

- D. A statement of the date that work to be performed will be completed;
- E. A statement sufficiently identifying the subdivision involved; and
- F. A section providing for the approval on the face of each contract by the Town of New Hope, Texas.

Section 7.2. Street Paving - Concrete.

A. Concrete Strength Requirements

1. Concrete Curb and Gutter

Concrete curb and gutter shall be constructed of a concrete batch design, providing a twenty-eight (28) day compressive strength of three thousand (3,000) pounds per square inch (p.s.i.). A coring of the streets may be required by the Town.

2. Reinforced Concrete Pavements and Monolithic Curb

Concrete pavement and monolithic curb properly and continuously reinforced shall be constructed of a concrete batch design, providing the appropriate twenty-eight (28) day compressive strength. The minimum reinforcement shall be No. 4 deformed bars spaced at twenty-four inches (24") center to center both ways. Mountable curbs may be used on all residential street and collector streets in residential areas.

B. Pavement Thickness Requirements

1. Residential Street and Alley Construction

The subdivider shall, at his own cost and expense, pay for constructing all residential streets and alleys within his subdivision and one-half (1/2) of all perimeter streets and alleys.

A six-inch (6") thickness of three thousand (3,000) p.s.i. reinforced concrete pavement on a compacted subbase shall be required. Said six-inch (6") thickness will be acceptable without performing additional soils investigation or design calculations. All steel reinforcing shall be deformed No. 4 bars on twenty-four-inch (24") centers both ways.

Where the plasticity index of the soil is fifteen (15) or greater, stabilization of the subgrade, six inches (6") thick with six percent (6%) hydrated lime by weight, shall be required. Compaction of the lime stabilized subgrade shall be to 95% standard proctor density.

Any proposed pavement section of lesser thickness or alternate materials shall be fully documented by the design engineer to substantiate the fact that such alternate will provide an equivalent capacity for the pavement noted above and must be approved by the Town.

For residential streets only, the Town will consider allowing an alternate street width of twenty-six feet (26'). This would be a twenty foot (20') concrete street of six-inch (6") thickness and three thousand (3,000) p.s.i., as noted above. There would be two (2) three foot (3') shoulders of asphalt or flex-base material, with no curbs. All alternate designs are subject to Town approval.

2. Collector Street and Commercial or Industrial Alley Construction

The subdivider shall, at his own cost and expense, pay for constructing all collector streets and alleys within his subdivision and one-half (1/2) of all perimeter streets and alleys.

Collector streets and alleys shall be designed and constructed with eight-inch (8") thickness or three thousand (3,000) p.s.i. reinforced concrete pavement on a compacted subbase. All steel reinforcing shall be deformed No. 4 bars on twenty-four-inch (24") centers both ways.

Where the plasticity index of the soil is fifteen (15) or greater, stabilization of the subbase with a six-inch (6") thickness of six percent (6%) hydrated lime by weight will be required. Compaction of the lime stabilized subgrade shall be to 95% standard proctor density.

Any proposed pavement section of lesser thickness or alternate materials shall be fully documented by the design engineer to substantiate the fact that such alternate will provide an equivalent capacity for the pavement noted above and must be approved by the Town.

3. Major Thoroughfare Construction

On roadways, adjacent to the proposed subdivision, that are designated to be major thoroughfares, the subdivider shall be required to construct, at his own cost and expense, one-half (1/2) of the street section with integral curbs on each side.

Where major thoroughfares traverse a subdivision, the subdivider shall be required, at his own cost and expense, to construct a 22-foot wide section on each side of the roadway.

Thoroughfares shall be designed and constructed with an eight-inch (8") thickness of three thousand five hundred (3,000) p.s.i. reinforced concrete pavement on a compacted subbase. All steel reinforcing shall be deformed No. 4 bars at twenty-four-inch (24") centers both ways.

Where the plasticity index of the soil is fifteen (15) or greater, stabilization of the subgrade, six inches (6") thick with six percent (6%) hydrated lime by weight, shall be required. Compaction of the lime stabilized subgrade shall be to 95% standard proctor density.

Any proposed pavement section of lesser thickness or alternate materials shall be fully documented by the design engineer to substantiate the fact that such alternate will provide an equivalent capacity for the pavement noted above and must be approved by the Town.

C. Paving Width Requirements

1. Residential Streets, Collector Streets, and Alleys

Residential street paving shall be a minimum of twenty-six feet (26') in width, measured between the faces of curbs.

Collector street paving shall be a minimum of thirty-six feet (36') in width, measured between the faces of curbs, except that the width for collector streets in industrial and commercial areas must be a minimum of forty-four feet (44') in width, measured between the faces of the curbs.

Alley paving shall be ten feet (10') wide in residential areas and sixteen feet (16') wide in commercial and industrial areas. Alley turnouts shall be paved to the property line and shall be at least two feet (2') wider than the alley paving at that point. Paving radius

where alleys intersect residential and collector streets shall be ten feet (10') and where alleys intersect thoroughfare streets, the radius shall be fifteen feet (15').

2. Major Thoroughfares

The following minimum pavement widths are set by this Ordinance for the construction of thoroughfares as follows:

<u>Thoroughfare Classification</u>	<u>Minimum Right-of-Way Width</u>	<u>Minimum Pavement Width Between Faces of Curbs</u>
Major Thoroughfare	100'	Two 33' Traffic Lanes divided by a 15' median
Collector A	60'	Four 11' Traffic Lanes
Collector B	60'	Two 12' Traffic Lanes and Two 8' Parking Lanes
Residential	50'	26' with no curbs

Note: The minimum width of a median adjacent to a left turn lane shall be five feet (5').

3. Street Returns

- a. The minimum radius for all street returns shall be twenty feet (20').
- b. Returns for driveways on residential streets shall be ten feet (10'). Commercial and industrial driveway returns shall be a minimum of ten feet (10') and a maximum of twenty feet (20') except in special cases.

D. Miscellaneous

1. Reinforcing Steel

Steel for street and alley paving shall meet ASTM designation A 15, A 16, or A 408 and be deformed bars.

2. Sawed Dummy Joints

Sawed dummy transverse joints shall be not greater than 20' - 2" apart and as required by the Town Engineer at intersections.

Longitudinal sawed dummy joints shall be required in all pavements where the concrete is poured in a continuous width of 30 feet or more. The longitudinal dummy joint shall be located at one-third point of the width or as directed by the Town.

3. Expansion Joints

Expansion joints shall be placed at distances no greater than 600 feet and shall be constructed in accordance with the Town's standards. Construction joints shall be constructed in accordance with the expansion joint standard.

Expansion joints shall have No. 5 smooth dowels, at 24-inch centers that are acceptable to the Town. Construction joints shall have the reinforcing bars continuous through the joint.

4. Longitudinal Pavement Slopes

The minimum longitudinal standard alley pavement slopes shall be as set forth in Section 12-6.1, I.

The maximum longitudinal slopes are as follows:

<u>Type of Street</u>	<u>Maximum Slope</u>
Major Thoroughfare	6%
Collector A and B	8%
Residential	10%

Maximum grades for alleys shall be 8% within 30 feet of its intersection with a street and 14% elsewhere.

5. Transverse Pavement Slopes

The transverse pavement slope for all non-divided streets shall consist of a parabolic curve from the pavement centerline to the gutter. The crown of the parabolic curve shall be four inches (4") above the gutter grade on residential streets and six inches (6") on collector

streets. For divided streets, the transverse slope shall be as required by the Town.

6. Lime Stabilization

Contractor shall rough grade to the proposed top of subgrade as shown on the plans. Areas shall be proof rolled and any soft areas shall be excavated and replaced with satisfactory material.

Lime Slurry shall be Type B, Grade 1, as specified under TDHPT Item 264. Lime shall be applied at a rate of 6% of the dry weight of the soil. First mixing shall be allowed to moist cure for forty-eight (48) hours at the proper moisture content. Final mixing shall begin after the mixture is tested to insure a minimum of 60% passing of No. 4 Sieve. Material shall then be compacted to a minimum of 95% Standard Proctor.

Section 7.3. Sidewalks.

Concrete sidewalks, if installed, shall have a width of not less than four feet (4') and thickness of not less than four inches (4") and shall be constructed of three thousand (3,000) p.s.i. concrete on both sides of all streets and thoroughfares within the subdivision. Sidewalks shall be constructed one foot (1') from the property line within the street or thoroughfare right-of-way and shall extend along the street frontage including the side of corner lots and block ends. Construction of sidewalks adjacent to curb in residential areas will be considered where driveway entrances are constructed from the rear of lots on each side of the street for the full length of the block or where mountable curbs are installed. In these instances, the sidewalks shall be five feet (5') wide.

Sidewalks in Commercial areas shall be a minimum width of five feet (5') or extend from the back of the curb to the building line as required by the Town.

All concrete for sidewalks shall be placed on a two-inch (2") sand cushion and shall be reinforced with 6 x 6 No. 10 gauge welded wire fabric.

Longitudinal slope of sidewalks shall be that of the curb adjacent to the sidewalk. The transverse slope of the sidewalk shall be 1/4-inch per foot starting at the back of the curb. The maximum ground slope from the edge of the sidewalk on the property line side shall not exceed 11%. If it does exceed eleven percent (11%), a retaining wall, that is acceptable to the Town, shall be provided on the property line.

Section 7.4. Storm Sewer.

A. General

1. Plans, profiles, and specifications shall be prepared for storm sewer improvements to be constructed and shall show the locations, sizes, grades, hydraulic gradients, flow arrows, and other details for the proposed pipe, inlets, manholes, culverts, outlet structures, and other appurtenances. Each sheet of the plans and profiles shall bear the seal and signature of the registered professional civil engineer who prepared them.
2. The subdivider shall pay for the cost of all drainage improvements connected with development of his subdivision, including any necessary off-site channels or storm sewers and acquisition of any required easements.
  - a. An enclosed storm sewer shall be provided in all areas where the quantity of the accumulated storm run-off does not exceed two hundred (200) cubic feet per second (c.f.s.).
  - b. In drainage courses where the accumulated storm run-off is more than two hundred (200) c.f.s. and less than five hundred (500) c.f.s., either an enclosed storm sewer system or a concrete-lined channel shall be constructed.
  - c. In drainage courses where the accumulated storm run-off is more than five hundred (500) c.f.s., the drainage improvements may be either an enclosed storm sewer system, a concrete-lined channel, or an earthen channel. Earthen channels shall be designed according to the criteria as set forth herein for open channel sections.
3. Discharge of storm drainage shall be at a point of adequate capacity. This shall require the developer to provide off-site drainage if adequate capacity does not exist on-site.

B. Rational Method

The design of storm drainage improvements in the Town shall be based on flood discharges determined from the Rational Method. The formula for calculating storm flows in this manner is:

$$Q = CIA, \text{ where,}$$

- Q is the storm flow at a given point, measured in cubic feet per second;
- C is the percentage of rainfall on a given area that flows off as free surface water;
- I is the average intensity of rainfall in inches per hour for a period equal to the time of flow from the farthest point of the drainage area to the first inlet or given point on the storm sewer;
- A is the area in acres tributary to the design point.

C. Run-Off Coefficient "C"

The run-off coefficient, which considers the slope of the terrain, the character of the land-use, the length of overland flow, and the imperviousness of the drainage area, shall be determined from the ultimate land development plan of the Town. The run-off coefficient for the appropriate land uses shall be as follows:

Commercial Areas	0.90
Industrial Areas	0.70
Residential Areas	0.45
Apartment Areas	0.70
Park Areas	0.35

D. Rainfall Intensity "I"

The rainfall intensity - frequency curves, which are shown on Plate 1, are plotted from data published by the U. S. Department of Commerce Weather Bureau, Technical Paper No. 40.

The intensity, I, in the formula  $Q = CIA$ , is determined from these curves by arriving at a time of concentration and adapting a storm frequency upon which to base the drainage improvements.

E. Time of Concentration

The time of concentration, which is the time of flow from the furthest point of the drainage area to the first inlet in the system, or given point on the storm sewer, consists of the time required to flow overland plus the time required to flow in the gutter to the inlet, plus the time of flow in the

storm sewer. A minimum time or concentration of fifteen (15) minutes shall be used for all areas except commercial areas, and a minimum time or concentration of ten (10) minutes shall be used in commercial areas. A nomograph, shown on Plate 2, is attached for estimating the time of concentration.

2. Storm Frequency

Recommended design storm frequencies for the storm drainage improvements in the Town are shown in a table as follows:

<u>Type of Facility</u>	<u>Description of Area to Be Drained</u>	<u>Maximum Time of Concentration (Minutes)</u>	<u>Design Frequency (Years)</u>
*Storm **Sewers	Residential, Commercial, and Industrial	30	25
**Culverts, Bridges, Channels, and Creeks	Any type of area less than 100 acres	30	25
***Culverts, Bridges, Channels, and Creeks	Any type or area greater than 100 acres but less than 1,000 acres	45	50
Culverts, Bridges, Channels, and Creeks	Any type or area greater than 1,000 acres	**** 60	100

- \* When the maximum time of concentration or area to be drained is exceeded, the design shall be based on a fifty (50) - year frequency.
- \*\* When the maximum time of concentration or area to be drained is exceeded, the design shall be based on a one hundred (100) - year frequency.
- \*\*\* Whenever, in a storm sewer system, an inlet is located at a low point so that flow in excess of the storm sewer capacity would be directed onto private property, the design frequency shall be increased beyond twenty-five (25) years. In the inlet location is such that overflow could cause damage or serious inconvenience, it may

be desirable to increase the design frequency to as much as one hundred (100) years.

\*\*\*\* When the maximum time of concentration of sixty (60) minutes is exceeded on any area to be drained, the design shall be based on a one hundred (100) - year frequency having a maximum time duration of 60 minutes.

E. Area

The area used in determining flows by the "Rational Method" shall be calculated by subdividing a map into drainage areas within the basin contributing storm water run-off to the system.

F. Spread of Water

During the design storm, the quantity of storm water that is allowed to collect in the streets before being intercepted by a storm drainage system is referred to as the "spread of water". In determining the limitations for carrying the storm water in the street, the ultimate development of the street shall be considered. The use of the street for carrying storm water shall be limited to the following:

SPREAD OF WATER

Major Thoroughfares (divided)	-	One (1) traffic lane on each side to remain clear.
Major Thoroughfares (not divided)	-	Two (2) traffic lanes to remain clear.
Collector Streets (A and B)	-	One (1) traffic lane to remain clear.
Residential Streets	-	Six-inch (6") depth of flow at curb, or no lanes completely clear.

Curves are provided on Plate 3 for determining the spread of water for certain gutter slopes, gutter discharge, and pavement crown. Also provided are nomographs, Plate 4 and Plate 5, for determining the capacity of parabolic gutters for various width of streets and a curve for determining the curb inlet opening length (Plate 6).

The length of inlet opening for each cubic feet per second of gutter flow is as follows:

<u>Street Grade</u>	<u>Length of Inlet Opening in Feet per C.F.S.</u>
Less than 2%	1.0
2% to 3.5%	1.5
Greater than 3.5%	2.0

G. Storm Sewer Design

Storm water run-off in excess of that allowed to collect in the streets shall be intercepted in inlets and carried away in a storm sewer system. Storm sewer capacity shall be calculated by Manning's Formula:

$$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}, \text{ where,}$$

Q is the discharge in cubic feet per second;

A is the cross-sectional area of flow in square feet;

R is the hydraulic radius in feet;

S is the slope of the hydraulic gradient in feet per foot; and

n is the coefficient of roughness (n = 0.013 for concrete pipe and 0.015 for poured culverts).

In the design of the storm sewer system, the elevation of the hydraulic gradient of the storm sewer shall be a minimum of one and one-half feet (1.5') below the elevation of the adjacent street gutter.

Storm sewer pipe sizes shall be so selected that the average velocity in the pipe will not exceed fifteen feet (15') per second nor be less than three feet (3') per second.

Storm sewer pipe shall be reinforced concrete culvert pipe conforming to ASTM Description C76 Class III and shall be a minimum of eighteen inches (18") in diameter.

H. Open Channel Design

Storm water run-off in excess of that allowed to collect in the streets in developed areas and run-off in undeveloped areas may be carried in open channels (not in the street right-of-way). Open channel capacity shall be calculated by Manning's Formula, and roughness coefficients shall be as follows:

<u>Type of Lining</u>	<u>Roughness Coefficient "n"</u>	<u>Maximum Permissible Mean Velocity</u>
Earth (Bermuda Grass)	0.035	8 ft. per sec.
Earth (Non-Vegetated)	0.030	5 ft. per sec.
Concrete-lined	0.015	15 ft. per sec.
Weathered Rock	0.030	15 ft. per sec.

Open Channels shall be constructed with a trapezoidal cross-section and shall have side slopes no steeper than 3:1 in earth and 1.5:1 when lined with concrete.

Reinforced concrete lining shall be constructed in all open channels having a design quantity of run-off greater than 300 cubic feet per second and less than 2,000 cubic feet per second. Open channels having a quantity greater than 2,000 c.f.s. may be either earthen channel or concrete-lined.

Where the grade of the open channel must be 0.16%, or less, the channel shall be concrete-lined, regardless of the amount of run-off.

Concrete lining in channels shall have a minimum thickness of six inches (6") and shall be reinforced with 12 x 21-W4 x W4 welded wire fabric with a nominal diameter of 0.225 inches and a nominal weight of 0.136 lbs./L.F.

Concrete-lined channels shall have a reinforced concrete toe wall constructed along the base and side slopes of the lined channel and shall have a minimum vertical depth of two feet (2'). A horizontal concrete section, one foot (1') in width, shall be constructed between the top of the channel lining and the toe wall.

The subdivider shall dedicate a right-of-wry on all earthen and concrete-lined channels or sufficient width to provide for excavation of the open

channel of proper width, plus ten feet (10') on each side to permit ingress and egress for maintenance.

I. Culvert Design

At locations of creek crossings with proposed roadway improvements, it is sometimes necessary to receive and transport storm water under the roadway in culverts. The quantity of flow shall be determined by the Rational Method, and the capacity of the culvert shall be calculated by Manning's Formula.

Design of culverts shall include the determination of upstream backwater conditions as well as downstream velocities and flooding conditions. Consideration shall be given to the discharge velocity from culverts, and the following limitations are allowed:

CULVERT DISCHARGE - VELOCITY LIMITATIONS

Culvert Discharging onto Maximum Allowable Velocity (f.p.s.)

Earth	6
Sod Earth	8
Paved or riprap apron	15
Shale	10
Rock	15

Generally, all culverts shall be designed with a free outfall, and the following head losses shall govern the design of the culvert.

1. Frictional Head Loss

$$h_f = S_f L, \text{ where}$$

$S_f$  = Slope of frictional gradient in feet per foot; and

$L$  = Length of culvert in feet

2. Head Loss Due to Change in Velocity

$$h_v = \frac{V_2^2 - V_1^2}{2g}, \text{ where,}$$

$V_2$  = Velocity in culvert

$V_1$  = Velocity in channel upstream from culvert; and

$g$  = Acceleration due to gravity

3. Head Loss at Upstream Entrance to Culvert Due to Entrance and Change in Section

$h_e = V_2^2$ , where  $V_1$  is equal to or less than six feet (6') per second.

$h_e = V_2^2 + 0.5 V_f^2$ , where  $V_1$  is greater than six feet (6') per second.

**Section 7.5. Water Systems.**

Water systems shall be of sufficient size to furnish adequate domestic water, to furnish fire protection to all lots, and shall conform with the Town's Comprehensive Plan and meet the requirements, in all respects, of the Texas Department of Health. The Town shall make the final determination of the adequacy of water mains proposed in conjunction with North Collin Water Supply Corporation.

A. Materials

1. Water Mains

- a. All water mains twelve inches (12") in diameter and smaller may be either ductile iron pipe, thickness Class 50 minimum, or AWWA C900 polyvinyl chloride (PVC) pipe. Water mains larger than twelve inches (12") in diameter may be constructed with either pretensioned or prestressed concrete steel cylinder pipe or ductile iron pipe.
- b. The subdivider shall comply with all applicable Standard Specifications, Division 2, Item 2.12., Sections 2.12.5, 2.12.8., and 2.12.20.

2. Gate Valves

Gate valves shall be furnished in accordance with the Standard Specifications, Division 2, Item 2.13., Section 2.13.1.

3. Fire Hydrants

- a. Fire hydrants shall be furnished in accordance with the Standard Specifications, Division 2, Item 2.14.
- b. The subdivider shall furnish drawings with complete detailed dimensions of the fire hydrant proposed for the subdivision.

B. Installation and Testing

1. Water Mains, Fittings, Gate Valves, and Fire Hydrants

- a. The subdivider shall comply with all applicable Standard Specifications in Division 6, for installing materials that comply with the standards of the Town.
- b. Prior to approval of plans and specifications for ductile iron pipe, the subdivider shall perform a soil survey to establish the corrosive characteristics of the soil at, and along, the alignment or the proposed water mains. If the corrosive characteristics of the soil are found to be excessive or indicate a potential for a corrosive condition, then an approved polyethylene encasement or wrapping shall be installed to protect the pipe in accordance with the Standard Specifications, Division 2, Item 2.9., Section 2.9.5.
- c. Tap installations on PVC pipe will be made by attaching a bronze service clamp equipped with a sealed threaded port on the periphery of the main; then drilling through the pipe wall to complete each service port. Taps may be made either on an uncharged system or into a main under pressure.

2. Location

- a. All water mains shall be constructed within street rights-of-way or easements dedicated to the Town.
- b. Easements shall be provided for water mains which parallel any State-numbered highway.
- c. Water mains shall be installed in or extended along all frontage streets of the proposed subdivision and shall be connected to all existing water mains where convenient.

Provision of water mains in conjunction with cul-de-sac streets shall be at the discretion of the Town Engineer. To insure reliability or service, dead-end mains of adequate capacity shall not exceed three thousand feet (3,000') in length. Adequate capacity shall be determined by the standards for fireflow as accepted by the State Board of Insurance and the Fire Prevention and Engineering Bureau of Texas.

All trenches must be a minimum of two feet (2') in width. Trench cover must be a minimum of two feet (2') or sand and backfilled with sandy loam and rock (no rock larger than 3" in diameter).

- d. In zoning districts commonly referred to as "Residential Sections", the minimum size of water main shall be six inches (6") in diameter. Where intervals between "cross-connecting" mains must exceed one thousand two hundred feet (1,200'), or where dead-ends must exist, eight-inch (8") diameter or larger mains shall be installed.
- e. Eight-inch (8") diameter and larger mains shall be installed in all streets in zoning districts commonly referred to as "Commercial" with minimum size eight-inch (8") diameter intersecting mains every six hundred feet (600'). Where dead-ends must exist, eight-inch (8") diameter or larger mains shall be installed. The minimum limits set forth in the above shall not be exceeded except upon the specific approval by the Town Engineer, Town Building Official, and the Fire Chief, but in no event shall these requirements be less than the minimum required by the State Board of Insurance and the Fire Prevention and Engineering Bureau of Texas.
- f. Twelve-inch (12") diameter or larger mains shall be installed in all streets in zoning districts commonly referred to as "Commercial" or "Industrial", where service is to be provided to developments that may require fire sprinkler systems.
- g. All valves buried in the ground shall be provided with cast-iron valve boxes of proper dimensions to fit over the valve bonnets and to extend to such elevation at or slightly above the finished street grade or ground line, as approved by the Town. Tops shall be complete with covers marked "water" and shall be adjustable. Valve boxes shall be set vertical and concentric with the valve stem.

Any valve box which has so moved from its original position as to prevent the application of the valve key shall be satisfactorily reset by the developer at his own expense. A reinforced concrete pad of the dimensions, 3'-0" x 3'0" x 6", shall be poured around all valve boxes that are outside the pavement section, unless otherwise directed by the Town.

- h. Fire hydrants shall be placed to conform with the requirements of the State Board of Insurance and the Fire Prevention and Engineering Bureau of Texas. Each hydrant shall be set upon a slab of stone or concrete not less than four inches (4") thick and not less than one (1) square foot of surface area. Where solid rock exists in the bottom of the trench and same is excavated to the proper depth to form a foundation for the hydrant, the slab of stone or concrete above specified may be omitted.

The hydrant shall be set perpendicular, and to the proper depth, and shall be carefully and substantially blocked against firm trench walls using Class 2,000 concrete.

- i. Fire hydrants shall be installed and operable prior to the erection of any building in which any combustible material is used as determined by the Fire Chief of the Town.
- j. Fire hydrants shall be spaced no farther than a three hundred foot (300') hose-lay in commercial and industrial zoned areas, and a three hundred foot (300') hose-lay in residential-zoned areas.

#### Section 7.6. Sanitary Sewers.

Sanitary sewer facilities shall be furnished and installed to adequately service the subdivision and shall conform to the Town's Sanitary Sewer Plan. The adequacy of the sewerage facilities provided by the subdivider shall be determined by the Town.

##### A. Materials

Sanitary sewer mains may be vitrified clay sewer pipe (extra strength), conforming to ASTM C700, latest revision, or cement-lined bituminous coated ductile iron pipe or polyethylene-lined ductile iron pipe.

As approved by the Town, sanitary sewer mains may also be constructed of polyvinyl chloride (PVC) pipe conforming to the specifications of ASTM

D 3034, SDR 35, or equal. Joints for the PVC pipe and fittings shall be compression rubber gasket joints. The bell shall consist of an integral wall section with factory installed ring securely locked in bell groove to provide positive seal under all installation conditions. Fittings and accessories shall be manufactured and furnished by the pipe supplier, or approved equal, and shall have bell and/or spigot configuration identical to that of the pipe.

Connections shall be made with a fabricated fitting. Field-glued connections are not allowed. When PVC pipe passes through a manhole wall, asbestos cement sleeves with a rubber ring joint shall be used to provide a positive water-tight connection.

The PVC pipe shall be placed on a four-inch (4") layer of crushed rock or rounded gravel bedding material. The trench shall be backfilled with a minimum of six inches (6") or sand on the sides and twelve inches (12") loose sand over the top of the pipe and consolidated to a minimum of 90 percent standard proctor density. This is basic - Class "B" embedment as defined by ASCE Manual No. 37 and AWWA C900-75 and ASTM D2321, with five percent (5%) maximum Mandrell Test to be performed. Final backfill is to conform to Section S.4.17. The Class "B" embedment material is further defined as follows:

1. 95% of Material Passing 3/4" Screen
2. 95% of Material Retained on No. 4 Screen

PVC pipe shall be encased in concrete. PVC pipe, vitrified clay pipe, and ductile iron pipe shall be embedded in four inches (4") of crushed stone and covered with one foot (1') of free-flowing sand.

B. Minimum Size Main

The minimum diameter of sewer mains shall be eight inches (8"). Six-inch (6") diameter sewer mains may be acceptable only for short distances (not to exceed 400 feet) and only in locations approved by the Town.

C. Pipe Joints

All vitrified clay sanitary sewer pipe joints shall be of the premolded type conforming to ASTM Designation C425.

D. Location

Wherever possible, sewers shall be located in the alleys or easements and shall be a minimum of five feet (5') to six and one-half feet (6-1/2') deep to the invert.

E. Alignment and Grades

All sewers shall be laid in straight alignment where possible with a uniform grade between the manholes. In those cases where horizontal curvature must be utilized to serve a particular area, the minimum radius of curvature shall be one hundred feet (100'). Grades and appurtenances of sanitary sewers shall conform to the requirements of the Texas Department of Health, and the following are the minimum slopes which should be provided for a velocity or at least 2.0 feet per second; however, slopes greater than these are desirable.

<u>Sanitary sewer - Diameter</u>	<u>Minimum Slope in Feet Per 100 Feet</u>
4-inch (service mains)	1.000
6-inch	0.500
8-inch	0.330
10-inch	0.250
12-inch	0.200
15-inch	0.150
18-inch	0.110
21-inch	0.090
24-inch	0.080
27-inch	0.060
30-inch	0.055
36-inch	0.045

F. Infiltration

Prior to the acceptance, the sanitary sewers shall be subject to leakage tests. The leakage outward or inward (exfiltration or infiltration) shall not exceed two hundred (200) gallons per inch of the pipe diameter per mile per twenty four (24) hours for any section or the system.

Other testing procedures (exfiltration, air, etc.) may be used subject to the approval of the Town.

G. Force Mains

All force mains shall be ductile cast iron pipe, minimum Class 50, with rubber gasket joint, and shall have a cement mortar lining, with a seal-cast of bituminous material or may have a polyethylene lining.

Force mains constructed of polyvinyl chloride (PVC) pipe, as required for water mains described in SECTION 8.5, Paragraph G., may be used where adequate provisions are made for the embedment of the pipe.

At design for average flows, a cleansing velocity of at least two feet (2') per second shall be maintained. Where necessary, automatic air relief valves shall be placed at high points in the force main to prevent air locking.

H. Manholes

Manholes shall be placed at points of change in alignment, grade, or size of sewer, the intersection of sewers, and the end of all sanitary sewer mains that will be extended at a later date.

Maximum manhole spacing for sewers with straight alignment and uniform grades should be determined so as to assure continuous operation based on available cleaning equipment. The maximum manhole spacing shall be as follows:

MINIMUM DESIGN STANDARDS

<u>Sewer Pipe Size</u>	<u>Manhole Diameters</u>	<u>Maximum Distance Between Manholes</u>
6"	4'-0"	400 feet
8"	4'-0"	600 feet
10"	4'-0"	800 feet
12"	4'-6"	900 feet
15"	4'-6"	1,000 feet
18"	5'-0"	1,100 feet
21"	5'-0"	1,200 feet
24"	5'-0"	1,300 feet
30"	6'-0"	1,500 feet
36"	6'-0"	1,500 feet

I. Cleanouts

Standard cleanouts shall be constructed at the ends of all sanitary sewers where no future extensions will ever be made to the main.

Section 7.7. Septic Systems.

- A. The minimum plat or lot size upon which a septic system may be installed is one (1) acre gross.
- B. Only one septic system shall be installed on a one (1) acre plot, with the exception that where a septic system now exists, and it is necessary for the landowner, for the construction or improvement of a road, street, or highway adjacent to said plot, to convey by Deed or grant by Easement by virtue of a voluntary act or eminent domain a portion of said plot to any governmental body or a subdivision thereof, including but not limited to a town, a city, the County or the State, for the purposes of construction or improving said road, street or highway, said septic system shall be allowed to remain on said tract even though said tract shall be less than one (1) acre area after said conveyance or grant.
- C. The minimum safe distances or the septic system shall be as follows:

MINIMUM SAFE DISTANCE IN FEET

<u>From</u>	<u>Septic Tank</u>	<u>Soil Absorption System</u>	<u>Case Iron Sewers</u>	<u>Vitrified Clay Pipe with Water-Tight Joints</u>
Water Wells Cisterns, and Pump Suction Pipes	50	150	10	50
Streams and Ponds	75	75		75
Foundation Walls of Structures	5	15		
Property Lines	30	30		

- D. For a multiple dwelling, such as a duplex, home or an apartment, a single septic system may serve up to a maximum of two (2) units of the dwelling.
- E. The septic system shall consist or not less than two (2) tanks of equal size. The tanks shall be of concrete construction or as specified by the Town of New Hope. The septic tank minimum liquid capacity shall be as follows:

SEPTIC TANK MINIMUM LIQUID CAPACITY

<u>Number of Bedrooms</u>	<u>Tank Capacity (gallons)</u>
2 or less	750
3	1,000
4	1,250
for each additional bedroom	250

(Ord. No. 74-20, Sec. 5, 1-7-75, amended 7-10-84.)

- F. A four-inch (4") diameter clay tile, concrete, polyvinyl chloride (PVC), or cast iron pipe is mandatory between the dwelling and the septic tank and between tanks in a multiple tank arrangement. All joints must be made leak tight. The leach (drain) field shall have trenching as specified below, with the minimum lengths as for a dwelling having two (2) bedrooms. In percolation tests are not performed, the drain field shall be made up of a minimum of two hundred and fifty feet (250') or lateral line; with an additional fifty feet (50') of lateral line for every bedroom over the count of two (2). (Ord. No. 74-20, Sec. 6 and 7, 1-7-75, amended 7-10-84.)

G. MINIMUM REQUIRED TRENCH PER BEDROOM

<u>Average Percolation Rate (minutes per inch)</u>	<u>Required Trench Bottom Area (square feet)</u>	<u>Total Trench Length (ft.) for Specified Trench Widths</u>			
		<u>18'</u>	<u>24'</u>	<u>30'</u>	<u>36'</u>
1	85	57	43	34	29
3	100	67	50	40	34
4	115	77	58	46	39
5	125	84	63	50	42
10	165	110	83	66	55
15	190	127	95	76	64
30	250	167	125	100	84
45	300	200	150	120	100
60	330	220	165	132	110

Over 60                      Unsuitable for soil absorption systems

- Notes: 1. A minimum sized installation should be designed on the basis of a two (2) bedroom house, i.e., double the minimum area required as given in SECTION 7.7.
2. SECTION 7.7 provides for the normal household appliances including automatic sequence washer, mechanical garbage grinder and dishwasher.

- H. The lateral line shall be standard four-inch (4") diameter clay, polyvinyl chloride (PVC), or concrete pipe made and designed exclusively for lateral line.
- I. General Constructions Procedures shall include:
1. The septic tank(s) shall be set on hard level ground with the inlets and outlets as shown in Figure 1. The tank should be backfilled and the soil tamped up to the level of the outlets before any connections are made. Backfilling shall be by hand with the dirt containing no rocks or stones larger than three inches (3") diameter. For two (2) septic tanks in a sewer, the first compactment should be two (2) to three (3) times larger than the second compactment as shown in Figure 1A.
  2. The entire leach (drain) field shall be essentially level; with a maximum slope away from the septic tanks being one inch (1:) per ten feet (10') of line. A typical layout for a level drain field is shown in Figure 2.
  3. The lateral line pipe shall be placed as shown in Figure 5.
  4. A layer of impervious material shall be placed over the gravel (stone) cover to assure that the fill dirt does not enter the voids.
  5. Percolation tests shall be performed, and they must be conducted in accordance with Appendix "A" of "A" Guide to the Disposal of Household Sewage." The percolation tests must be witnessed by an authorized official of the Town of New Hope.
  6. At the terminal point of a section of lateral line there shall be a minimum of thirty feet (30') in the axial direction, thus reducing the possibility of seepage on sloped terrain.
  7. Absorption Field Construction - all parts of the trench or bed bottom shall be at the same elevation. Trenches should be constructed as shallow as possible with a minimum depth of eighteen inches (18") and a maximum depth of thirty-six inches (36"). For trench depths greater than twenty-four inches (24"), sand should be used to fill the trench up to the topsoil cover as is shown in Figure 4. The trench width should not exceed thirty inches (30") and narrow trenches (12 to 18 inches) are recommended. Although trench length is based on bottom area only, sidewall area is important since much of the wastewater is absorbed through the sidewalls and is evapo-

transpired. Minimum recommended spacing between adjacent edges of parallel trenches is approximately five feet (5'). Liquid from the septic tank is conducted to the absorption system via a watertight line similar to the house sewer. The liquid is distributed uniformly through the gravel-filled trenches by the use of a perforated plastic pipe or equivalent pipe materials. It is important that the distribution piping be laid level in the trenches, with a minimum of six inches (6") gravel depth of approximately twelve inches (12") would be required. The trench media may be clean graded gravel, broken vitrified brick, washed rock, crushed stone or similar aggregate and may range in size from 1.5 inches to 2.5 inches. Oyster shell, other types of shell and soft limestone are not recommended for trench media because cementitious properties of this type of material often result in early trench failure.

J. Prior to approval by the Town of New Hope, the septic tank system must be reviewed by an authorized official or duly authorized representative of the Town of New Hope. The Town Secretary must be notified seventy-two (72) hours in advance of the requested review. For review, the tanks, lead-in pipe and lateral lines must be installed but left exposed. All stages of the backfilling operation must be done with the reviewer present. The reviewer reserves the prerogative of being present for the entire backfilling operation, and may authorize its completion without his presence.

K. Commercial Septic Tanks

<u>1. Type of Facility</u>	<u>Capacity in Gallons</u>
Factory - Gallons per shift per person (exclusive of Industrial Waste)	20 per person per shift
Office Buildings	15 per person per day
Restaurants	15 per person per day
Stores (Total per day washroom)	400
Motels and Hotels	60 per person per day
Hospitals	200 per person per day
Institutions Other Than Hospitals (churches)	15 per person per day

2. Selection of Septic Tank Capacity

The net volume or effective capacity below the flow line of a septic tank that flows up to 500 gallons per day should be at least 750 gallons. For flows between 500 gallons and 1,500 gallons per day, the capacity of the tank should be equal to approximately 2 days sewage flow. With flows greater than 1,500 gallons per day, the minimum effective tank capacity should equal 1,125 gallons, plus 75% of the daily sewage flow or:

$$V = 1,125 + 0.75 Q$$

Where Q is average daily flow in gallons per day and V is the tank volume in gallons. For daily flow over 5,000 gallons per day, a different system should be considered.

3. Construction Specifications

Tank and trench construction and installation shall be the same as residential (SECTION 12-7.7 f and g). Drain lines as specified in SECTION 10-57 shall be a minimum of 250 feet of four-inch (4") diameter clay tile, concrete, polyvinyl chloride (PVC), or cast iron, is mandatory. Between the dwelling and the septic tank and between tanks in a multiple tank arrangement, a solid four-inch (4") diameter clay tile, concrete, polyvinyl chloride, or cast iron pipe is mandatory.

L. Alternative Domestic Septic System

1. Prior Approval Required

As an alternative to the domestic septic system described in SECTION 7.7 a through j, a disposal method identified as Pressurized Subsurface Effluent Dosing (PSED) may be used, if prior approval is obtained from the Town.

2. Description of the PSED Process

The PSED process consists of pumping treated effluent through small diameter perforated pipe into an enclosed (covered) trench. The effluent is either absorbed into the surrounding soil or rises to the surface and is dissipated to the atmosphere by evapotranspiration. A low pressure pump is utilized for this process with controls provided to turn the pump on and off and for an alarm in case of system malfunction. Dosing is accomplished by pumping the effluent from a separate compartment (pump well) and establishing a fixed

quantity of effluent to be pumped when the pump is activated. A positive pressure pump is required along with some method to control the pressure in the drainfield. Off-on switches and alarm switches are also required to control the pump. In most cases the pumping system is preceded by some type of aerobic treatment unit which contains a mechanical aerator.

3. Pipe Specifications

The perforated pipe used to distribute the effluent is constructed of polyvinyl chloride (PVC), polyethylene, or similar materials and ranges in diameter from one to two inches (1" - 2"). One-eighth inch (1/8") diameter holes are drilled through the pipe in line on approximately three inch (3") centers. Standard tees, elbows and other fittings are used to construct a gridded distribution system.

4. Trench Construction and Sizing

Trenches are excavated to a depth which varies from eighteen inches (18") to thirty inches (30") depending on soil conditions (See Figures 8 and 9). In very tight clay soils the trenches are shallow (18 inches), while deep trenches (30 inches) are used in sandy soils. Trench width is not important. However, trench widths are usually held to a minimum of six inches (6") to minimize excavated material. The pipe is placed in the trench with the perforations towards the trench bottom. It is very important that the overall drainfield location have all of the trench bottom level and on the same elevation for equal effluent distribution. Where rock is used to reduce the number of linear feet of pipe, refer back to the septic tank requirement for leach (drain) field.

M. Waste Treatment Size

1. No landfill facility or wastewater treatment plant with capacity in excess of twenty-five thousand (25,000) gallons per day used for the treatment and/or storage of noxious matter, toxic materials or any other form of liquid or solid waste material from any source shall be permitted within the corporate limits of the Town of New Hope.
2. No feeder trunk lines, lift stations, pumps stations or any other appurtenances or fixture which are to be used in connection with a wastewater treatment plant not located within the corporate limits of the Town of New Hope, shall be located within the corporate limits of the Town or New Hope unless a special use permit shall be obtained from the Town Council.

Section 7.8. Utility Services.

- A. All services for utilities shall be made available for each lot in such a manner so as to eliminate the necessity for disturbing the street and the alley pavement, curb, gutter, sidewalks, and drainage structures when connections are made.
- B. The subdivider shall provide separate service lines for water and sanitary sewerage to each lot or point of metering.
- C. All water services shall be a minimum of three-fourths inch (3/4"). Double services are required on every other lot line with a corporation at the main, 1" Type K copper, curb stop, u-branch, and two (2) angle stops, all of which are brass and accepted by the Town. The meters shall be located at least two feet (2') outside or curb and set to where, when meter is set, the top of the meter is only eight inches (8") from below final grade level and centered in a box acceptable by the Town.  
  
Where single services are necessary, they shall be three-quarter inch (3/4") copper to the center of the lot.
- D. Sanitary sewer service lines shall have a minimum diameter of four inches (4"), shall meet the same requirements for sanitary sewers described above, shall be constructed from the main to the lot property line using wyes and necessary bends, and shall have a minimum cover at the property line of four feet (4'), where possible. All sewer locations shall be ten feet (10') downstream from the center of each lot.
- E. The subdivider shall place a suitable marker at the point where said service lines are stubbed out so that these lines can be easily located for connection by the Town. Suitable markers shall be "W" for water and "S" for sewer stamped in top of curb or edge of pavement if no curb is constructed. Letters shall have a minimum height of two inches (2") and a minimum width of two inches (2").
- F. The subdivider shall make arrangements with all other appropriate utility companies for the extension of their respective utility lines and service to and within the addition and for any costs or refunds of such cost.
- G. All electrical services and transmission lines shall be underground unless otherwise approved by the Town.
- H. All utility companies will notify the Town before digging, boring, drilling, etc.

**Section 7.9. Street Lighting.**

Street lighting shall conform to the latest edition of the Illuminating Engineering Society Handbook. Round tapered standards with bracket arms shall be used and lighting levels, as recommended, shall be provided for very light traffic in residential areas, medium traffic on collector streets, and heavy traffic on thoroughfares. In no instance shall the spacing between street lights exceed four hundred feet (400'). The use of sodium vapor lights for street and parking lot illumination shall not be allowed in the Town or New Hope. Cost of installation of street lighting shall be borne by the subdivider.

**Section 7.10. Record Drawings (As-Built Plans).**

- A. Within thirty (30) days of acceptance of the subdivision, the engineer for the developer shall submit to the Town a complete set of drawings of the paving, drainage, water, and sanitary sewer improvements showing all changes made in the plans during construction and containing on each sheet an "Record-Drawing" stamp bearing the signature of the engineer and the date. In addition, three reproducible drawings of the utility plan sheets, containing the Record-Drawing information, shall be submitted to the Town.
- B. No final acceptance of the subdivision will be made by the Town until this requirement has been made to the satisfaction of the Town. It shall be the responsibility of the developer to furnish copies of the record-drawing plans to the appropriate State agencies.

**ARTICLE VIII. FILING FEES AND CHARGES**

**Section 8.1. Procedure.**

Fees and charges shall be paid to the Town when any plat is tendered to the Planning and Zoning Commission or any other authorized board or agency of the Town. Each of the fees and charges shall be paid in advance, and no action of the Planning and Zoning Commission or any other board or agency shall be valid until the fee or fees shall have been paid to the officer designated therein.

**Section 8.2. Fee Structure.**

The Town shall calculate the basic fees and charges for plat review.

- A. Fees shall be charged on all plats, regardless of the action taken by the Planning and Zoning Commission and whether the plat is approved or denied by the Town Council.
- B. If the amount deposited is less than the actual cost of reviewing and processing the plat, that balance shall be collected before final approval of the plat.

**ARTICLE IX. MAINTENANCE**

The subdivider shall furnish a good and sufficient maintenance bond in the amount of ten percent (10%) of the total cost or contract price of each job, with a reputable and solvent corporate surety, in favor of the Town, to indemnify the Town against any repairs which may become necessary to any part of the construction work performed in connection with the subdivision, arising from defective workmanship or materials used therein, for a full period of two (2) years from the date of final acceptance of the entire project. Final acceptance will be withheld until said maintenance bond is furnished to the Town. An example of a maintenance bond is shown in the Appendix (Exhibit B).

**ARTICLE X. EXTENSION TO EXTRATERRITORIAL JURISDICTION.**

**Section 10.1. Extension.**

The Subdivision regulation Ordinance of the Town of New Hope, Texas, as it now exists or may hereafter be amended, is hereby extended to all of the area lying within the extraterritorial jurisdiction of the Town of New Hope, Texas, and the rules and regulations within this Chapter governing plats and subdivision of land shall be applicable to such area within said extraterritorial jurisdiction from and after the effective date of the adoption of this Chapter regulating subdivisions.

**Section 10.2. Requirement.**

No person shall subdivide or plat any tract of land within the extra-territorial jurisdiction of the Town of New Hope, Texas, except in conformity with the provisions of the Subdivision Regulations contained in this Chapter.

## ARTICLE XI. OTHER REQUIREMENTS

### Section 11.1. Sight Barrier Fence

Commercial and industrial areas shall be separated from residential areas by the erection of a sight barrier fence minimum of six feet (6') in height constructed of materials to be determined by the Town.

### Section 11.2. Inspections

- A. A letter of acceptance is required from the Town Inspector before any job is complete.
- B. No acceptance will be given on any work covered before the Town Inspector has seen it.
- C. A minimum of a four-hour time allotment must given before the Town Inspector is expected at the job site. Any work or improvements covered before inspections will be uncovered.

### Section 11.3. Permits.

Any developer, contractor, builder, etc. must obtain a permit from the Town prior to the commencement of any construction. This includes such improvement as grading, street construction, removal of existing structures, utility installation, etc.

### Section 11.4. Changes and Variations.

The rules and regulations in this Chapter are the standard requirement of the Town. A variance or waiver of any of these rules and regulations may be granted by the City Council, upon a showing that there are special circumstances or conditions affecting the property in question and that enforcement of the provisions of this Chapter will work a hardship on the applicant as defined by those portions of the Town Ordinances governing the Board of Adjustments, and that such variance or waiver, if granted, will not be materially detrimental to the public welfare or injurious to other property rights in the vicinity. Preview of variances on waivers shall be reviewed by Planning and Zoning prior to being submitted to the Town Council.

## ARTICLE XII. PENALTY

### Section 12.1. Penalty.

Any person, firm or corporation who shall violate any of the provisions of this Chapter or who shall fail to comply with any provision hereof shall be guilty of a misdemeanor and, upon conviction, shall be subject to a fine not to exceed two thousand dollars (\$2,000), and each day that such violation continues shall constitute a separate offense and shall be punishable, accordingly.