: Standard Specifications for Construction as adopted by the City Council are bound in this document. The Standard Specifications for Construction set forth in minimum requirements for materials and workmanship for streets, alleys, parking lots, and sidewalks. These specifications should be considered as minimum requirements, and such additional requirements as the developer of the City may consider appropriate should be added as supplements.

1.4 Standard Details: In an effort to have uniformity and to facilitate maintenance, the City Council has adopted standard design features for certain facilities such as street and alley sections, paving sections, sidewalks, ramps for the handicapped, etc. These requirements are shown in the City's Standard Construction Detail book.

1.5 Inspection of Construction: All inspection of construction and verification of compliance to the plans and specifications shall be conducted by the City's staff or consultants under the direction of the City's Engineer. The facilities included in this inspection requirement are streets, sidewalks, parking lots, alleys, etc. The developer

shall advise all of his construction contractors of this requirement. No development will be accepted by the City until all construction has been approved by the City's staff or consultants. The developer shall be responsible for any additional expense to the City at a rate established by the city at that time when inspection is done after normal business hours of the City, or when the improvements built will be privately owned.

=

The developer will be responsible for furnishing to the City the original reproducible engineering drawings corrected to show "as - built" conditions before any utility improvements will be accepted. Building permits will not be issued until all public or required improvements are accepted by the City

2. STREET SYSTEM

2.1 General: The street system, including the street layout, shall be in accordance with generally accepted engineering practices and in compliance with the Comprehensive Plan, the latest Thoroughfare Plan, the Zoning Ordinances, the Subdivision Regulations and other applicable regulations. The plans and specifications, design computation, and other applicable data shall be submitted to the City for review. The subgrade materials will be tested in accordance to the Standard Specifications for Construction, unless otherwise approved by the City. In general, the soils testing will include the testing of Atterburg limits. Lime stabilization of the subgrade will be required if the plasticity index (P.I.) is 15 or above. Lime stabilization or concrete stabilization may be required for soils showing a P.I. of 15 or less. Construction shall not commence prior to approval of the plans and specifications by the City. All changes during construction shall be submitted to the City Engineer for approval prior to any construction modifications.

2.2 Street Arrangement: Unless otherwise approved by the City, provisions shall be made for the extension of existing major arterials, collector streets and those local streets in accordance with Thoroughfare Plan and any specific street alignments as adopted by the City Council.

Off-center intersections will be considered for approval only for minor collector and local streets, and only when there is a minimum property line separation of 150'.

Within residential areas, the following design elements are encouraged: (A) Developing only a limited number of access points to arterial streets bordering the subdivision; (B) Incorporating curvilinear streets into the plan; and (C) Incorporating a discontinuous residential street network, which utilizes three-way intersections in lieu of four-way intersections. When these factors are incorporated into a residential street plan, the result is enhanced character and superior traffic safety.

2.3 Thoroughfare and Street Geometry: Geometric design standards are presented in two formats within this section. Table 2.1 identifies specific design criteria for each standard roadway type. In another format, Figure 2.1 shows the resulting typical cross-section for each standard roadway type. It is noted that dimensions shown are to the face of curb, unless specifically identified otherwise.

Each roadway type is keyed to the City Thoroughfare Plan, with the exception of local streets. The reader is referred to this document for information as to the locations where these roadways are to be used.

Arterial thoroughfares in the City are intended to have raised medians. Median opening locations are a critical part of arterial thoroughfare design. Minimum spacing between median openings depends upon many factors. To aid in thoroughfare design and adjacent property development, standards for median opening locations have been established, and are shown in Figure 2.2.

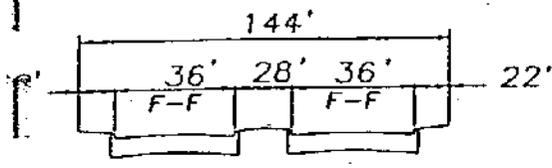
TABLE 2.1

GEOMETRIC DESIGN STANDARDS

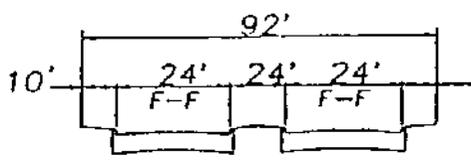
DESIGN ELEMENT	EXPRESS-WAY TYPE A	MAJOR THRFARE TYPE B/B+	MAJOR THRFARE TYPE C	SECOND THRFARE TYPE D	SECOND THRFARE TYPE E	SECOND THRFARE TYPE F	RESIDENT
MINIMUM ROW WIDTH*	144-244	130-160/ 140	110	92	65	60	50
NUMBER TRAFFIC LANES	6	6/8	6	4	4	2	2
MINIMUM LANE WIDTH	12	12	11	12	11	18	13
DESIGN SPEED (MPH)	45	45	45	40	35	30	30
STOPPING SIGHT DISTANCE	400	400	400	325	275	200	200
MEDIAN WIDTH**	28	24/20	24	24	NONE	NONE	NONE
MINIMUM LATERAL CLEARANCE	6	6	6	6	6	6	-
PARKING PERMITTED	NO	NO	NO	NO	COM-NO RES-SOME	COM-SOME RES-YES	COM-YES RES-YES
MINIMUM HORIZONTAL CENTERLINE CURVATURE	1200	1200	1200	1000	COM-700 RES-500	COM-500 RES-350	COM-250 RES-175 ELBOW-50

* RIGHT-OF -WAY REQUIREMENTS FOR STATE HIGHWAYS AND/OR THE PROVISION OF RIGHT TURN LANES MAY EXCEED THIS MINIMUM R.O.W. STANDARD.

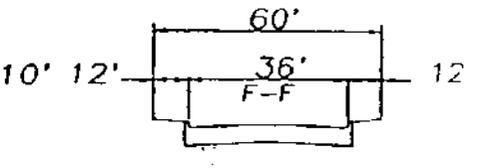
** LARGER MEDIANS MAY BE REQUIRED TO PROVIDE FOR MULTIPLE TURN LANES.



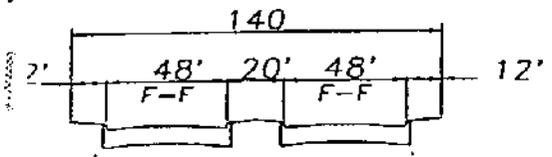
EXPRESSWAY TYPE A



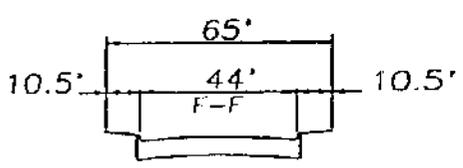
SECONDARY THOROUGHFARE TYPE D



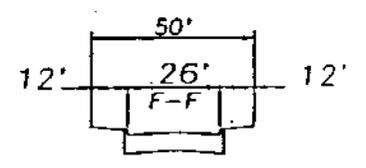
SECONDARY THOROUGHFARE TYPE F



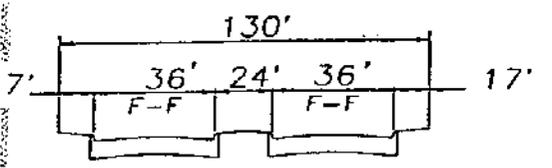
MAJOR THOROUGHFARE TYPE B+



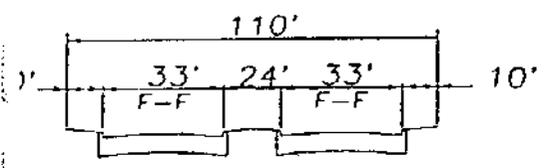
SECONDARY THOROUGHFARE TYPE E



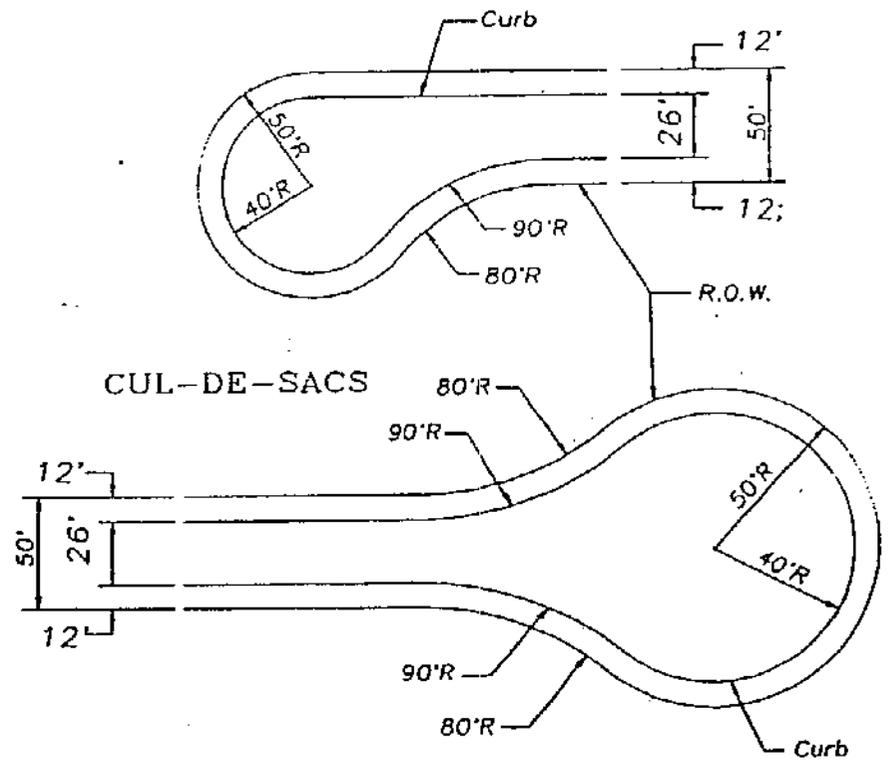
RESIDENTIAL



MAJOR THOROUGHFARE TYPE B

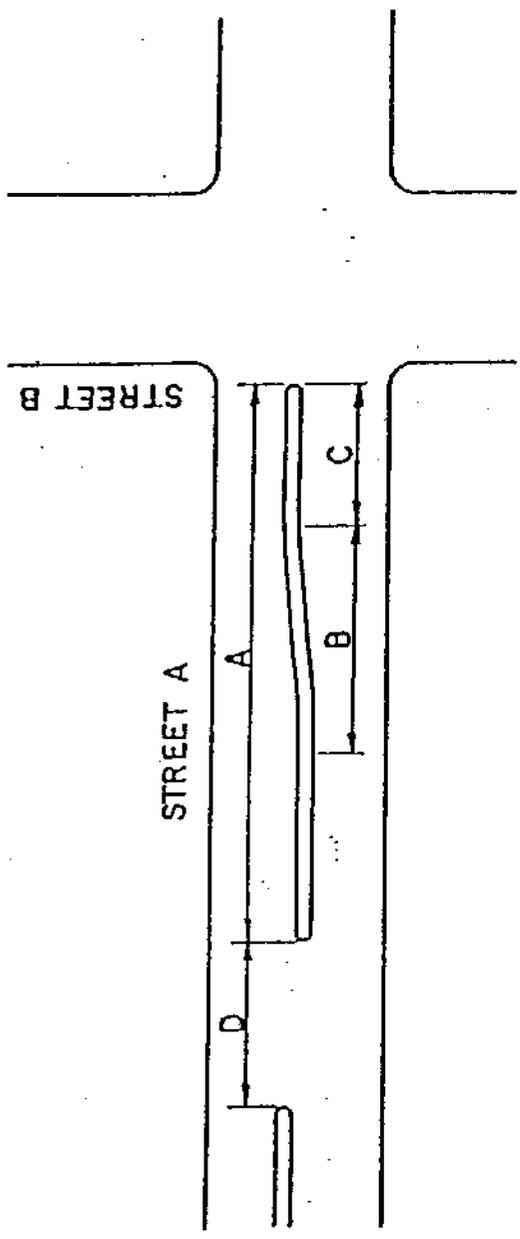


MAJOR THOROUGHFARE TYPE C



MINIMUM WIDTH OF PAVEMENT

FIGURE 2.

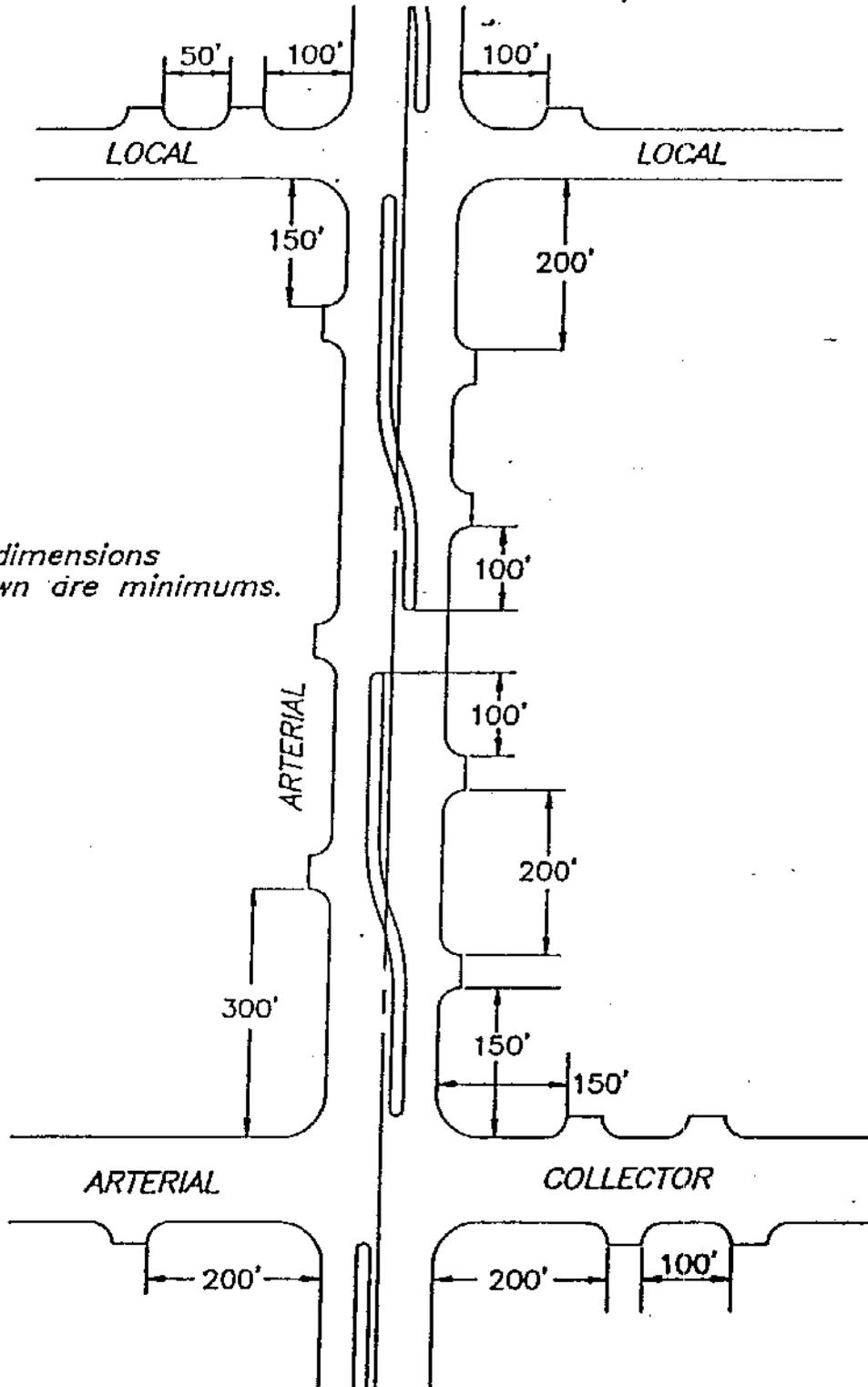


INTERSECTING STREET TYPE		MINIMUM LENGTH (FEET)			
STREET A	STREET B	A	B	C*	D**
Principal	Principal	450	100	200	60
Principal	Minor	450	100	150	60
Principal	Collector	300	100	100	60
Principal	Local/Private	300	100	80	60
Minor	Principal	450	100	150	60
Minor	Minor	400	100	150	60
Minor	Collector	300	100	80	60
Minor	Local/Private	300	100	60	60

- LEFT-TURN STORAGE AREA WIDTH 10' MINIMUM
- MEDIAN WIDTH (SEE GEOMETRIC DESIGN STANDARD FOR PRINCIPAL AND MINOR ARTERIAL)
- * SUGGESTED LENGTH - ACTUAL LENGTH DEPENDENT UPON ANTICIPATED TURN VOLUME
- ** OR STREET WIDTH + 8 FEET - WHICHEVER IS GREATER

MEDIAN DESIGN STANDARDS

NOTE:
All dimensions
shown are minimums.



MINIMUM DRIVEWAY SPACING
AND CORNER CLEARANCE

FIGURE 2.3

2.4 Driveway Access Location: Driveway location is very important to the proper design of thoroughfares and adjacent property. Minimum standards for driveway separation accessing the same site are shown in Figure 2.3. This standard applies to all non-residential uses.

There is a minimum distance upstream and downstream from adjacent intersections within which driveways should not be located. This separation distance varies with the classification of street and is shown in Figure 2.3. This standard applies to all non-residential users.

At midblock access points, there is a minimum distance from a median nose, within which driveways should not be located. This is shown in Figure 2.3 and is equally applicable along both major and minor arterials for non-residential uses.

All residential/residential intersecting streets shall have a minimum distance of 45 feet to the nearest driveway approach.

2.5 Block Lengths: In general, streets shall be provided at such intervals as to serve cross traffic adequately and to intersect with existing streets. Where no existing plats control, the blocks shall be not more than 1,200 feet in length nor less than three hundred (300) feet in length except in unusual cases. Block arrangements must provide access to all lots, and in no case, shall a block interfere with traffic circulation.

2.6 Street Intersection: More than two streets intersecting at one point shall be avoided. All streets and thoroughfares should intersect other streets and thoroughfares at an angle of ninety (90) degrees.

Arterial and collector street intersections shall have property line corner clips with a minimum tangent distance of thirty (30) feet. Residential streets shall not normally be required to have a corner clip at their intersection with other streets or thoroughfares.

Curb radii at intersections shall have a minimum radius of thirty (30) feet along arterials, twenty-five (25) feet along collectors and, twenty (20) feet along residential streets.

In any case where streets intersect at an angle of other than ninety (90) degrees, the City may require non-standard right-of-way corner clips and curb return radii.

2.7 Relation to Adjoining Streets: The system of streets designed for the development, except in unusual cases, must connect with streets already dedicated in adjacent developments. Where no adjacent connections are platted, the streets must be the reasonable projection of streets in the nearest subdivided tracts and must be continued to the boundaries of the tract development, so that other developments may eventually connect with the proposed development. Strips of land controlling access to or egress from other property or any street or alley or having the effect of restricting or damaging the adjoining property for development or subdivision purposes or which will not be taxable or accessible for special improvements shall not

be permitted in any development unless such reserve strips are conveyed to the City. When such access is needed to maintain permanent City owned utilities, the roadway will be an improved right-of-way. If the utilities are temporary, an improved easement may be approved.

2.8 Dead End Streets, Cul-de-Sacs and Courts: Cul-de-sacs are permitted and encouraged within residential subdivisions. Use of this design shall provide proper access to all lots and shall not exceed six hundred feet in length, measured from the center of the cul-de-sac to the center of the intersecting street. Specific aspects of the standard cul-de-sac design are given in Figure 2.1. In lieu of the typical design shown, the City may approve alternative concepts for a specific application.

2.9 Alleys and Alley Widths: Alleys shall be built in accordance with the City's Subdivision Regulations. Alleys shall be provided in all residential areas and shall be paved with concrete. The City Council may waive the residential alley requirement upon determination by the Council, if it is in the best interest of the City. Alleys may be required in commercial and industrial districts. The City may waive this requirement where other definite and assured provisions are made for service access such as off-street loading, unloading, and parking consistent with and adequate for the uses proposed. The minimum right-of-way width of an alley for front entry lots shall be fifteen (15) feet with a ten(10) foot paving width. Alleys for rear entry lots shall be constructed a minimum twelve(12) feet in width within a minimum twenty(20) right-of-way. Dead-end alleys shall not be permitted. The City may waive this requirement where such dead-end alleys are unavoidable and where adequate turnaround facilities have been

provided. Adequate provisions shall be made at all intersections in order that equipment, such as garbage collection vehicles and maintenance vehicles, can maneuver the corners. The interior edge of the pavement, at the corners, shall have a minimum radius of 30 feet. The exterior edge of the pavement, at the corners, shall have a minimum radius of 20 feet. The right-of-way limits shall be expanded, if necessary, beyond the minimum requirement in order to include all of the paved section and utilities within the right-of-way of the alley. Alley turnouts shall be paved to the property line and shall be fifteen (15) feet wide at that point. The concrete shall have a minimum strength of 3,500 psi within 28 days and a minimum cement content of 5 sacks per cubic yard. The reinforced concrete shall have a minimum thickness of 7 inches of exterior sections and 5 inches on interior sections. The testing of the concrete paving shall be done by an approved testing lab and conform to the Standard Specifications for Construction.

2.10 Street Grades: Arterial streets may have a maximum grade of seven and one-half (7 1/2%) percent, for a maximum continuous distance of two hundred (200) feet. Collector streets may have a maximum grade of seven and one-half (7-1/2) percent. Residential streets may have a maximum grade of ten (10) percent, unless otherwise approved by the City where the natural topography is such as to require steeper grades. All streets must have a minimum grade of at least five-tenths (0.5) of one (1) percent. Centerline grade changes with an algebraic difference of more than one (1) percent shall be connected with vertical curves in compliance with the minimum length requirements set forth in Table 2.2.

Table 2.2

Crest Vertical Curves

<u>Design Speed, MPH</u>	<u>Coeff Of Friction (a)</u>	<u>Stopping Sight Distance, FT.</u>	<u>SSD, Rounded for Design</u>	<u>K</u>	<u>K, Rounded for Design</u>
15	0.42	72.98	75	4.01	5
20	0.40	106.83	125	8.59	10
25	0.38	146.70	150	16.19	20
30	0.36	193.58	200	28.20	30
35	0.34	248.72	250	46.55	50
40	0.32	313.67	325	74.03	80
45	0.31	383.12	400	110.44	120

(a) AASHTO, p. 316

Table 2.2 Cont'd.

Crest Vertical Curves

Grade Diff., %	Rounded Minimum Length of Vertical Curve in Feet Algebraic For Speeds and K Values Shown Below							
	MPH K	15 5	20 10	25 20	30 30	35 50	40 80	45 120
1		5	10	20	30	50	80	120
2		10	20	40	60	100	160	240
3		15	30	60	90	150	240	360
4		20	40	80	120	200	320	480
5		25	50	100	150	250	400	600
6		30	60	120	180	300	480	720
7		35	70	140	210	350	560	840
8		40	80	160	240	400	640	960
9		45	90	180	270	450	720	1080
10		50	100	200	300	500	800	1200
11		55	110	220	330	550	880	1320
12		60	120	240	360	600	960	1440
13		65	130	260	390	650	1040	1560
14		70	140	280	420	700	1120	1680
15		75	150	300	450	750	1200	1800
16		80	160	320	480	800	1280	1920
17		85	170	340	510	850	1360	2040
18		90	180	360	540	900	1440	2160
19		95	190	380	570	950	1520	2280
20		100	200	400	600	1000	1600	2400

Table 2.2 Cont'd.

SAG Vertical Curves

<u>Design Coess of</u> <u>Speed, MPH</u> <u>Design</u>	<u>Friction (a)</u>	<u>Stopping Sight</u> <u>Distance, FT.(b)</u>	<u>SSD, Rounded</u> <u>K-</u> <u>for Design</u>	<u>K, Rounded</u> <u>[S L]</u>	<u>For</u>
15	0.42	72.98	75	8.13	10
20	0.40	106.83	125	14.75	20
25	0.38	146.70	150	23.56	30
30	0.36	193.58	200	34.78	40
35	0.34	248.72	250	48.69	50
40	0.32	313.67	325	65.69	70
45	0.31	383.12	400	84.31	90

(a) AASHTO, p. 316

(b) AASHTO. p. 312

Table 2.2 Cont'd

SAG Vertical Curves

Rounded

Table 2.2 Cont'd

SAG Vertical Curves

Rounded

Minimum Length of Vertical Curve in Feet
Algebraic For Speeds and K Values Shown Below

Grade Diff., %	MPH	15	20	25	30	35	40	45
	K	10	20	30	40	50	70	90
1		10	20	30	40	50	70	90
2		20	40	60	80	100	140	180
3		30	60	90	120	150	210	270
4		40	80	120	160	200	280	360
5		50	100	150	200	250	350	450
6		60	120	180	240	300	420	540
7		70	140	210	280	350	490	630
8		80	160	240	320	400	560	720
9		90	180	270	360	450	630	810
10		100	200	300	400	500	700	900
11		110	220	330	440	550	770	990
12		120	240	360	480	600	840	1080
13		130	260	390	520	650	910	1170
14		140	280	420	560	700	980	1260
15		150	300	450	600	750	1050	1350
16		160	320	480	640	800	1120	1440
17		170	340	510	680	850	1190	1530
18		180	360	540	720	900	1260	1620
19		190	380	570	760	950	1330	1710
20		200	400	600	800	1000	1400	1800

2.11 Pavement Design: Pavement design shall be in accordance with good engineering practice. Pavements shall be of concrete having not less than 3,500 psi strength in 28 days with a cement content of not less than 5 sacks per cubic yard. Pavement shall be reinforced with No. 3 bars at 24-inch centers in both directions. Minimum concrete thickness of pavement shall be 6 inches for local residential and minor collector residential streets which are not subject to heavy truck and/or equipment traffic. Residential and minor collector pavement design shall have a minimum flexural strength of 575 psi in 28 days. Local commercial, minor collector commercial, major collector, and arterial pavement design shall also have a minimum flexural strength of 575 psi in 28 days and a minimum of 8 inches in concrete thickness. All flexural strength test shall be based on center point loading.

Traffic projections may require additional thickness of paving on collector and arterial streets.

The subgrades shall be compacted and finished to a smooth uniform surface. Subgrades of native material which have a Plasticity Index (P.I.) of 15 or more shall be lime stabilized to a minimum depth of seven (7) inches. The lime stabilization shall be used for the full width of the street, back of curb to back of curb, plus six (6) inches on each side. The minimum lime content shall be seven and a half (7 1/2) percent of the dry weight of the material.

2.12 Parkways, Grades and Sidewalks: All parkways shall be constructed to conform to top of curb grades with a standard transverse slope of one-quarter (1/4) inch per foot rise from top of curb to back-of-walk line.

Where the natural topography is such as to require steeper grades, transverse slopes up to one (1) inch per foot may be used with approval of the City.

"Sidewalks shall be provided for all residential streets in subdivisions zoned for one or two family dwellings and on all streets designated on the adopted Master Thoroughfare Plan. The City may require sidewalks in other locations. Where provided, they shall not be less than four (4) feet in width, located directly adjacent to the curb, and located directly adjacent to the curb, and located wholly within the dedicated street or road easement in the case of private streets.

Sidewalks abutting business property shall have a minimum width of four (4) feet. Sidewalks shall be of concrete having not less than 3,000 psi strength in 28 days. The concrete thickness shall be four (4) inches reinforced with No. 3 bars at 24 inch centers both ways.

2.13 Driveways: Residential driveways to serve single car garages, two car garages, carports and/or storage areas shall be not less than sixteen (16) feet nor more than twenty-four (24) feet in width, measured at the property line. Residential driveways shall be separated from one another by a distance of at least ten (10) feet apart. The radii of all residential driveway returns shall be a minimum of five (5) feet. Driveways to be replaced which have an existing width less than ten(10) feet shall be replaced with a minimum width of ten(10) feet or greater.

Driveways providing access to multi-family, commercial, or industrial uses shall generally have widths between 24 and 45 feet when measured at their narrowest point near, or at, the property line. The minimum radius for these uses shall be 15 feet, and larger radii are encouraged.

Limitations on permissible locations for these driveways is addressed in Section 2.4, Driveway Access Locations. Driveway radii returns shall not extend across abutting properties.

2.14 Traffic Information and Control Devices: The developer shall arrange for the installation of all pavement striping, regulatory, warning and guide signs, including posts, as

shown on the plans or as directed by the City. Street name signs shall be installed at each intersection. Examples of regulatory, warning, information, and guide signs are as follows:

- a. Regulatory signs shall include, but are not limited to, STOP, 4-WAY, YIELD, KEEP RIGHT and speed limit signs.
- b. Warning signs shall include, but are not limited to, DEAD END, NO OUTLET, DIVIDED ROAD, and PAVEMENT ENDS.
- c. Guide signals shall include, but are not limited to, street name signs, DETOUR, direction arrow and advance arrow.
- d. Traffic striping shall be provided by the developer and directed by the City.

The developer shall be responsible for the expenses by the City for manufacture and installation of the signs.

House street numbers shall be placed on the curbs for each lot and shall comply with the requirements of the Standard Specifications for Construction.

2.15 Street Lighting: All developments shall be provided with street lights. In general, lights should be located at street intersections and at intervals no greater than 400 feet apart. Street lights should be the equivalent of 175 watt mercury vapor fixtures on minor residential streets. All collector and arterial, or commercial streets, shall have sodium vapor fixtures with a minimum wattage of 250 or 400 watts as directed by the City. In some instances, greater wattage may be required by the City.

2.16 Curb Ramps for Handicapped: Curb ramps for the handicapped shall be provided in all commercial areas and in residential areas which have sidewalks. Ramps shall be located to provide adequate and reasonable access for the safe and convenient movement for physically handicapped persons, including those in wheel chairs, across curbs at all pedestrian crosswalks. Where sidewalks are not provided in a development, curb ramps shall not be constructed.

2.17 Off-Street Parking:

- A. All parking areas and spaces shall be designed and constructed in accordance with the following requirements:
1. All parking areas and spaces shall be designed and constructed so as to have free ingress and egress at all times.
 2. No parking space or parking area shall be designed so as to require a vehicle to back into a public street or across a public sidewalk, except in the case of one and two-family dwelling units.
 3. Minimum dimensions for Off-Street Parking:
 - (a) Ninety-degree angle parking. Each parking space shall not be less than nine (9) feet in width and eighteen (18) feet in length. Maneuvering space shall not be less than twenty-four (24) feet. Designated small car parking spaces shall not be less than eight (8) feet in width and sixteen (16) feet in length.

- (b) Sixty-degree angle Parking. Each parking space shall be not less than nine (9) feet wide perpendicular to the parking angle nor less than twenty (20) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than sixteen (16) feet perpendicular to the building or parking line. Designated small car parking spaces shall not be less than eight (8) feet in width and eighteen (18) feet in length.
- (c) Forty-five degree angle parking. Each parking space shall not be less than nine (9) feet wide perpendicular to the parking angle nor less than eighteen and one-half (18 1/2) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than twelve (12) feet perpendicular to the building or parking line. Designated small car parking spaces shall not be less than eight (8) feet in width and ten (10) feet in length.
- (d) Parallel parking. Each parking space shall not be less than eight (8) feet in width and twenty-two feet in length. Maneuvering space will not be less than twenty (20) feet. Designated small car parking spaces shall not be less than eight (8) feet in width and twenty (20) feet in length.
- (e) When off-street parking facilities are located adjacent to a public alley, the width of said alley may be utilized as a

portion of the maneuvering space requirement, provided the alley is paved.

- (f) Twenty percent (20%) of the total requirements may be used as small car parking with eighty percent (80%) of that total being grouped and designated for that use.
 - (g) When off-street parking facilities are provided in excess of minimum amounts herein specified, or when off-street parking facilities are provided, but not required by this chapter, said off-street parking facilities shall comply with the minimum requirements for parking and maneuvering space herein specified.
4. Paving Standards: Unless otherwise approved by the City Council, all parking lots shall be paved with concrete and designed according to City standards and specifications. The parking lanes must be clearly marked by approved paint, buttons, or other material.
 5. No parking area shall be designed or constructed which ends in a dead end, if more than three (3) parking spaced in depth, unless adequate turnaround space is provided.
 6. All entrances or exits in a parking lot shall be a minimum of thirty (30) feet from the beginning point of any corner radius.

7. All entrances or exits in a parking lot shall be a minimum of twenty-four (24) feet and a maximum of forty-five (45) feet in width, unless one-way, in which case they shall both be a minimum of twelve (12) feet, or as approved by the City Council.
8. The driveway approach angle to any parking area shall be a maximum of sixteen (16) degrees, the departure angle a maximum of ten (10) degrees, the ramp angle a maximum of eleven (11) degrees, or otherwise shall be approved by the City Engineer.
9. No parking areas or parking spaces shall be allowed to pave over or utilize public right-of-way, with the exception of approved entrances and exits, unless an exception is granted by the City.
10. Any lighting used to illuminate any off-street parking area shall be so designed and constructed as to direct the light to the property and away from any adjoining property or street.
11. All multifamily and commercial parking areas and parking spaces shall be designed and constructed to protect adjacent residences from the direct glare of headlights of vehicles using the parking area.
12. All multifamily, retail, commercial, and industrial parking lots shall be required to provide a fire lane with a minimum width of twenty (20) feet and a maximum width of twenty-five (25) feet and shall be approved by the City Fire Marshall.

13. The pavement within a designated loading area shall be designed and constructed to carry the additional loading of merchandise, goods, sanitation pick-up, etc., in order to prevent any unnecessary failure in the pavement itself. The pavement design shall be included in the engineering construction plans and specifications and submitted to the City Engineer for approval.

STANDARD SPECIFICATIONS FOR CONSTRUCTION

ITEM 1 - GENERAL REQUIREMENTS

1.1 MATERIALS: These Standard Specifications for Construction are intended to be so written that only materials of the best quality and grade will be furnished. The fact that the specifications may fail to be sufficiently complete in some detail will not relieve the Contractor of full responsibility for providing materials of high quality and protecting them adequately until incorporation in the project. The specifications for materials set out the minimum standard of quality which the City believes necessary to procure a satisfactory project. No substitutions will be permitted until the Contractor has received written permission of the City to make a substitution for the material which has been specified.

Where the term "Or Approved Equal" is used, it is understood that if a material, product or piece of equipment of the specified name and quality is furnished it will be approvable, as the particular trade name and quality acceptable to the City. If a product of any other name is proposed for use, the City's approval must be obtained before the proposed substitute is incorporated into the work. Wherever the term "Or Equal" is used, it is understood to mean "Or Approved Equal".

Where the terms "Or Approved Equal" or "Or Equal" are not used, the Contractor shall furnish the material as specified, and no substitutions will be allowed.

1.2 WORKMANSHIP: These specifications contain detail instructions and descriptions covering the major items of construction and workmanship necessary for building and completing the various units or elements of the project. The specifications are intended to be so written that only first class workmanship and finish of the best grade and quality will result. The fact that at these specifications may fail to be so complete as to cover all details will not relieve the Developer of full responsibility for providing a completed project of high quality, with a first class finish and appearance and satisfactory for operation, all within the apparent intent of the plans and specifications.

1.3 HANDLING MATERIALS NOT APPROVED: The Developer shall remove from the site any materials found to be damaged and any materials not meeting the specifications. These materials shall be removed promptly, unless the City will accept the materials after repairing. Materials found to be damaged, or not acceptable to the City, shall be removed if installed. Inspection before installation shall not relieve the Developer from any responsibility to furnish good quality materials.

1.4 CLEARING AND GRUBBING: The Contractor shall do all clearing and grubbing necessary for construction operations. All trees, branches, limbs and roots shall be removed and disposed of by the Contractor so as to leave the right-of-way in a neat and presentable condition. Clearing and grubbing shall be done so as not to injure or damage adjacent property. In disposing of brush, particular care shall be taken so as to eliminate the possibility of starting a grass fire. Any

and all damages outside the limits of the construction right-of-way shall be paid for and settled by the Contractor at his expense.

1.5 SAFETY AND PROPERTY PROTECTION:

1.5.1 TRAFFIC CONTROL IN WORK AREAS, BARRICADES, GUARDS AND SAFETY PROVISIONS: To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, guards, and other traffic controls as required shall be placed along all roads, street crossings, etc. and shall be maintained during the progress of the construction work and until it is safe for traffic to use the construction site. All traffic control devices shall comply with the latest edition of the Texas MUTCD.

Excavations for construction operations shall be conducted in a manner to cause the least interruption of traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at road crossings, street intersections, and driveways.

1.5.2 FLOW OF DRAINS AND SEWERS MAINTAINED: Adequate provisions shall be made for the flow of storm sewers, drains and water courses encountered during the construction, and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work.

1.5.3 PROPERTY PROTECTION: Trees, fences, signs, poles, guy wires, and all other property shall be protected unless their removal is authorized; and any property damage shall be satisfactorily restored by the Contractor.

The Contractor shall make adequate provisions for the protection of permanent paving, both concrete and asphalt, from damage by construction equipment.

1.6 GUARANTEE: The Contractor shall guarantee the work for a period of one (1) year after the date of acceptance by the City. During this period, the Contractor shall make any repairs and/or replacements of defective materials and corrections due to poor workmanship, as may be required for full compliance with these Specifications. This guarantee shall apply to all matters reported by the City in writing within said one (1) year period, and this guarantee shall be covered by the Maintenance Bond.

1.7 WATER FOR CONSTRUCTION: The Contractor shall furnish all water required for construction. The Contractor may purchase water from the City at published water rates. All connections to the City's water system shall meet the approval of the City. The Contractor shall post a deposit with the City in order to use a city construction meter.

1.8 DISPOSAL FOR CONSTRUCTION: The Contractor shall properly dispose of all excess material.

1.9 MAINTENANCE AND CLEANUP: During the prosecution of the work, the Contractor shall maintain the project site in an orderly and acceptable manner. Upon completion of any unit of work, it shall be maintained by the Contractor until acceptance by the City of the entire work covered by this contract.

Upon completion of the project, the Contractor shall clean and remove from the site of the project surplus and discarded materials, temporary structures, and debris of every kind and shall leave the site of the work in a neat and orderly condition.

1.10 LABORATORY CONTROL: Laboratory work with regard to soils will involve the following:

- (1) Running Atterberg Limits immediately after the grading has been roughly finished to subgrade level. Results from the Atterberg limits will be used to determine whether lime treatment is required. Subgrade materials having a plasticity index (P.I.) equal to 15 or more will require lime treatment.

Tests for Atterberg Limits shall be run on clay type materials which are representatives of raw subgrade materials. A minimum of three (3) tests for Atterberg Limits, unless otherwise approved by the City, shall be required for subgrade materials subject to lime stabilization. Additional testing may be required to locate areas where an appreciable change in subgrade material indicates a P.I. or less than 15.

- (2) When lime treatment is completed, gradation tests will be made to insure that the material is properly mixed and pulverized.
- (3) When subgrade compaction, and/or embankment is in progress, density tests will be made to determine whether the proper density is being attained.
- (4) Test requirements for mixing and pulverizing of materials and compaction shall be specified in the various items of these specifications.

Laboratory work for concrete work shall consist of:

- (1) Mixing plant control consisting of controlling the mix and reporting to insure compliance with the specifications.
- (2) Making and testing beams and cylinders as required for the paving concrete in the specifications. Requirements for making and testing of beams and cylinders shall be as specified herein.

The Contractor shall employ a qualified commercial testing laboratory, approved by the City, and shall pay for the laboratory work directly. Copies of all reports shall be furnished to the City.

Preliminary tests and cylinders before construction begins will be waived providing the Contractor can provide a mix design from a recent project that meets the specifications and can provide some results of compression or flexural tests to prove adequate strength. The mix and materials, however, must be from the same source that he intends to use on this project.

1.11 INSPECTIONS: The Developer shall be responsible for expenses for inspection after working hours.

END OF ITEM

ITEM 2 - STREET EXCAVATION AND GRADING

2.1 DESCRIPTION: Street Excavation and Grading will consist of all the required excavation within the limits of the right-of-way and areas adjacent thereto, the removal, proper utilization or disposal of all excavated materials; the construction of all embankments and the shaping and finishing of all earthwork in conformity with the lines and grades as shown on the plans or established by the approved plans in accordance with the specification requirements contained herein.

2.2 CLASSIFICATION: Without regard to materials encountered, all street excavation shall be unclassified and shall be designated as "Unclassified Street Excavation" which will include all materials excavated. It is to be distinctly understood that any reference to rock, or any other material on the plans and/or in this specification is solely for the City's and the Contractor's information and is not to be taken as an indication of the classification of excavation.

2.3 EXCAVATION: All excavation shall be in accordance with the lines, grades, and typical sections as shown on the plans or established by the City. Unless otherwise shown on the plans or established by the City, street excavation will be made to the subgrade of the roadway and finished grade of parkways.

Where excavation to grades established in the field by the City would terminate in unstable soil, the City may require the Contractor to remove the unstable soil and backfill to the required grade with suitable material compacted, in an approved manner, to a satisfactory density.

Where excavation to the grade established in the field by the City terminates in loose or solid rock, the Contractor may be required to extend the depth of excavation six (6") inches and backfill with select material compacted, in an approved manner, to a satisfactory density. Subject to the approval of the City, the select material backfill may be obtained from any point within the right-of-way where suitable backfill material is available.

The Contractor shall conduct his operations in such a manner that adequate measurements may be taken before any backfill, as required above, is placed.

A portion of the existing pavement, including both gravel base and asphalt surface, shall be thoroughly scarified, salvaged and used for the transition paving base. Care shall be taken in removing the gravel base so as not to include any of the subgrade. After removal of the pavement, the excavation shall be continued to proper grades and then stabilized with lime when the Plasticity Index (P.I.) equals 15 or more.

2.4 PROVISIONS FOR DRAINAGE: If it is necessary in the prosecution of the work to interrupt the natural drainage of the surface or the flow of artificial drains, the Contractor shall provide temporary drainage facilities that will prevent damage to public or private interests and shall restore the original drains as soon as the work will permit. The Contractor shall be held liable for all damages which may result from neglect to provide for either natural or artificial drainage which his work may have interrupted.

2.5 EMBANKMENT: After the site has been cleared, the ground surface upon which embankments are to be constructed shall be scarified in furrows uniformly spaced so that the surface will be broken to a depth of at least four (4") inches.

Embankments shall be constructed of suitable materials and shall be placed in successive horizontal lifts of not more than eight (8") inches in depth by loose measurement for the full width of the embankment. Stumps, trees, rubbish, vegetation or other unsuitable materials shall not be placed in embankments. All construction traffic shall be uniformly distributed over the entire surface of each layer of the embankment.

A blade or other suitable equipment shall be kept in operation on the embankment for the purpose of uniformly mixing, spreading and pulverizing the embankment material.

After a layer of embankment material has been placed and bladed, it shall be sprinkled as required to bring the material to the uniform moisture content necessary for maximum compaction and rolled with a tamping roller, or other approved compaction equipment. The roller shall pass over every part of each layer for a maximum of six (6) times. In the event water from the City Water Mains is used, it shall be metered and paid for by the Contractor. Each lift of embankment construction shall be compacted to 95% Standard Proctor Density.

No successive layer shall be placed until the layer under construction has been thoroughly bladed and rolled to the satisfaction of the City.

After a section of the embankment has been completed, it shall be maintained to grade and cross-section by blading when required.

Embankments placed over and adjacent to pipes, culverts, and other structures shall be of suitable materials and shall be placed in successive horizontal lifts of not more than six (6") inches in depth by loose measurement. Each layer shall be uniformly mixed, pulverized and thoroughly compacted to the satisfaction of the City by the use of rakes, hand tamps, and/or other approved methods. Special care shall be taken to prevent any wedging against the structure. This method of consolidation and compaction shall be used for such distances along an embankment adjacent to structures as may be necessary and in other areas where blading and rolling would be impractical.

2.6 EMBANKMENTS CONTAINING ROCK: Where a large portion of the materials excavated consists of rock, the rock may be used in the construction of the embankment as hereinafter specified.

The maximum dimension of any rock used shall not exceed fifty (50%) per cent of the height of the embankment and in no case shall any rock over twenty-four (24") inches in its maximum dimension be placed in the embankment. When the greater portion of the embankment is to be composed of materials other than rock, the embankment shall be constructed as required in the preceding paragraphs; and the rock shall be carefully distributed throughout the embankment and

filled around with earth or other approved fine material so that the interstices between the large particles are filled, and a dense, compact and uniform embankment is secured.

When embankments are to be constructed principally of the rock, the rock shall be placed in successive horizontal layers, not to exceed thirty (30") inches in depth, for the full width of the embankment and the interstices between the large stones shall be filled, insofar as practicable, with small stones and spalls.

The upper eight (8") inches of all embankments shall be composed of earth or other acceptable material.

2.7 LABORATORY CONTROL: The Contractor shall furnish and pay for a qualified commercial laboratory, approved by the City, to perform compaction tests on embankment construction for each two-thousand (2000 s.y.) square yards per eight (8") inch lift, unless otherwise approved by the City.

2.8 EXCESS EXCAVATION: Unsuitable street excavation and suitable street excavation in excess of that needed for construction shall be disposed of as directed by the City. In general, suitable excess street excavations will be used in the construction of parkways, widening of embankments, flattening of slopes, etc. If material must be wasted, the material shall be disposed of in such a manner as to present a neat appearance and to not obstruct proper drainage or to not cause injury to street improvements or to abutting property.

2.9 SUBGRADE FINISH: The subgrade will be accurately finished to the required grades and typical sections shown on the Plans. Subgrade material which requires lime stabilization shall be constructed in accordance with LIME STABILIZED SUBGRADE of these specifications. Subgrade material which does not require lime stabilization shall be brought to a uniform moisture content near optimum, compacted to 95% Standard Proctor Density to a minimum depth of six (6") inches and finished to an accurate and smooth finish.

END OF ITEM

ITEM 3 - LIME STABILIZED SUBGRADE

3.1 GENERAL: Lime stabilized subgrade shall be required in all areas which receive a paved surface where the plasticity index (P.I.) of the natural subgrade soil equals 15 or more. If the PI is less than 15, the Developer may need to specify cement treated subgrade. The amount of lime for treatment and stabilization shall be as required in Paragraph 3.5, Amount of Lime, of these specifications.

3.2 WORK INCLUDED: This item shall consist of treating the subgrade by pulverization, addition of lime and mixing and compacting the mixed material to the density required, conforming with the lines, grades and typical section as shown on the Plans.

3.3 MATERIAL REQUIREMENTS: The lime used for stabilizing shall be hydrated lime in dry form or lime in the slurry form at the City's discretion. The lime shall comply with the Texas Highway Department Specification Item 264. The various types and grades of lime are defined and identified as follows:

- A. **Type A, Hydrated Lime:** Hydrated Lime shall consist of a dry powder obtained by treating quicklime with enough water to satisfy its chemical affinity for water under the conditions of its hydration.

Hydrated Lime for stabilization purposes shall be applied, as provided in the governing specifications, as a dry powder or mixed with water to form a slurry.

- B. **Type B, Commercial Lime Slurry:** Type B, Commercial Lime Slurry, shall be pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity and/or nature injurious or objectionable for the purpose intended.

Type B, Commercial Lime Slurry, shall conform to one of the following two (2) grades as defined in THD Specification Item 264:

- (1) **Grade 1:** The "Dry Solids Content" shall be at least thirty-one (31) percent by weight of the slurry.
- (2) **Grade 2:** The "Dry Solids Content" shall be at least thirty-five (35) percent by weight of the slurry.

When Type B, Commercial Lime Slurry, is selected for construction, the Contractor shall select, prior to construction, the grade to be used and shall notify the City in writing before changing from one grade to another.

3.4 MEASUREMENT: When Type A, Hydrated Lime, is used the quantity of lime will be measured by the ton of two thousand (2,000) pounds, dry weight.

When Type B, Commercial Lime Slurry, is used the quantity of lime shall be calculated from the required minimum percent solids based upon the use of Grade 1 or Grade 2 as follows:

Grade 1: The "Dry Solids Content" shall be at least thirty-one (31) percent by weight of the slurry, and the quantity of lime shall be calculated by the ton of two thousand (2,000) pounds based on the thirty-one (31) percent of lime content as delivered at the job site.

Grade 2: The "Dry Solids Content" shall be at least thirty-five (35) percent by weight of the slurry, and the quantity of lime will be calculated by the ton on two thousand (2,000) pounds based on the thirty-five (35) percent lime content as delivered at the job site.

3.5 AMOUNT OF LIME: The rate of application of lime shall be such as to result in a minimum lime content of six (6) percent by the dry weight of compacted subgrade.

3.6 LABORATORY CONTROL: The Contractor shall employ a qualified commercial testing laboratory, approved by the City, to perform all tests for gradation and compaction. The Contractor shall pay for all laboratory work directly. Copies of all reports shall be furnished to the City.

Gradation and compaction tests for lime stabilized subgrade shall be required for each two thousand (2,000 s.y.) square yards or a fraction thereof, unless otherwise approved by the City.

3.7 CONSTRUCTION METHODS:

3.7.1 GENERAL: It is a primary requirement of this specification to secure a completed course of treated material containing a uniform lime mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.

Prior to beginning any lime treatment, the road bed shall be constructed and shaped to conform to the typical sections, lines, and grades as shown on the plans.

3.7.2 EQUIPMENT: Machinery, tools and equipment necessary for proper prosecution of the work shall be on the project and approved by the City prior to the beginning of construction operations.

All machinery, tools, and equipment used shall be maintained in a satisfactory and workmanlike manner.

3.7.3. TREATMENT OF SUBGRADE: Material to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. Any wet or unstable materials below the secondary grade shall be corrected by scarifying, adding lime, and compacting until it is of uniform stability. The excavated material shall then be spread to the desired cross-section. If the Contractor elects to use a cutting or pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade or windrow the material. However, the Contractor shall be required to roll the subgrade before using the pulverizing machine and correct any soft areas that this rolling may reveal. This method will be permitted only where a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will place the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.

3.7.4 APPLICATION: Lime shall be spread only on that area which the mixing operation can be completed the same working day.

When Type A, hydrated lime is selected, the lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry. Type B, Commercial Lime Slurry, shall be applied with a lime percentage not less than that application for the grade used. The distribution of lime at the rate shall be attained by the successive passes over a measured surface of roadway until the proper moisture and lime content have been secured. The distributor truck shall be equipped with an agitator which will keep the lime and water in a uniform mixture.

For a Type B, Commercial Lime Slurry, Grade 1, an approximate mix is one (1) ton of lime to 533 gallons (4448) pounds of water which gives a 31 percent solution. For Grade 2, one (1) ton of lime to 445 gallons (3714 pounds) of water which gives a 35 percent solution.

3.7.5 MIXING:

- A. **First Mixing:** Material and lime shall be thoroughly mixed by approved road mixers or other approved equipment; and the mixing shall be continued until the homogenous, friable mixture of material and lime is obtained, and is free from all clods or lumps. Materials containing plastic clay or other materials which will not readily mix with the lime shall be mixed as thoroughly as possible at the time of the lime application, brought to the proper moisture content and left to cure one (1) to four (4) days as directed by the City. During the curing period, the material shall be kept moist.
- B. **Final Mixing:** After the required curing time, the material shall be uniformly mixed by approved methods. If the soil binder-lime mixture contains clods, they shall be reduced in size by raking, blading, dicing, harrowing, scarifying, or the use of other approved pulverization methods so that when all nonslaking aggregates obtained on the No. 4 sieve are removed, the remainder of the material shall meet the following requirements when tested dry by laboratory sieves:

Minimum passing 1-3/4 inch sieve 100%
Minimum passing No. 4 sieve 60%

During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of six (6) hours or more, or to excessive loss due to washing or blowing, will not be accepted for payment.

3.7.6 COMPACTION: Compaction of the mixture shall begin immediately after final mixing and in no case later than three (3) calendar days after final mixing. The material shall be aerated or sprinkled as necessary to provide optimum moisture. Compaction shall begin at the bottom and shall continue until the depth of the mixture is uniformly compacted. The compacted mixture shall have a uniform density of not less than ninety-five (95%) percent of Standard Proctor Density. After each section is completed, compaction tests as are necessary shall be made by the laboratory. If any portion fails to meet the density or the depth specified, it shall be reworked as necessary to obtain the specified density and depth of lime treatment required.

3.7.7 FINISHING, CURING AND PREPARATION FOR SURFACING: After mixture has been compacted, the surface shall be shaped to the required line, grades, and cross-sections and then thoroughly rolled as required with a pneumatic or other suitable roller sufficiently light to prevent hair-cracking. The completed section shall then be moist-cured for a minimum of seven (7) days before further courses are added or any traffic permitted. In cases where subgrade treatment or subbase sets up sufficiently to prevent objectionable damage from traffic two (2) days after compaction. If the completed section has not been covered by pavement in fourteen (14) days, it shall be sealed by an application of AC-20 asphalt at the rate of one-tenth (0.10) gallon per square yard.

3.7.8 MAINTENANCE: The Contractor shall be required to maintain the completed soil lime subgrade within the limits of these specifications, in good condition, satisfactory to the City as to grade, crown, and cross-section until such time as the surface course is constructed. All irregularities or other defects that may occur shall be immediately repaired by the Contractor at his own expense. Repairs are to be made as directed by the City and in a manner to insure restoration of a uniform surface and durability of the portion repaired.

END OF ITEM

ITEM 4 - CONCRETE PAVING

4.1 GENERAL: This section covers the construction of concrete paving. The typical section and the elevations for paving shall be as shown on the plans. Subgrade treatment will be dependent upon the plasticity index of the native soil at subgrade level. The typical section for each of these conditions is shown on the Standard Details.

4.2 CEMENT: Cement shall be Type I in accordance with ASTM C150 and THD Item 360.

4.3 ADMIXTURE: None required.

4.4 COARSE AGGREGATE: Coarse aggregate shall conform to THD Item 360, and the grading from that specification is quoted as follows:

Retained on 1-3/4 " sieve	0%
Retained on 1-1/2" sieve	0 - 5%
Retained on 3/4" sieve	30 - 65%
Retained on 3/8" sieve	70 - 90%
Retained on No. 4 sieve	95 - 100%

4.5 FINE AGGREGATE: Fine aggregate shall comply with THD Specification Item 360, and the grading from that specification is quoted as follows:

Retained on 3/8" sieve	- 0%
Retained on No. 4 sieve	0 - 5%
Retained on No. 8 sieve	0 - 20%
Retained on No. 16 sieve	15 - 30%
Retained on No. 30 sieve	35 - 75%
Retained on No. 50 sieve	70 - 90%
Retained on No. 100 sieve	90 - 100%
Retained on No. 200 sieve	97 - 100%

4.6 WATER: Water as used in concrete mix for this project shall generally comply with the requirements of potable water, and further, shall comply with THD Specification Item 360.

4.7 PROPORTIONING OF CONCRETE: Concrete mix for paving shall conform to THD Specification 364.2 "Class A Concrete". A part of the requirements of the THD Specification is as follows:

	Minimum Sacks of Cement per Cu. Yd.	5
	Minimum Compressive Strength/28 days	3,500 p.s.i.
Maximum	Minimum Water Cement Ration	6.5 gals./sack
	Slump Range	1 to 3 inches

MIX DESIGN: The Contractor shall prepare a mix design through commercial laboratory report compressive and flexural test results to the City prior to beginning of paving work.

Graduation tests of the aggregate used in the mix shall also be reported. This laboratory work shall be paid for by the Contractor.

4.7.2 GENERAL CHARACTERISTICS OF MIX: The workability and other general characteristics of the mix shall conform to the requirements of THD Specification Item 360.4.

4.8 REINFORCING STEEL: Reinforced steel shall be provided in the sizes and lengths as shown on the Plans and shall be properly tied and supported at the positions in the slab as indicated. Reinforcing steel shall otherwise conform to the THD Specification Item 360.2.

4.9 PLACING AND REMOVING FORMS: The subgrade under forms shall be accurately cut so that the form has firm support for its length. Forming and removal of forms for concrete paving shall in general comply with THD Specification Item 360.5.

4.10 MIXING AND PLACING OF CONCRETE: Mixing and placing shall, in general, comply with THD Specification Item 360.6 with some of the essential requirements listed as follows:

1. On site mixers are preferred, and transit mix concrete will require a special permit from the City.
2. Mixing and batching equipment is subject to the City's approval.
3. Mixing time shall not be less than 50 seconds or more than 90 seconds after all the ingredients are in the drum.
4. All concrete must be placed within 30 minutes from beginning of the mixing operation.

4.11 PAVEMENT SUBGRADE: The forms shall be metal forms in accordance with THD Specification Item 360.3.

4.12 CONCRETE SPREADER: A self-propelled concrete spreader and strike-off machine will be required in accordance with THD Specification Item 360.3.

4.13 VIBRATORY EQUIPMENT: Mechanical vibratory equipment in accordance with THD Specification Item 360.3 will be required and shall be operated ahead of the finishing machine. Complete consolidation of concrete will be required.

4.14 SPREADING AND FINISHING: Wherever possible the concrete paving shall be finished with a power-driven machine. Hand finishing will be permitted at intersections and other places where machine finishing is not feasible. Spreading, compacting and finishing shall comply in general with THD Specification Item 360.8.

4.15 OPTIONAL EQUIPMENT: The Contractor, at his discretion, may use a "traveling form paver".

4.16 FINISHING EQUIPMENT: The finishing machine shall be designed to ride on the forms and to accurately finish the surface to the specified grades. In general, finishing equipment shall conform to THD Specification Item 360.3.

4.17 CONSTRUCTION JOINTS: Stoppage of concrete placement shall be either at an expansion joint or at a construction joint. Construction joints and weakened plane joints shall have continuous reinforcing steel through the joint and shall comply in general with THD Specification Item 360.6.

4.18 EXPANSION JOINTS: Joint assembly, including dowels and premolded filler, shall be as shown on the Plans. A removable strip shall be placed at the top of the premolded filler so that it can be removed and the sealer material installed. The joint sealer shall be "Hot Poured Rubber" in accordance with THD Specification 360.2, Class 2. Before applying the sealer material, the joint surfaces shall be clean and dry and free of curing compound, oil or any other material that would prevent the sealer from adhering to the concrete surface. The premolded filler shall be PVC foam joint filler, such as "Rodofam" as manufactured by Electrovert, Inc. The grade of the material shall be semirigid. Expansion joints shall otherwise conform to THD Specification Item 360.7.

4.19 OTHER JOINTS: Weakened plane joints (sawed joints), contraction joints and longitudinal joints shall comply with the details shown on the Plans. In addition to the Plan requirements, the construction of these joints shall comply with THD Specification 360.7.

4.20 PROTECTION FROM TRAFFIC: The Contractor shall place barricades and otherwise protect the slab to insure that traffic gets on the slab until it has cured for at least 7 days.

4.21 CURING: Immediately after finishing operations have been completed, the concrete shall be cured with either water curing or a membrane curing compound. Water curing may be done with mats or other approved methods that would insure the concrete is kept wet for a minimum of 72 hours. Curing compound where used shall comply with THD Specification Item 360.2. Curing of concrete, whether by water curing or curing compound, shall comply with THD Specification Item 360.10.

4.22 MONOLITHIC CURB: The monolithic curb shall be constructed as shown on the Plans. Joints in the curb shall match joints in the pavement. The monolithic curb has a small exposed section, and particular attention shall be given to proper curing of this item.

4.23 GRADE AND ALIGNMENT: At the beginning of the project, the Developer will provide tack pointed offset stakes at intervals of 50 feet. These stakes will be offset from the back of the outside curb a convenient distance to permit all operations to be completed without disturbing the stake. Information given on these stakes will be as follows:

1. Station Number
2. Offset distance from back of curb

3. Elevation of hub which will be given in tabular form separately

It will be this Contractor's responsibility to maintain these stakes and to use this information for all other horizontal and vertical control required. This Contractor will be required to furnish experienced personnel to do this work. The plans will show top of curb elevations for the median curb and for the outside curbs. This Contractor will sell all forms using this data, blue tops for fine grading subgrade, and all other vertical and horizontal control required.

4.24 TESTING AND QUALITY CONTROL DURING CONSTRUCTION:

The Contractor shall furnish the following at his own cost and expense:

1. Batch Plant Control from a qualified commercial laboratory. Laboratory personnel shall be competent to determine free moisture in aggregates and make needed adjustments in control of the mix and the slump.
2. Testing of four compression cylinders for each 200 cubic yards of concrete, or fraction thereof, with two to be broken at 28 days.
3. Testing of two beams for each 200 cubic yards of concrete, or fraction thereof, to be broken at 7 days.
4. Reporting of the test results to Developer and the City.

The Contractor shall provide proper curing facilities for the test specimens in accordance with the applicable ASTM Specifications.

4.25 THICKNESS TEST: The pavement will be subject to being core drilled by the City prior to final acceptance. The thickness of the pavement will be determined by measurement of the cores taken at such points as the City may select. Cores will be drilled from the width of normal thickness of section and the thickness of individual cores will be determined by averaging at least three measurements. Pavement of a thickness within 1/4 inch of that required by plans will be considered as satisfactory. Pavement of a thickness less than that shown on the Plans by more than 1/4 inch, but not exceeding 10 per cent of plan thickness may be considered as inadequate. The length of the area of such inadequate thickness shall be determined by additional cores taken at intervals of ten feet along the length of the pavement in each direction until cores are obtained which are within at least 1/4 inch of plan thickness.

Pavement averaging less than the specified thickness and considered as inadequate may be ordered by the City to be removed and replaced with pavement meeting the specifications or be adjusted by other methods to bring the pavement to a comparable quality and thickness to that required by the Plans. Pavement which averages more than 10 percent below design thickness shall be removed and replaced. The cost of core testing shall be paid by the Contractor if the pavement thickness is found substandard.

When pavement is ordered to be removed and replaced or adjusted by other methods, it shall be done at the sole expense of the Contractor.

END OF ITEM