DESIGN GUIDELINES

FOR

SUBDIVISION IMPROVEMENTS

IN

WHITEHOUSE, TEXAS

AND

EXTRA TERRITORIAL JURISDICTION

January 27, 2004

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IN
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CHAPTER ONE

GENERAL INFORMATION

I. Purpose:

The purpose of these guidelines is to inform Engineers, Planners and others concerned with subdivision design, of the basic procedures and requirements for construction plans for public facilities in subdivisions. These requirements are for use as guidelines **only**, and are not to be construed as a waiver by the City of Whitehouse of the right to require a more stringent or lenient design as conditions warrant.

II. Designs:

All construction plans for subdivision improvements are to be prepared under the direction and supervision of a qualified Texas Registered Professional Engineer and such plans shall bear the seal and signature of that engineer.

III. Construction Plans:

The following chapters outline the detailed requirements for the preparation of the construction plans for water, sanitary sewer, paving and drainage. These various plans may be combined into one complete set, as long as the clarity and usefulness of the drawings is not diminished.

A. **Submittal:** Two complete sets of construction plans and specifications shall be submitted to the City Engineer, or designee, when the final plat is submitted to the City for Planning and Zoning Commission consideration. (References to "City Engineer" in these Design Guidelines shall mean City's consulting engineer).

B. **Content:** Completed plans shall include the following sheets:

1. **Title sheet** showing names of subdivision, developer, engineer, City Secretary, Mayor, date, location map and any other pertinent information. It should also provide a space for signature of approval from the Mayor.

2. **Final plat** as submitted and approved.

3. **Overall water and sanitary sewer layout sheet** showing street layout, lots and lot dimensions, curve data, and any other pertinent information necessary for surveying all lots and streets. This may be a modified print of the subdivision final plat.

4. **Drainage area map** and drainage computation sheet showing contours at two foot intervals for the entire drainage basin of all structures planned for the subdivision and flood plains shown on the plat. Where two-foot contour intervals are not available, five-foot contour intervals shall be used. See Chapter Three Paving and Drainage for further details.

5. **Plan-profile sheets** showing all improvements in accordance with Chapter Two and Three.

6. **Detail sheets** for special construction and City of Whitehouse standard detail sheets.

C. **Approval:** Approval of the construction plans by the City Engineer, or designee, and Mayor is a prerequisite for final plat approval by the City Council.

D. **Approved Construction Plans:** Prior to commencing any construction, prints of the approved subdivision construction plans shall be distributed as set out in Chapters Two and Three.

IV. Contractor Procurement:

The City of Whitehouse acts as the contracting agent on water and sanitary sewer improvements. Contracts are awarded on a competitive sealed bid basis using the finances and construction plans submitted by the developer. The developer may request, in writing, to privately contract improvements and construct them in accordance with City of Whitehouse Water and Sanitary Sewer Specifications. For paving and drainage improvements, however, the developer shall secure the contractors by whatever means (sealed bids, price quotes, force account, etc.) that may be deemed appropriate, and the City of Whitehouse is not a party to the contract. When the City of Whitehouse is to participate in the cost of the improvements, in accordance with the City's cost sharing policy, and the City's portion of the cost is thirty percent (30%) of the total costs, or greater, the contractor must be secured by competitive sealed bids.

V. Inspection:

An inspector for the City of Whitehouse will inspect all construction of the improvements described herein. No work of any nature shall begin without authorization of the inspector. The contractor shall cooperate

with the inspector in coordinating construction and inspections, and shall notify the inspector so that he may be present to inspect construction. Failure to notify the inspector properly may result in the City of Whitehouse not accepting that work. The contractor would then be required to remove and reconstruct the improvements. The inspector shall not have the authority to approve defective work and his acceptance of improvements will not constitute any waiver of the contractor's responsibility in adhering to the construction plans and specifications, nor the designing engineer's responsibility for the inspection of the construction of his design.

CHAPTER TWO

PAVING AND DRAINAGE IMPROVEMENTS

I. General:

The purpose of these guidelines is to guide the engineer in design and preparation of plans and specifications for the construction of public paving and drainage improvements. All paving and drainage improvements shall be designed and constructed in accordance with standard details of the City of Whitehouse. Drainage facilities shall be designed using the "Storm Drainage Design Standards" of the City of Whitehouse and all subsequent amendments. Materials and construction methods for paving and drainage work (technical specifications) shall conform to "Texas Department of Transportation, 1993 Standard Specifications for Construction of Highways, Streets and Bridges", or successor, except where specifically superseded in this publication. Where any questions arise as to the interpretation of the standards of design, the decision of the City Engineer will be final.

II. Roadway Design:

A. Roadway Pavement Section Design: The City of Whitehouse does not have a typical or standard pavement section, therefore, this section presents the method for the thickness design of roadway pavements. It contains the design requirements for various street widths and traffic conditions, various subgrade support soils, and various types of pavement materials. Pavement design options are based on a combination of the above variables.

Step 1 - Determine the structural support of the roadway's existing subgrade. The subgrade strength is defined by having a California Bearing Ratio Test (CBR) performed in accordance with ASTM Method D 1883-73 (Standard Test Method for Bearing Ratio of Laboratory - Compacted Soils) by a geotechnical and construction materials testing lab.

Location of borings to obtain soil samples are to be placed along the proposed roadway to provide a representative view of the existing subgrade. Laboratory tests are to be performed on these representative soil samples to determine natural moisture content, liquid and plastic limits, and percent passing the No. 200 sieve. These tests are to be performed in accordance with ASTM Methods D 2216, D 4318, and D 422, respectively. Additional CBR tests are to be performed where above lab tests on soil samples of the existing subgrade reveal variations in the subgrade soil according to the "Unified Soil Classification". Unified Soil Classifications are to be determined using procedures in accordance

with ASTM Method D 2487. Additional CBR tests are to be performed on soil samples where roadway grades produce cuts into varying subgrade soils.

The existing subgrade shall always be able to provide a stable working platform when the soil is compacted to a density of 95% of standard proctor at optimum moisture content according to ASTM Method D 698. All organic and unstable material is to be removed during construction and replaced with select fill.

Step 2 – Identify the class of the street to be built. Street classifications are determined by the following attributes: Master Street Plan designation, Zoning, existing and future traffic volumes, and street width. (See Table II-A-1) Choose the street type, which matches the design roadway's attributes. If a design roadway's attributes fall between street classes, for example, a street that has both residential and commercial zoning, choose the street class which produces the most stringent pavement design.

TABLE II – A – 1

STREET CLASSIFICATIONS

Class	Zoning	Width (B-B)	Maximum Avg. vehicle Per Day 1	Percent Trucks 2	Avg. Gross Weight (Lbs) 3	Single Axle Load Limit (Lbs)
Cul-De-Sac	Residential	32'	500	2	20000	20000
Standard	Residential	32'	4800	5	25000	20000
Collector	Residential	40'	9600	5	30000	20000
Collector	Commercial	40'	11200	15	30000	20000
Collector	Industrial	40'	9600	20	30000	20000
Arterial	All	64-88'	24300	15	30000	20000

1. These values were developed from the Texas State Department of Highways and Public Transportation 1985 Highway Capacity Manual as shown in the City of Tyler Subdivision Design Guidelines.
2. The Asphalt Institute, U. S. Federal Highway Administration
3. The Asphalt Institute, U. S. Federal Highway Administration

Step 3 – Determine the total thickness of the pavement section for each type of pavement design. Three pavement design tables are provided, (see tables II-A-2, II-A-3 & II-A-4); one for flexible base pavement, one for full-depth hot mix asphaltic concrete pavement, and one for concrete pavement. Each design table is divided into street classification columns and subgrade CBR% rows. Using the street class identified in Step 2, follow this column down until it intersects the subgrade CBR% row determined in Step 1. This number represents the total thickness of pavement section, in inches, to be used.

Step 4 – Determine the thickness of base. The minimum surface thickness is found at the bottom of each street class column. To obtain the thickness of base, subtract the surface thickness from the total thickness of the pavement section. On roadways that have an existing subgrade CBR% greater than 12, step four often provides the most economical design and the design process could be stopped, (see Example Problem II-A-1), however, for roadways that have subgrade CBR% less than 12, the design process should continue to provide an economical design.

Step 5 – Select a suitable subbase material if the process is continued. Subbase material can be the existing subgrade treated with lime or cement, or a select fill material, such as iron ore topsoil. The subbase material is sampled and the subbase strength is defined by having a CBR test performed.

Step 6 – Determine the new thickness of base and surfacing. Taking into account the subbase CBR% value and using the pavement design table again, follow the same street class column down until it intersects the subbase CBR% determined in Step 5. This number represents the total thickness, in inches, of base and surfacing. The base thickness is found by subtracting the surface thickness from the total thickness of base and surfacing.

Step 7 – Determine the thickness of the subbase material selected in Step 5. This is found by subtracting the total thickness of base and surfacing in Step 6 from the total thickness of the pavement section in Step 3. However, the minimum thickness of a subbase material is six inches.

Step 8 – Determine the overall pavement section design. Add the surface thickness and base thickness found in Step 6 to the subbase thickness found in Step 7. (See Example Problem II-A-2)

To determine the most economical and efficient roadway pavement design, the above process should be performed using each pavement design table, varying the subbase materials, and then applying current construction costs.

Step 9 – Design submittal. Submit on the forms provided (see form II-A-9) the roadway pavement section designs performed and the roadway pavement design recommended to the City Engineer for his approval. Also submit the results of the CBR test performed by a geotechnical and construction materials testing lab.

TABLE II – A – 2

FLEXIBLE BASE PAVEMENT DESIGN

DESIGN PERIOD = 20 YEARS

TOTAL PAVEMENT SECTION					
SUBGRADE OR SUBBASE CBR %	RESIDENTIAL 32' B–B	COLLECTOR 40' B–B Resid.	COLLECTOR 40' B–B Comm.	COLLECTOR 40' B–B Indust.	ARTERIAL 60' B–B
	Inches	Inches	Inches	Inches	Inches
2	32	35	36.5	38	39
3	24	27.5	29	30	31
4	21	23	24	24.5	25
5	18	19.5	20.5	21	21.5
6	16	17.5	18	18.5	19
7	14	16	16.5	17	17.5
8	13	14.5	15	15.5	16
9	12	13.5	14	14.5	15
10	11	12.5	13	13	13.5
12	9.5	10.5	11	11.5	12
15	8	9	9.5	10	10
20	7.5	8	9	9.5	10
25	7.5	8	9	9.5	10
MINIMUM SURFACE & BASE SECTION					
HMAC	2	2	2	2.5	3
BASE	5.5	6	7	7	7
MINIMUM STABILIZED SUBBASE SECTION					
	6	6	6	6	6
Texas State Department of Highways & Public Transportation "1982 Standard Specifications For Construction of Highways, Streets And Bridges" Items 248 & 249 shall govern except California Bearing Ratio Tests will replace Triaxial Classes and the maximum PI=9. The base shall be compacted to a density of 95% of modified proctor at optimum moisture content according to ASTM Method D 1557.					
Grade	1, 2, 3	1, 2, 3	1, 2	1, 2	1, 2
Minimum CBR% of Base	40	60	70	70	80

TABLE II – A – 3

FULL DEPTH HMAC PAVEMENT DESIGN

DESIGN PERIOD = 20 YEARS

TOTAL PAVEMENT SECTION					
SUBGRADE OR SUBBASE CBR %	RESIDENTIAL 32' B-B	COLLECTOR 40' B-B Resid.	COLLECTOR 40' B-B Comm.	COLLECTOR 40' B-B Indust.	ARTERIAL 64' B-B
	Inches	Inches	Inches	Inches	Inches
2	12.5	14	15.5	16	16.5
3	10.5	12	13.5	13.5	14
4	9.5	10.5	12	12	12.5
5	8.5	9.5	11	11	11.5
6	8	9	10	10	10.5
7	7.5	8.5	9.5	9.5	10
8	7.5	8	9	9	9.5
9	7	7.5	8.5	8.5	9
10	6.5	7.5	8	8.5	9
12	6	7	7.5	8	8
15	5.5	6.5	7	7.5	7.5
20	5.5	6	7	7	7
25	5.5	6	6.5	7	7
MINIMUM SURFACE & BASE SECTION					
TYPE"D"	1.5	2	2	2.5	3
TYPE"B"	4	4	4.5	4.5	4
MINIMUM STABILIZED SUBBASE SECTION					
	6	6	6	6	6

Hot Mix Asphaltic Concrete Specifications:
Texas State Department of Highways & Public Transportation "1982 Standard Specifications For Construction of Highways, Streets, And Bridges" Item 340 with coarse aggregate being crushed so that a minimum of 50% of particles retained on # 4 sieve shall have more than one crushed face when tested in accordance with Test Method Tex-413 A (Particle Count)

TABLE II – A – 4

CONCRETE PAVEMENT DESIGN

DESIGN PERIOD = 35 YEARS

TOTAL PAVEMENT SECTION						
SUBGRADE OR SUBBASE CBR %	RESIDENTIAL 32' B-B		COLLECTOR 40' B-B Resid.	COLLECTOR 40' B-B Comm.	COLLECTOR 40' B-B Indust.	ARTERIAL 64' B-B
	Cul-De-Sac	Stand-ard				
	Inches	Inches	Inches	Inches	Inches	Inches
2	7	8	9	10	11	11
3	6	7	8	9	10	10
4	6	7	8	9	10	10
5	6	6	7	8	9	9
6	6	6	7	8	9	9
7	6	6	7	8	9	9
8	6	6	7	8	9	9
9	6	6	7	8	9	9
10	5	6	7	8	8	8
12	5	6	6	7	8	8
15	5	6	6	7	7	7
20	5	5	6	7	7	7
25	5	5	6	6	7	7
MINIMUM STABILIZED SUBBASE SECTION						
	6	6	6	6	6	6

Concrete Specifications:

Texas State Department of Highways & Public Transportation "1982 Standard Specifications For Construction of Highways, Streets And Bridges", Item 360 with a minimum compression strength of 4000 PSI at 28 days (5 sacks of cement per cubic yard) with #3 rebar on 18" c-c each way.

EXAMPLE PROBLEM II - A - 1

Required: Determine a pavement section for a collector street in a commercial area.

Solution A: FLEXIBLE BASE PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 - From Table II - A - 1, the street classification was determined to be a 40' B-B commercial street.

Step 3 - From Table II - A - 2, "Flexible Base Pavement Design", the total thickness of the pavement section was determined to be 11".

Step 4 - The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 11" - 2" = 9". The design process could stop here with an overall pavement section design of 2" HMAC Surface on 9" Flexible Base. However, a treated subgrade may produce a more economical design.

Step 5 - The existing subgrade is treated with lime, (say 6%) and testing shows the new subbase material has a CBR of 20%.

Step 6 - From Table II - A - 2, the new total thickness of base and surfacing is 9". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface;
9" - 2" = 7".

Step 7 - The subbase thickness is found by subtracting Step 6 from Step 3; 11" - 9" = 2". However, minimum subbase thickness is 6".

Step 8 - The overall pavement section design is found by adding Step 6 to Step 7; 2" HMAC Surface on 7" Flexible Base on 6" Lime Treated Subbase.

Solution B: FULL DEPTH HMAC PAVEMENT SECTION

Step 1 - From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 - From Table II - A - 1, the street classification was determined to be a 40' B-B commercial street.

Step 3 – From Table II – A – 3, "Full Depth HMAC Pavement Design", the total thickness of the pavement section was determined to be 7.5".

Step 4 – The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 7.5" – 2" = 5.5". The design process could stop here with an overall pavement section design of 2" HMAC Surface on 5.5" HMAC Base.

Solution C: CONCRETE PAVEMENT SECTION

Step 1 – From testing the roadway's existing subgrade, a CBR of 12% was obtained.

Step 2 – From Table II – A – 1, the street classification was determined to be a 40' B–B commercial street.

Step 3 – From Table II – A – 4, "Concrete Pavement Design", the total thickness of the pavement section was determined to be 7". The design process could stop here with an overall pavement section design of 7" Concrete Pavement on untreated subgrade.

EXAMPLE PROBLEM II – A – 2

Required: Determine a pavement section for a local street in a residential subdivision.

Solution A: FLEXIBLE BASE PAVEMENT SECTION

Step 1 – From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 – From Table II – A – 1, the street classification was determined to be a 32' B–B residential street.

Step 3 – From Table II – A – 2, "Flexible Base Pavement Design", the total thickness of the pavement section was determined to be 24".

Step 4 – The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 24" – 2 = 22". A base thickness of 22" is excessive, and the design process should continue to find a more economical design.

Step 5 – The existing subgrade is treated with lime,(say 6%)

and testing shows the new subbase material has a CBR of 9%.

Step 6 – From Table II – A – 2, the new total thickness of base and surface is 12". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface; 12" – 2" = 10".

Step 7 – The subbase thickness is found by subtracting Step 6 from Step 3; 24" – 12" = 12".

Step 8 – The overall pavement section design is found by adding Step 6 to Step 7; 2" HMAC Surface on 10" Flexible Base on 12" Lime Treated Subbase.

Solution B: FULL DEPTH HMAC PAVEMENT SECTION:

Step 1 – From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 – From Table II – A – 1, the street classification was determined to be a 32' B–B residential street.

Step 3 – From Table II – A – 3, "Full Depth HMAC Pavement Design", the total thickness of the pavement section was determined to be 10.5".

Step 4 – The thickness of base without a subbase is found by subtracting the minimum surface from the total thickness; 10.5" – 1.5 = 9.0".

Step 5 – The existing subgrade is treated with lime,(say 6%) and testing shows the new subbase material has a CBR of 9%.

Step 6 – From Table II – A – 2, the new total thickness of base and surface is 7". The new thickness of base with a subbase is found by subtracting the minimum surface from the new total thickness of base and surface;
7" – 1.5" = 5.5".

Step 7 – The subbase thickness is found by subtracting Step 6 from Step 3; 10.5" – 7" = 3.5", however, minimum subbase thickness is 6".

Step 8 – The overall pavement section design is found by adding Step 6 to Step 7; 1.5" HMAC Surface on 5.5" Flexible Base on 6" Lime Treated Subbase.

Solution C: CONCRETE PAVEMENT DESIGN:

Step 1 – From testing the roadway's existing subgrade, a CBR of 3% was obtained.

Step 2 – From Table II – A – 1, the street classification was determined to be a 32' B–B residential street.

Step 3 – From Table II – A – 4, "Concrete Pavement Design", the total thickness of the pavement section was determined to be 7".

Step 4 – The design process could stop here with an overall pavement section design of 7" Concrete Pavement on untreated subgrade. However, a treated subgrade may produce a more economical design.

Step 5 – The existing subgrade is treated with lime,(say 6%) and testing shows the new subbase material has a CBR of 9%.

Step 6 – From Table II – A – 4, the new total thickness of pavement is 6".

Step 7 – The subbase thickness is found by subtracting Step 6 from Step 3; 7" – 6" = 1", however, minimum subbase thickness is 6".

Step 8 – The overall pavement section design is found by adding Step 6 to Step 7; 6" Concrete Pavement on 6" lime treated subbase.

FORM II – A – 9
CITY OF WHITEHOUSE
ROADWAY PAVEMENT SECTION DESIGN

SUBDIVISION/PROJECT NAME:_____

STREET NAME:_____

Step 1 **California Bearing Ratio Test (CBR) of Existing Subgrade**

Boring #	Station #	Offset Distance	Depth of Material Tested	CBR %

Step 2 **Street Classification:**_____

Step 3 **Total Thickness Of Pavement Section.**

Flexible Base (Table II-A-2)	Full Depth HMAC (II-A-3)	Concrete (II-A-4)

Step 4 **Thickness Of Base.**

		Flexible Base		Full Depth HMAC
Total thickness of Pavement Section (Step 3)				
Surface Thickness	(-)		(-)	
Base Thickness				

Step 5 Subbase Material. (If used)

	Flexible Base	Full Depth HMAC	Concrete
Type of Subbase Material			
CBR % of Subbase			

B. Width: Pavement widths shall conform to the requirements of the Master Street Plan, but shall in no case be less than the widths shown in the following table:

Type Street	Minimum Paving Width*
Residential	32'
Commercial, Industrial or Collector	40'
Arterial (4 lane)	64'
(6 lane)	88'
Alley (residential)	15'
(other than residential)	20'

* Dimensions are from back of curb to back of curb or edge of pavement to edge of pavement centered in right of way.

C. Grades: Street profile grades shall be set on top of curbs or set on centerline for streets with no curb and gutter. Profile grades shall not be less than 0.5 feet rise or fall in 100 feet. Profile grades shall not be greater than 12.0 feet rise or fall in 100 feet (12%) on local streets, and not greater than 9.0 feet rise or fall in 100 feet (9%) on collector streets, and not greater than 6.0 feet rise or fall in 100 feet (6%) on arterial streets. Grade changes exceeding one percent (1%) shall be made with vertical curves. To satisfy requirements of minimum sight distance, comfort and appearance, use the following criteria for minimum vertical curve length (L) in feet:

L = KA
K = Factor from table below
A = Algebraic difference of grades in percent.

Design Speed*	30	35	40	45	50	55	60	65
Minimum K Value:								
Crest Vertical Curve	30	40	60	80	110	150	190	230
Sag Vertical Curve**	40	50	60	70	90	100	120	130

*The design speed shall be established by the City Engineer.
**Length of sag vertical curve may be shortened by the City Engineer to reduce siltation.
Top of curb grades shall be set low enough below the adjacent land to facilitate proper drainage from the residential lot to the street.
Curb separation shall not exceed crown height except in situations of super elevated curves or divided roadways. Divided roadways shall have a straight cross slope downward from median to outside curb rather than a parabolic crown on each lane. Divided roadways shall not be designed for, unless approved by City Engineer.

D. **Street Alignment:** Street alignment design shall consider not only the best use of the land, but also traffic safety. The maximum degree of horizontal curvature for an arterial shall be 7.0 degrees. The maximum degree of curvature on a collector shall be 22.9 degrees (minimum radius shall be 250 feet). The horizontal curvature on commercial or residential streets shall be designed so as to eliminate sharp reverse curves that are hazardous. The minimum tangent length between reverse curves shall be 50 feet. All horizontal curve lengths, degree of curvature, curve super elevations and other elements of traffic safety must be approved by the City Engineer during the approval of the subdivision plans.

E. **INTERSECTIONS:** All intersections should intersect at an angle of 90 degrees. When not practical, the angle of intersection will not be less than 70 degrees.

When intersecting a street in a horizontal or vertical curve, adequate sight distance must be provided.

Curb returns at intersections on residential streets shall have a radius of 20 feet measured to the face of curb.

At the intersections of collectors & collectors, collectors & arterials, and arterials & arterials, the radius will be 30 feet measured to the face of curb, unless otherwise approved by the City Engineer. A larger radius may be required by the City Engineer to accommodate traffic movement.

F. **Curb and Gutter:** Concrete curb and gutter is required on all streets constructed within the City of Whitehouse and its

Extra Territorial Jurisdiction, except in subdivisions with all lots 2.0 acres and greater in size. All curb and gutter will be designed in accordance with City of Whitehouse "Standard Details".

G. **Concrete Headers:** Concrete headers shall be installed at the termination of all asphalt pavements, unless otherwise approved by the City Engineer.

H. **Concrete Valley Gutters:** Where water runoff conditions dictate, the City Engineer may require certain valley gutters crossing streets or intersections within the subdivision to be constructed of reinforced concrete to prevent asphalt pavement deterioration.

I. **Subsurface Drainage:** Ground water is prevalent in Whitehouse and its surrounding Extra Territorial Jurisdiction. The consulting engineer will design and provide for the construction of underdrain systems in the construction plans. Even if the consulting engineer provides no underdrain, the City Engineer may require the installation of underdrain.

J. **Erosion Control:** In the construction plans, the design engineer shall include plans for erosion control during construction and permanent erosion control.

III. Paving Plans:

A. Paving plans shall be prepared on nominal 24"x36" plan profile sheets, or plan sheets with separate profile sheets. Profiles shall have grid increments of less than one inch. Drafting medium, lettering, layout, etc., are all optional except to the extent required herein.

B. The plan shall be drawn to a scale of not more than fifty feet to the inch (1"=50') for new sheets or not more than 20 feet to the inch (1"=20') for the reconstruction of existing streets and shall include but not be limited to the following list:

1. Right of way, easements, and street pavement widths
2. Stationing of proposed street from left to right on sheet and stationing of intersecting streets.
3. Angles and stations of intersections
4. Street names
5. Horizontal curve data
6. Existing topographic features such as utility poles, fire hydrants, culverts, inlets, lakes, watercourses, etc.
7. North arrow
8. Graphic scale
9. Lot lines, lot numbers, subdivision lines and City limit

lines
10. Curb radii, and special curb grade points such as end of radius returns and mid-points and top of inlet, etc.
11. Underground utilities located as accurately as possible
12. Location of soil borings
13. Limits of significant cut or fill
14. Directional arrows showing direction of drainage in gutters
15. Crown transition in intersections
16. Special notes
17. Engineer's seal and signature

C. The profile shall be drawn to a scale to match the plan horizontally and not more than five feet to the inch (1"=5') vertically and shall include but not be limited to the following list:

1. Existing ground profiles along the centerline and each right of way line.

2. Proposed top of curb profile line and existing top of curb line where curb has previously been built. If the new street does not have curb and gutter, proposed top of pavement profile along centerline and flowline of ditches on both sides.

3. Vertical curve data including the curve length, vertical point of intersection station and elevation, high point or low point station and elevation. Percent grades shall be shown on all tangents.

4. Top of curb grades shall be shown at not more than 50 foot intervals in tangents and 25 foot intervals in vertical curves. The PC, PT and PI shall be shown in profile with station and elevation.

5. Benchmark (National Geodetic Survey Datum, formerly U.S. Coast and Geodetic Survey Datum) description and elevation on each sheet with temporary bench marks set at intervals of not more than 300 feet.

6. Proposed and/or existing storm sewer, sanitary sewer, water, electrical, gas and telephone lines.

IV. Drainage Design

A. The criteria for drainage design shall be "Storm Drainage Design Standards" prepared by Wisenbaker, Fix Consulting Engineers, September, 1974 for the City of Tyler except where superseded by these guidelines.

(1) Drainage facility needs caused by the development or use of property must be identified and provided for in appropriate stages of development. During the platting process, the flood hazard areas shall be identified and drainage easements dedicated to the public on the final plat. The objective of drainage planning and facilities is two-fold: (a) to protect the uses of the platted property and the safety of the citizens of Whitehouse who use the platted property in the future, and (b) to prevent development and usage of the platted property from adversely affecting others. The owners and developers of property have the duty to control: (a) rainfall runoff originating on the platted property; (b) the drainage systems flowing through the platted property; and © water courses along the boundaries of the platted property.

(2) Drainage improvements required for tracts impacted by drainage systems having a contributing watershed area of less than one square mile or which are upstream from the LIMIT OF DETAILED STUDY as shown on the "Flood Boundary Floodway Map of the City of Whitehouse, Texas and Smith County" dated February 13, 1979 prepared by the Federal Insurance Administration and subsequent map revisions thereto, shall be provided in accordance with these design guidelines. Water conveyances shall consist of reinforced concrete pipe culverts or reinforced concrete box culverts placed underground, or improved open channels. An improved open channel is one in which the channel bottom and sides are lined with reinforced portland cement concrete or other structurally sound material approved by the City Engineer to the depth that will convey the 100-year frequency flood.

These permanent improvements shall be constructed in drainage easements dedicated to the public. When the construction is approved by the City Engineer, the City of Whitehouse will assume maintenance of the portion of such improvements that are within the City limits of the City of Whitehouse. Exceptions to the minimum standards may be granted by the Planning & Zoning Commission on recommendation by the City Engineer when such improvements are not warranted.

(3) For drainage improvements required for a tract impacted by drainage systems having a contributing watershed area one square mile, or greater the following strategies for controlling drainage, erosion and flooding apply. A tract will be considered to be impacted when part of the property lies within the flood plain of a stream or watershed area one square mile or greater, or where the bed or banks of such a stream touches or crosses part of

the tract. One of the following strategies may be selected by the developer so long as the strategy can be demonstrated to function without adversely impacting property located either upstream or downstream from the subject tract.

(a) The stream may be left in its natural state with minor improvements and no development within its floodplain. Minor improvements include the removal of dead trees, discarded debris and obstructions that would hinder the conveyance of water. The entire floodplain shall be platted and dedicated to the City as a floodway easement. The City will maintain the easement in the same condition as provided, when the easement is within the City limits of the City of Whitehouse.

(b) The floodplain fringe may be reclaimed for use as long as the floodway is protected and the 100 year flood elevation is not raised more than one foot. This method of development may require erosion control to offset changes in the stream regimen caused by development of the property and drainage improvements in accordance with Section V, Paragraph 7, Environmental Considerations. The floodway will be platted as a floodway easement. The floodway easement will be maintained by the City of Whitehouse when it is within the City limits of the City of Whitehouse.

(c) The stream may be reconstructed or relocated to accommodate development. The new channel shall be sufficient to convey the 100 year flood. The design will include erosion control such as seeding, sodding, channel lining, or a combination of these. The new channel shall be platted in a floodway easement. The channel will be maintained by the City of Whitehouse if it is within the City limits of the City of Whitehouse.

B. All pipe used in the storm sewer system shall be reinforced concrete pipe and conform to ASTM C-76 unless otherwise approved by the City Engineer. Minimum pipe size shall be 18 inches inside diameter for storm sewer systems to be dedicated to and maintained by the City. All storm sewer pipe shall be placed in a drainage easement except where pipe is carrying storm water runoff solely from one property that likely will not be subdivided or where approved by City Engineer.

C. All inlets shall conform to City of Whitehouse standard details.

D. Proposed storm sewer systems may be connected into existing systems as long as the proposed combined discharge will not exceed the capacity of the existing system. Additional

drainage areas shall not be directed into a watershed from another watershed.

E. Storm sewers should discharge into natural streams or into other storm sewers. No new unimproved channels may be constructed to carry storm water runoff, although existing channels may be improved and realigned per Subdivision Ordinance.

F. Reinforced concrete bridges, box culverts, headwalls, wingwalls, piers and bents shall conform to Texas State Department of Highways and Public Transportation standard details for such structures. Headwalls or wingwalls are required on all culverts and on the discharge point of storm sewer pipe. Energy dissipating devices such as concrete or rock riprap, splash basins, baffles and other structures to minimize erosion shall be incorporated into design of storm drainage facilities.

G. Any development within a designated 100 year floodplain must be permitted through the City Engineer or designee. To develop property within a designated 100 year floodplain, the developer must submit documentation to the City Engineer that proves the development of the lot will not encroach into the 100 year floodway.

If channel modifications are to be done to recover land in the floodplain, the developer must submit documentation to the City Engineer to send to FEMA that proves the proposed modifications will revise the floodplain accordingly. The City Engineer will request a Conditional Letter of Map Revision (Conditional **LOMR**). This Conditional LOMR must be received prior to approval of channel modifications. Upon completion of channel modifications, documentation must be submitted to the City Engineer to send to FEMA showing that modifications have been completed and the City Engineer will request a LOMR which actually revises the floodplain maps.

V. Drainage Plans:

A. Drainage plans shall be prepared on nominal 22" x34" plan profile or plan with separate profile sheets. Profiles shall have grid increments of less than one inch. Drafting medium, lettering, layout, etc., are all optional except to the extent required herein.

B. An overall drainage area contour map with 2 foot contour intervals of the subdivision shall be shown divided into sub-basins for each structure or floodplain. Each sub-basin shall

be marked with an identifying number or letter, and the acreage. Run-off computations curb inlet design computations, and storm sewer design computations shall all be shown in a tabular format in the construction plans.

C. The plan shall be drawn to a scale of not more than fifty feet to the inch (1"=50') and shall include but not be limited to the following list:

1. Location of all proposed or existing inlets, pipe, culverts, manholes, headwalls and wingwalls.

2. Location of all channels and streams to be filled, improved, or used as discharge points for the system.

3. Curve data, angle points, or other survey data necessary to install the storm sewer facilities or to locate the facilities and easements after installation.

4. Location of all underground utilities or pipelines which might conflict with the storm sewer, culvert, or channel.

5. Typical cross sections for improved earthen or concrete lined channels.

6. North arrow, graphic scale, subdivision lines, lot lines, easement lines, street names.

7. Proposed street paving width, right of way width, or easement width.

8. Base line (centerline) showing stationing.

9. Special notes.

10. Minimum finished floor elevation for each lot within or adjacent to a 100 year floodplain or drainage easement.

D. The profile shall be drawn to a scale of not more than fifty feet to the inch (1"=50') horizontally and not more than five feet to the inch (1"=5') vertically. Drainage profiles shall include but not be limited to the following list:

1. Existing surface profile above centerline of storm sewer pipe, culverts, and existing high bank and flowline profiles for open drainage channels.

2. Proposed drainage structures with flowline (invert) elevation at not more than fifty foot intervals.

3. Proposed top of curb profile.

4. Elevations of pipelines or underground utility crossings.

5. Vertical curve data for flowline including the curve length and the vertical point of intersection station and elevation.

6. Benchmark (National Geodetic Survey Datum, formerly U.S. Coast and Geodetic Survey Datum) description and elevation.

7. Water surface profile for the "one hundred year flood" for open channels within the subdivision and hydraulic grade line for storm sewer pipe.

VI. CONSTRUCTION PLANS (PAVING AND DRAINAGE):

Following approval of final plat and the incorporation of changes required by the City Engineer, six complete sets of construction drawings shall be submitted to the City Engineer for signature prior to commencing construction.

VII. "RECORD" DRAWINGS:

The developer's engineer shall furnish to the City Engineer a reproducible set of construction plans for all improvements called for in this section at the time the six sets of construction plans are submitted. The developer’s engineer will correct plans to reflect all field changes so as to accurately depict the final installed improvements. Electronic copies of all “Record Drawings” shall be provided to the City by the developer.

REFERENCES

Reference For **Table II – A – 2**

1. National Crushed Stone Association's "Flexible Pavement Design Guide for Highways" April 1975
2. National Crushed Stone Association's "Design Guide For Streets Featuring Crushed Stone Bases" June 1975
3. U. S. Army Engineers' Manual TM 5-822-5" 1965
4. U. S. Department of the Navy, Naval Facilities Engineering Command's "Civil Engineering-Pavements" Design Manual 5.4 NAVFAC DM-5.4 October 1979 Revised September 1985.

Reference For **Table II – A – 3**

1. The Asphalt Institute's Manual Series No. 1 (MS-1) "Thickness Design – Full Depth Asphalt Pavement Structures For Highways And Streets" Revised Eighth Edition August 1970 & September 1981.

Reference For **Table II – A – 4**

1. Portland Cement Association's "Design Of Concrete Pavement For City Streets" ISl84P 1974
2. Portland Cement Association's "Thickness Design For Concrete Highways And Street Pavements" EB 109.01 P 1984
3. U. S. Department Of The Navy, Naval Facilities Engineering Command's "Civil Engineering-Pavements" Design Manual 5.4 NAVFAC DM-5.4 October 1979 Revised September 1985

CHAPTER THREE

WATER AND SANITARY SEWER IMPROVEMENTS

I. General:

All water and sewer lines constructed within the City of Whitehouse shall be designed and constructed in accordance with the most current guidelines as promulgated by the Texas Department of Health, the Texas Commission on Environmental Quality, Texas Insurance, American Water Works Association, United States Health Service, and the Environmental Protection Agency. The design and construction shall also comply with the requirements of the City of Whitehouse Standard Specifications. Where the standard specifications are in conflict with these criteria, the Standard Specifications shall govern. The design and construction shall also be in compliance with the most current City Master Plan and in agreement with the Whitehouse Water Utilities-Water and Sewer Service Codes and current policies of the City of Whitehouse.

II. Water Line Design:

A. Location: Water mains shall be constructed in a dedicated street, alley, or an easement to the City of Whitehouse which shall be filed in the public records. Water mains shall be located in the north one-third and west one-third of street rights of way except where otherwise approved by City Engineer.

(1) Minimum cover for 6 and 8 inch water pipe shall be 36 inches below finished subgrade.

(2) Water lines shall be laid higher in elevation than sewer lines, where possible.

B. Minimum Size: The minimum inside diameter size requirement for water lines is 6 inches. Exceptions may be granted in special circumstances such as cul-de-sacs, upon approval of the City Engineer or designee.

C. Looping: All lines shall be looped except, where lines will enter a future subdivision, then a dead end will be allowed. The maximum length of looped 6 inch water lines shall be 3,000 feet. The maximum length of unlooped 6 inch water lines shall be 1,500 feet. A standard fire hydrant shall be installed at any dead end line, except where other suitable means of flushing can be provided. The dead end line shall have a gate valve installed on the line and a minimum of one 18 foot joint of pipe past the valve. The end of the line shall be plugged

and blocked with concrete to prevent line and valve blow-off. Construction of water lines shall extend to the boundaries of the development.

D. **Design Criteria:** The water lines shall be designed to carry a minimum of 750 gallons per minute while maintaining a minimum of 20 pounds per square inch gauge pressure (psig) at any connection and a minimum of 35 pounds psig at all connections at a rate of 1.5 gallons per minute per connection. The City of Whitehouse's pressure plane datum is 600 feet above mean sea level. The maximum head loss allowable is 10 feet per thousand feet of pipe. In commercial areas, the minimum flow shall be 1,500 gallons per minute and in mercantile or industrial areas, 3,000 gallons per minute. Shopping centers with 10 acres or more shall be considered mercantile areas. Assuming a pipe flow coefficient of C=140, based on the William and Hazen Formula, at the maximum head loss, the available flows are shown in the following table:

Size of Inside Diameter of Pipe in Inches	Gallons Per Minute
6	380
8	780
10	1,400
12	2,260

E. **Soil Tests:** The soil corrosivity shall be determined in accordance with the procedures outlined in ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron-Pipe for Water and Other Liquids", Appendix A. The earth resistivity and soil analysis shall be performed in the line of the proposed water main and to a depth equal to the installed pipeline depth.

Locations of the earth resistivity and soil tests shall be placed along the proposed pipeline to provide a representative view of the existing subsurface conditions. A point accumulation of 10 or greater indicates corrosive soil conditions and pipeline corrosion protection shall be required.

Corrosive soil conditions in isolated areas of development shall require polyethylene encasement. Corrosive soil conditions in the general overall development may require the Engineer to recommend alternate materials for construction of water pipelines, subject to approval of the City Engineer.

Test results shall be correlated with Utilities Department personnel.

F. Fire Hydrants:

(1) Approved fire hydrants shall be provided at locations such that all areas of single-family residential development are located with in five hundred (500) feet hose line route to each building via public right-of-way. In areas other than single-family residential development the hose line route shall not be more than three hundred (300) feet via public right-of-way. In locating fire hydrants, preference shall be given to street intersections. A fire hydrant shall be located at each entry to a subdivision.

(2) Each fire hydrant shall be positively restrained.

(3) Fire hydrants shall be equipped with Pentagon operating nuts.

(4) Each fire hydrant shall have an individual 6 inch gate valve to allow the fire hydrant to be shut off for service.

G. Materials for Water Lines: The materials for water line construction shall comply with the City of Whitehouse Standard Specifications. Allowable materials for water lines are shown in the following list:

1. Ductile Iron Pipe
2. Concrete Cylinder Pipe (C 303)
3. PVC water pipe C-900.

H. Valves:

(1) Each branch line shall be valved.

(2) Main lines shall be valved at least every three blocks.

(3) The maximum distance between valves shall be 1500 feet.

(4) Valves shall be located in intersection where possible.

I. House Connections:

(1) A 1 inch copper tubing service line shall be installed at a point three feet behind curb at each lot.

(2) Each service line shall have a 1 inch corporation cock on the main line, and a 1 inch meter stop at the end of the

service.

(3) Each service line shall be permanently marked with a "W" on the curb where service line crosses curb and a ½ inch diameter by 3 foot steel rod driven at the meter stop, with 6 inches of the rod left exposed.

(4) Magnetic locator tape shall be installed directly above the water service pipe from the corporation to the meter stop.

J. Plans and Specifications:

(1) Preliminary Plan:

(a) The developer shall submit with the preliminary plat, a plan showing the proposed location and sizes of water lines, prepared, signed, and sealed by a Registered Professional Engineer. The plan shall include location of lots, minimum finished floor elevations, streets, water lines, sewer lines, valves, and fire hydrants along with the design calculations for the size of the lines. The preliminary plat should reflect the Master Plan for the total area to be developed.

(b) There shall be one copy of the preliminary plan showing the coverage of the area by fire hydrants. For residential areas, this preliminary plan shall have a circle scribed around each fire hydrant 500 foot radius. For commercial areas this preliminary plan shall have a circle scribed around each fire hydrant at a 300 foot radius.

(c) The preliminary plans will be on a scale of not more than one hundred feet to the inch (1" = 100').

(2) Construction Plans:

(a) The developer shall submit with the final plat, the proposed plans, specifications, and contract documents complete, prepared, signed and sealed by a Registered Professional Engineer. The City Engineer will review for approval the plans and specifications. After the review the developer shall include into the plans and specifications any additions or corrections required.

(b) The construction plans may be submitted by the City of Whitehouse to the Texas Commission on Environmental Quality for their review, following staff review. Generally, construction shall not begin until that

approval has been received.

(c) The construction plans shall include a location map showing location of proposed water lines, valves, and fire hydrants. The map may be on the same scale as the preliminary plan. The construction plans shall include plan and profile sheets showing the location of all water lines, valves, and fire hydrants.

1. Plan Section: The plan shall be prepared on 22" x 34" plan profile sheets or plan sheets with separate profile sheets. The plan section of the plan and profile shall show the streets and side streets, easements, lot lines, culverts, driveways (where possible), sewer lines, gas lines, power lines and poles, sewer lines, water lines, telephone lines and t.v. cable lines. The plan shall also indicate where house service lines are to be installed. The plan shall show all valves, fire hydrants and any branch line connections, and concrete blocking. Plan shall be drawn to scale of not more than fifty feet to the inch (1" = 50').

2. Profile Section: The profile shall be drawn to a scale of not more than fifty feet to the inch (1" = 50') horizontally and not more than five feet to the inch (1" = 5') vertically. The profile section shall show the grade of the water lines, the existing ground line, and the proposed ground line where it is different from the existing. All Bench Mark and profile elevations shall be tied to the National Geodetic Survey Datum (formerly The U. S. Coastal & Geodetic Survey Datum). Assumed datums will not be allowed. The profile shall show all storm sewers and sanitary sewers crossing the construction alignment of the proposed water line. The grades for water lines 12 inches diameter and larger shall be set and staked in the ground for construction by the developer's engineer and the contractor shall lay them as close as possible to the proposed grades. Grade stakes for water lines smaller than 12 inch diameter are not required, however, the engineer may include grades in the profile at his option.

Water lines shall not be laid to a grade less than 0.2 percent. A 1 inch corporation cock shall be installed at each low spot and each high spot in the water line on lines smaller than 12 inches. There shall be a temporary 1 inch copper tubing and 1 inch meter stop installed at each of these cocks for blowing off air and for testing the lines. After testing, these lines

shall be removed. A 6 inch diameter blow-off line is required at each low spot of lines 12 inches and larger and an adequately sized combination vacuum breaker, air release valve is required at each high point in lines 12 inches and larger. The construction plans shall also include a sheet showing standard valve, fire hydrants, and other pipe laying details. Each sheet must be reviewed, approved, signed, and sealed by a Registered Professional Engineer licensed to practice in Texas.

(3) "Record Drawings":

The developer's engineer shall prepare a set of "Record Drawings" based on the construction plans. The "Record Drawings" shall show the location of all valves, fire hydrants, and service connections, and the correct alignment and grade of lines as installed. All valves shall be located on the ground tied to at least two permanent land marks, i.e., fire hydrants, power poles, property lines, etc. The land marks shall be at least 90 degrees apart. The City Construction Inspector will assist the Engineer in procurement of information needed to develop the "Record Drawings". The developer shall provide the City Engineer one set of mylar film originals and one electronic copy of the "Record Drawings" within (30) thirty days of written final acceptance of the improvements.

K. <u>Contract Procurement:</u>

(1) The developer shall submit a minimum of ten sets of the revised plans and specifications and request that the City Engineer, or designee, set a bid date to receive bids on the proposed improvements. The developer shall also submit a "Notice To Bidders" for the City to publish.

(2) The City of Whitehouse will open the sealed bids prior to the next regularly scheduled City Council meeting and may, at its option, tabulate the bids or may request the developer's engineer to tabulate the bids.

(3) The developer may request the authority, in writing to the City Engineer and Mayor, to proceed with a private contract.

(4) The subdivision plat shall be recorded prior to contract negotiations in all provisions for development.

(5) Construction of water and sanitary sewer system improvements shall be performed by a bidder approved by

the City Engineer or designee.

(6) Streets shall be cut to subgrade and parkway berms shaped prior to commencement of water and sanitary sewer system installation.

(7) The construction inspection shall be performed by the owner (City of Whitehouse). The developer's engineer shall be available to consult with and assist the owner's inspector from time to time, as the need arises.

(8) The City of Whitehouse reserves the right to require changes in construction methods to insure compliance with the City of Whitehouse Standard Specifications.

(9) No work shall commence on improvements until directed, in writing, by the City Engineer or designee.

III. Sanitary Sewer Line Design:

A. Location: Sanitary sewer mains shall be constructed in a dedicated street, alley, or an easement to the City of Whitehouse which shall be filed in the public records. Sanitary sewer mains shall be installed in the south one-third and east one-third of street rights of way except where otherwise approved by the City Engineer.

A center line description of any off-site easement required for outfall, interceptor, approach or lateral lines to be constructed in conjunction with said project shall be furnished with the final plans and specifications for sanitary sewer mains. Center line descriptions shall be prepared by a **Registered Public Land Surveyor**.

(1) Sewers shall be laid in a straight alignment with uniform grade between manholes.

(2) The minimum cover for sewer lines shall normally be five feet with a minimum clearance of one foot below established flow line of creeks and drainage ways.

(3) Sewer lines shall be at a lower elevation than any water line at crossings, and shall have one 18 foot joint of ductile iron pipe centered at the water line with the sewer pipe joints 9 feet each side of the water lines.

(4) Sanitary sewer lines installed 14' deep or more shall require Class "C" embedment.

B. Minimum Size: The minimum inside diameter size requirement

for gravity sanitary sewer lines is 6 inches.

C. Grade: Size and minimum grade requirements are shown in the following table:

Size of Inside Diameter of Pipe in Inches	Fall in Feet Per 100 Feet of Sewer
6	0.50
8	0.33
10	0.25
12	0.20
15	0.15
18	0.11

These grade requirements are in accordance with the present State of Texas Standards. If the State standards are changed in the future, the above requirements shall be changed to comply with the then present State of Texas requirements. The minimum velocity in a sewer line is 2 fps, and maximum allowable velocity is 15 fps. Where velocities greater than 10 feet per second are attained, special provision shall be made to protect against erosion by velocity, and displacement by shock.

D. Design Criteria:

(1.) Design Flows: In residential development, gravity sewers shall be designed to carry an average daily flow of 140 gallons per capita per day based on 3.3 persons per single family unit. The line shall be designed to carry a peak flow of 4.0 times the average daily flow for 6 inch lines, and 2.5 times average daily flow for lines 8 inches and larger. For developments other than residential, the developer's engineer shall use the recommended design flows as promulgated by the Texas Department of Health or Texas Commission on Environmental Quality, unless the City of Whitehouse has data to require greater design flows.

(2.) Lift Stations and Pressure Lines: In general, the City of Whitehouse will not permit the construction of lift stations and pressure lines, unless it is impossible to connect to a gravity system. If a lift station is required, complete design, including site work, an all weather access, etc. shall be included in the plans and specifications. At the option of the City of Whitehouse, the design may include service to an area, in addition to the property being developed, with the City of Whitehouse participating in the excess capacity cost. The lift station shall be designed in compliance with current state and federal requirements and shall have either dual electrical supply or a stand-by

generator. The minimum lift station capacity shall be 100 gallons per minute and shall have at least two pumps. The minimum size for a pressure line shall be 4 inches.

E. **Soil Tests:** The soil corrosivity shall be determined in accordance with the procedures outlined in ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron Pipe for Water and Other Liquids". The earth resistivity and soil tests shall be placed along the proposed pipeline at points of crossing water lines with proposed sanitary sewer lines, and to a depth equal to the installed pipeline, to provide a representative view of existing subsurface conditions. A point accumulation of 10 or greater indicates corrosive soil conditions and pipeline corrosion protection shall be required. Test results shall be correlated with Utilities Department personnel.

F. **Allowable Materials:**

(1) The materials for sewer line construction shall be as specified in the City of Whitehouse Standard Specifications.

(2) Gravity lines 6 to 12 inches in diameter size shall be PVC, SDR 26 heavy wall gravity sewer pipe, or equal as determined by the City Engineer.

(3) Gravity lines 15 inches in diameter size and larger shall be cement lined, tar coated or epoxy coated ductile iron pipe, or equal as determined by the City Engineer.

(4) When crossing water lines, ductile iron pipe shall be required.

(5) Creek crossings, shallow lines, and lines laid in areas with high water table shall be constructed with ductile iron pipe, and shall be encased in concrete where unsuitable soil conditions necessitate encasement. The City Engineer may require concrete encasement at his discretion.

G. **Manholes:** Manholes shall be designed and built in accordance with the City of Whitehouse Standard Specifications.

(1) Manholes shall be placed at points of changes in alignment, grade, or size of sewer. Manholes shall also be placed at all street intersections, at intersections of sewers, and the end of all sewer lines that will be extended at a later date.

(2) Manhole spacing shall be a maximum of 400 feet for 6 inch

and 8 inch sewer lines.

(3) The minimum inside diameter of a manhole shall be 4 feet.

H. **Cleanouts:** Cleanouts may be used in lieu of manholes at the end of sewers which are not to be extended in the future.

I. **House Connections:**

(1) A minimum 4 inch PVC service line shall be installed to the property line of each lot.

(2) Each service line shall have a "Y" fitting installed in the branch line for each house service.

(3) Each service line shall be permanently marked with a "S" on the curb where the service line crosses the curb, with a ½ inch diameter x 3 foot steel rod driven at the end of the service line.

(4) Magnetic locator tape shall be installed directly above the sewer service pipe from the main line to the end of the service.

(5) The end of the service line shall be at least 4 feet deep at the curb and shall be deep enough to allow a 1 foot per 100 foot drop in the service line from the back of the lot or lowest point in the lot to the property line, plus an adequate depth for the house plumbing. The end of the service line shall be plugged.

J. **Plans and Specifications:**

(1) Preliminary Plan:

(a) The developer shall submit with the **preliminary plat**, a plan showing the proposed location and size of sewer lines prepared, signed, and sealed by a Registered Professional Engineer. The plan shall include location of lots, minimum finished floor elevations, streets, sewer lines, manholes, cleanouts, and water lines along with the design calculations for the size of lines. The preliminary plat should reflect the Master Plan for the total area to be developed.

(b) The preliminary plans will be on a scale of not more than one hundred feet to the inch (1" = 100').

(2) Construction Plans:

(a) The developer must submit with the final plat the proposed plans, specifications, and contract documents complete, prepared, signed and sealed by a Registered Professional Engineer. The City Engineer will review for approval the plans and specifications. After the review, the developer will include into the plans and specifications any additions or corrections required.

(b) The construction plans may be submitted by the City of Whitehouse to the Texas Commission on Environmental Quality for their review, following staff review. Generally, construction shall not begin until the approval has been received.

(c) The Construction plans shall include a location map showing location of proposed sewer lines, manholes, cleanouts, and water lines. This map may be on the same scale as the preliminary plan. The construction plans shall include plan and profile sheets showing the location of all sewer lines and manholes.

1. **Plan Section:** The plan shall be prepared on 22" x 34" plan profile sheets or plan sheets with separate profile sheets. The plan section of the plan and profile shall show the streets and side streets, easements, lot lines, culverts, driveways (where possible), gas lines, power lines and poles, sewer lines, water lines, telephone lines, and t.v. cable lines. The plan shall also indicate where house service lines are to be installed. The plans shall show all manholes, cleanouts, ductile iron pipe, and branch line connections, and concrete encasement. The plan shall be drawn to a scale of not more than fifty feet to the inch (1" = 50').

2. **Profile Section:** Profile shall be drawn to a scale of not more than fifty feet to the inch (1" = 50') horizontally and not more than five feet to the inch (1" = 5') vertically. The profile section shall show the grade of the sewer lines, the existing surface line, and proposed surface line where it is different form the existing. All Bench Mark and profile elevations shall be tied to the National Geodetic Survey Datum. (Formerly the U. S. Coastal & Geodetic Survey Datum). Assumed datum’s will not be allowed. The profile shall show all storm sewers and water lines crossing the construction alignment of the proposed sewer line. The grades for sewer lines shall be set by the developer's engineer and the contractor shall lay them as close as possible to the proposed grades.

Grade stakes and grade lines are required for all sewer lines. The construction plans shall also include a sheet showing standard manholes, cleanouts, and other pipe laying details. Each sheet must be reviewed, approved, signed, and sealed by a Registered Professional Engineer licensed to practice in Texas.

3. **"Record Drawings"**: The developer's engineer shall prepare a set of "Record Drawings" based on the construction plans. The "Record Drawings" shall show the location of all manholes, cleanouts, and service connections, and the correct alignment and grade of lines installed. All manholes and cleanouts shall be located on the ground tied to at least two permanent land marks, i.e., fire hydrants, power poles, property lines, etc. The land marks shall be shown on the plan and the dimension from land mark shall be shown. The land marks shall be at least 90 degrees apart. The City Construction Inspector will assist the Engineer in procurement of information needed to develop the "Record Drawings". The developer shall provide the City Engineer one set of mylar film originals and one electronic copy of the "Record Drawings" within (30) days of written final acceptance of the improvements.

K. Contract Procurement

(1) The developer shall submit a minimum of ten sets of the revised plans and specifications and request the City Engineer to set a bid date to receive bids on the proposed improvements. The developer shall also submit a "Notice To Bidders" for the City of Whitehouse to publish.

(2) The City of Whitehouse will open the sealed bids prior to the next regularly scheduled City Council meeting and may, at its option, tabulate the bids or may request the developer's engineer to tabulate the bids.

(3) The developer may request the authority, in writing to the City Engineer, or designee, to proceed with a private contract.

(4) The subdivision plat shall be recorded prior to contract negotiations in all provisions for development.

(5) Construction of water and sanitary sewer system improvements shall be performed by an approved bidder of the City of Whitehouse Utilities Department.

(6) The construction inspections shall be performed by the City of Whitehouse. The developer's engineer shall be available to consult with and assist the City of Whitehouse Inspector from time to time, as the need arises.

(7) The City of Whitehouse reserves the right to require changes in construction methods to insure compliance with the City of Whitehouse Standard Specifications.

(8) No work shall commence on improvements until directed, in writing, by the engineer and approved by the City Engineer.

BIBLIOGRAPHY

"RULES AND REGULATIONS FOR PUBLIC WATER SYSTEM"

Texas Commission on Environmental Quality
P. O. Box 13088
Austin, Texas 78711

"DESIGN CRITERIA FOR SEWAGE SYSTEMS"

Texas Commission on Environmental Quality
P. O. Box 13088
Austin, Texas 78711

"AWWA STANDARDS"

American Waterworks Association
6666 W. Quincy Avenue
Denver, Colorado 80235

"TEXAS GENERAL BASIS SCHEDULES"
PRESCRIBED BY THE BOARD
OF INSURANCE COMMISSIONERS

Texas State Board of Insurance
Austin, Texas 78711