LEAGUE CITY EST. 1893

General Design

And

Construction Standards

2025

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SECTION 100 GENERAL PROVISIONS

ITEM 101 GENERAL INFORMATION

101.1 Purpose

It is the intent of these General Design and Construction Standards ("Standards") of the City of League City (CoLC), Texas, to provide the minimum design requirements for sub-dividers, developers, engineers, surveyors, realtors, and other persons interested and involved in the development of land. Where adopted, the applicable City Master Plans guidelines shall be senior to these standards. Further, it is the intent, purpose, and scope of these Standards to promote and protect the health, safety, and general welfare of the public.

Presented herewith are the minimum design standards for the Public Works infrastructure within the CoLC corporate limits for designing public storm sewers, drainage facilities, water lines, paving, and sanitary sewers within the City of League City. These requirements are the general guideline to inform the design engineers and contractors performing work in League City of the Department's policies and procedures. In no way does the following information provide all answers to design and construction questions or situations; however, it does provide a means to initiate the design of facilities in the manner utilized by the Public Works.

The design of any public utility or paving must be released for construction by the City Engineer or their assigned designee prior to plan approval for its construction. The construction of public works infrastructure shall be certified by the Engineer on Record (EOR), concurred with and accepted by the City Engineer for ownership to maintain.

101.2 Authority

Under the authority granted to cities and counties under the Constitution and Laws of the State of Texas, including the provisions of Section 4 of the Municipal Annexation Act, as heretofore or hereafter amended, the City Council of League City has adopted the following standards for governing the engineering design of public works infrastructure within the city limits of League City, Texas.

ITEM 102 DEFINITIONS AND ABBREVIATIONS

AASHTO - American Association of State Highways and Transportation Officials.

ACI - American Concrete Institute

ADMINISTRATIVE OFFICIAL - Any employee or advisory, elected, or appointed body, which is authorized to administer any provisions of this ordinance.

AI - The Asphalt Institute

ANSI - American National Standards Institute

API - American Petroleum Institute

ASTM - American Society for Testing Materials

AWWA - American Water Works Association

BASE FLOOD - The flood having a one-percent chance of being equaled or exceeded in any given year.

CITY - means the City of League City.

CITY COUNCIL - means the City Council of the City of League City.

CITY INSPECTOR - An authorized representative of the City, assigned to inspect any and all parts of the work and the materials to be used therein.

CITY LIMITS - City boundary as fixed by Mayor and City Council and defined in City Ordinance.

CITY STAFF - Personnel working for the City.

PLANNING & ZONING COMISSION - A commission that acts as an advisory agency to the City Council.

CONTRACT - An agreement between the owner and the contractor covering the furnishing of materials and performance of the work.

CONTRACTOR - The individual, firm, or corporation or any combination thereof, with which the contract is made by a developer or the City.

CRSI - Concrete Reinforcing Steel Institute.

DEDICATORIAL - An acknowledgement by the owner and lien holders of property being subdivided under applicable City codes and ordinances and appearing on the plat dedicating said property.

DEVELOPMENT - The construction of a facility that is built, installed, or established to serve a particular purpose.

DEVELOPER - means any individual, firm, co-partnership, corporation or other legal entity commencing proceedings under the UDC.

EASEMENT- means a right granted for the limited purpose of use over, across or under private land. An easement may be created by a subdivision or granted by the owner for public or private utilities, drainage, sanitation or other specific uses having limitations. The title to the land shall remain in the name of the property owner, subject to the right of use designated in the reservation.

EASEMENT, AERIAL - An easement for the exclusive use of constructing and maintaining above ground utilities within its confines.

EASEMENT, DRAINAGE OR STORM WATER - means an easement for the unobstructed use of constructing and maintaining drainage facilities within its confines.

EASEMENT, MAINTENANCE - A perpetual 5-foot-wide wall-maintenance easement shall be provided on the lot adjacent to the zero-lot line/property line, which, with the exception of walls or fences, shall be kept clear of structures. This easement shall be noted on the plat and incorporated into each deed transferring title to the property.

EASEMENT, STORM SEWER - An easement for the exclusive use of constructing, maintaining and/or replacing storm sewer lines and appurtenances within its confines.

EASEMENT, UTILITY - An easement granted for the purpose of placing and maintaining utilities within its confines.

EASEMENT, WASTEWATER OR SANITARY - An easement for the unobstructed use of constructing and maintaining wastewater lines and appurtenances within its confines.

EASEMENT, WATER - An easement for the exclusive use of constructing and maintaining potable water lines and appurtenances within its confines.

ENCROACHMENT - a condition in which a private feature occupies space within the public right-of-way.

ENGINEER – A professional engineer, licensed by the Texas Board of Professional Engineers, with expertise in design and construction of the designed infrastructure.

Engineering – Designated representatives within the City of League City Engineering Directorate that are empowered to make decisions concerning items within this specification book.

ENGINEER OF RECORD ("EOR") - The Engineer-of-Record shall be a professional engineer licensed in the State of Texas retained by the developer. The EOR shall act as a representative of the City of League City, as well as the developer, in enforcing the specifications and construction standards.

EXTRATERRITORIAL JURISDICTION – As defined in the Texas Local Government Code and verified by the City attorney and City Engineer and the Texas Municipal Annexation Act, Texas Local Government Code, Chapter 42 et seq. and as amended.

FLOOD PLAIN – A land area which is floodplain as defined by the Army Corps of Engineers or the Federal Emergency Management Agency as indicated in the latest national flood insurance study.

FLOODWAY – A channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation, as defined by **FEMA** on the most recent flood boundary and floodway maps.

GCHD - Galveston County Health Department

HCFD - Harris County Flood Control District

MASTERPLAN – The initial plan or map for all subdivisions to be developed in phases or sections. The master plan shall be submitted prior to or with the plat of the first section of development of a subdivision and with all sections thereafter. Changes anticipated for the master plan shall be approved in advance of all platting, and the master plan map and attendant overlays or plans corrected as the changes are anticipated.

NLA - National Lime Association

NSF - National Sanitation Foundation

PLAT - a map depicting a tract of land prepared in conformance with Local Government Code, Chapter 212 and the provisions of this Code.

a. **PRELIMINARY PLAT** - A map illustrating the proposed subdivision or development of land which will be submitted for approval before preparation of the final plat.
b. **FINAL PLAT** - A map illustrating the proposed subdivision or development of land having been certified to by a registered professional land surveyor

and submitted to the City for approval by the Planning and Zoning Commission and/or Planning Director.

c. **REPLAT** - A revised map showing the subdivision of one or more lots that were part of a previously recorded subdivision or portion thereof. All property that was previously part of the lot(s) being subdivided shall be included in the boundaries of the replat, regardless of ownership. (All property does not have to be included if the property was platted prior to September 11, 1969.) When recorded, the replat will supersede the previous plat (or portion) filed there.

d. **PLAT VACATION** - An instrument declaring that a plat and its dedications be vacated or cancelled and that the land reverts to the original survey or any underlying subdivision.

PROPERTY - The land (whether leasehold or in fee simple) and the building(s), all improvements and structures thereon, and all easements, rights, and appurtenance belonging thereto.

PUBLIC WORKS – Designated representatives within the City of League City Public Works Directorate that are empowered to make decisions concerning items within this specification book.

RIGHT-of-WAY - Real property interest in a parcel or strip of land that is conveyed or dedicated to the public or other specified entity for purposes of the right of passage across said parcel or strip and/or for the right to install, maintain, and operate public or private infrastructure and appurtenances, including, but not limited to, street paving, sidewalks and trails, drainage facilities, water and wastewater facilities, and other public utilities (electric power, phone, gas; and cable television lines).

SPECIFICATIONS - The directions, provisions, and requirements contained herein or as may be issued or made pertaining to the methods and manner of performing the work or quantities and qualities of materials to be furnished. Where reference is made to specifications of ASTM, AASHTO, AWWA, ANSI, or bulletins and manuals, it shall be construed to mean the latest standard or interim standard in effect.

STREET means a strip of land, privately or publicly owned, which affords the principal means of access to abutting property.

a. **COLLECTOR** - A street designated as “Collector” by the City’s Master Mobility Plan, designed to provide both local access and traffic circulation within residential neighborhoods, commercial and industrial areas. They differ from the arterial systems in that collector streets may penetrate identifiable neighborhoods. Collector streets distribute traffic between the arterial and local street systems.

1. **Neighborhood Collector** – A street that is not a Master Mobility Plan recognized Collector but is designed to provide both local access and traffic circulation within residential neighborhoods at volumes less than or equal to 2,500 VPD. This level roadway allows on-street parking.
2. **City Collector** – a street that is a Master Mobility Plan recognized Collector and will typically have volumes exceeding 2,500 VPD. Unless specifically authorized by the City Engineer, this level roadway prohibits on-street parking.

b. **CUL-DE-SAC** - A street which is part of the local street system and closed on one end in a circular or other approved pattern meeting minimum radius requirements.
c. **LOCAL OR RESIDENTIAL** - A street designed to serve the local needs of the neighborhood and to provide access from abutting residential properties to other streets.
d. **MAJOR ARTERIAL** - A continuous street system serving moderate to long trip lengths that distributes traffic from the freeway/expressway system to and from the metropolitan area. The focus of major arterials is to provide mobility rather than land access. Major arterials should not penetrate identifiable neighborhoods.
e. **MINOR ARTERIAL** – A street that accommodate moderate trip lengths at a somewhat lower level of mobility. Minor arterials provide a lower level of mobility and distribute traffic to smaller geographic areas than major arterials. Minor arterials should not penetrate identifiable neighborhoods but can provide more direct access to abutting property.
f. **PRIVATE STREET** – A non-dedicated street on private property. A street with a non-dedicated right-of-way. Private streets are subject to a Private Streets Agreement, adopted by the City.
g. **STUB STREET** - A street which terminates at the boundary of a subdivision for future access to adjoining unplatted or undeveloped property.

SUBDIVISION - The division of a tract or parcel of land, by means of a plat, into 2 or more lots or other divisions of land, for the purpose of transfer of ownership or building development, expressly excluding development for agricultural purposes. The term does not include the division of land into parts greater than 5 acres where each part has access, and no public improvements are being dedicated.

SURVEYOR - An individual duly authorized under the current Land Surveying Practices Act of 1979, as amended, Vernon's Ann. Civ. Stat. art. 5282c, to practice the profession in the state of Texas thereof, who shall be responsible for all descriptions and plats to be recorded in official records.

SURVEY - A boundary or topographic map

TMUTCD - Latest edition of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways.

TxDOT - Texas Department of Transportation

UL - Underwriters Laboratories, Inc.

UNI-B - UNI-BELL PVC Pipe Association

UTILITIES - Facilities for public use, i.e., water, wastewater, and drainage, gas, telephone lines, electricity, cable television, etc.

ITEM 103 SCOPE OF WORK

103.1 Intent of Plans and Specifications

It is the intent of plans, reports and specifications submitted to provide quality control for the installation of public infrastructure to be installed under the legal purview of the CoLC. Plans, reports, and specifications will be submitted and reviewed by the City Engineer or appointed designee.

103.2 Changes and Alterations

All changes and alterations in the plans, reports, and specifications must be prepared by the EOR and released for construction by the City Engineer.

ITEM 104 CONTROL OF WORK

Development projects shall be constructed by the Developer and the Contractor. Specifications establishing contractual requirements shall be prepared and administered by the Developer's EOR.

If a City recognized benchmark is not in reasonable proximity, a benchmark shall be created with each development project, regardless of development size, for City use. The benchmark shall be in the Texas South Central 4204 zone. The Horizontal Datum shall be NAD83 (CORS96)(EPOCH 2002.0000), and the Vertical Datum shall be NAVD88 (2002 Adjustment) Continuously Operating Reference Station NETP (NGS PID AJ8805). The benchmark shall be established with GPS Observation survey method. The reference mark shall be established using procedures outlined in NOAA Technical Memorandum NOS NGS-58 Guidelines for Establishing GPS-Derived Ellipsoid Heights (Standards: 2 cm and 5 cm) and the Geometric Geodetic Accuracy Standards and Specifications for using GPS Relative Positioning Techniques by the FGSS 1989 and tied to the NGS

CORS Network. CORS reference station used in the League City GPS Network are: TXLM, TXGA, NETP, ANG1. Orthometric Heights shall be established with GEOID03. Benchmark required may be waived by sole discretion of the City Engineer.

104.1 Authority and Duties of Engineer-of-Record

The EOR shall provide for inspection, sampling and testing necessary to maintain day-to-day job control, regardless of the type of project. The construction shall be performed under the direct supervision of the EOR. The EOR or their representative shall inspect all work performed and all materials furnished to the project and bring any deficiencies in work or materials to the attention of both the Contractor and the City.

They shall see that all sampling and testing required by specifications or job site conditions, are performed by an independent Material Testing Laboratory. They shall also issue a certificate, at the completion of the work, acknowledging that the project was constructed in accordance with City approved plans, specifications, and special provisions.

104.2 Authority of City Engineer

The City Engineer's representative will decide all questions which may arise as to the quality of materials furnished and work performed, the manner of performance, the interpretation of the City's construction requirements, and the acceptable fulfillment of the Developer/Contractor's obligations.

104.3 Authority and Duties of City Inspector

City inspectors will be authorized to inspect the work done and all materials furnished. A City Inspector will be assigned to the work by the City Engineer and will report to the City Engineer as to the progress of the work and the manner in which it is being performed, also to report whenever it appears that the material furnished, and the work performed by the Developer/Contractor fail to fulfill the requirements of the specifications and to call attention of the EOR and Contractor to any such failure or other deficiency. Such inspection will not relieve the Developer/Contractor from any obligations to perform the work in accordance with the requirements of the specifications. In case of any dispute arising between the Developer/Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector will have the authority to reject materials or suspend work until the question at issue can be referred to and decided by the City Engineer. The Inspector will not be authorized to approve or accept any portion of work. He will in no case act as foreman or perform other duties for the

Developer/Contractor. The place, frequency and thoroughness of inspection will vary depending on the construction activity and the quality of work exhibited by the construction organization. The presence of a City Inspector does not relieve the EOR of their responsibilities.

104.4 Cooperation of Contractor

The Contractor shall give the work their constant attention to facilitate the progress thereof and shall cooperate with the City and the EOR in every way possible. They shall have at all times a satisfactory and competent English-speaking Superintendent on the work site.

104.3 Fees

Developer shall pay City fees as outlined in accordance with applicable City of League City Code of Ordinances.

104.6 Bond or Cash Deposit for Unsatisfactory Repairs or Damages

It will be the responsibility of the Contractor to put up a bond or cash deposit in the amount of 0.50% of construction cost to cover any damages incurred to City facilities or authorized franchise utilities during construction. Bond requirement may be waived at the sole discretion of the City Engineer.

ITEM 105 CONTROL OF MATERIALS

105.1 Quality of Materials

All Materials shall be new and of a quality conforming to the requirements of these specifications. Whenever the quality or kind of materials or articles is not particularly specified, the materials or articles shall be of the industry standard in quality and workmanship obtainable in the market from firms of established good reputation.

105.2 Samples and Test

All properly installed materials requiring pre-testing, shall be inspected, tested, and approved prior to being incorporated in the work. Subject to the approval of the City Engineer, pre-tested sampling and testing will be provided at the developer's expense, by a materials-testing firm approved by the City Engineer. All tests of materials shall be made in accordance with City specifications and recognized practices.

105.3 Storage of Materials

Materials shall be stored and protected in accordance with manufactures recommendations to insure the preservation of their quality and fitness for the work.

105.4 Defective Materials

All materials which do not conform to the requirements of these specifications shall be considered as defective, and all such materials, whether in place or not, shall be rejected and immediately be removed from the site of work, unless otherwise permitted by the City Engineer. Refurbished materials, the defects of which have been subsequently corrected, shall have the status of new materials, as approved by the City Engineer.

105.5 Delivery of Materials

Any vehicle, truck, truck-tractor, trailer or semi-trailer or combination of such vehicles, when used to deliver materials to a project shall comply with the State and City laws concerning gross weight and load limits. Special haul routes for construction traffic will be designated by the City Engineer within the City limits. The Developer/Contractor is responsible for the protection of all existing roads and small structures traveled by their material haulers.

Any damage by the use of construction equipment shall be restored to its original condition or replaced at the Contractors/Developers sole expense.

ITEM 106 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

106.1 Laws to be Observed

The Developer/Contractor shall make themselves familiar with and at all times shall observe and comply with all Federal, State, and Local laws, ordinances, and regulations which in any manner affect the conduct of the work and shall indemnify and hold harmless the City and its representatives against any claim arising from the violation of any such law, ordinance, or regulations, whether by themselves or by their employees. Developer/Contractor shall sign Recognition of City of League City Specifications for Construction document available on the City website (www.leaguecity.com).

106.2 Permits, Licenses, and Taxes

The Developer/Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work.

106.3 Sanitary Provisions

The Developer/Contractor shall, at their entire expense, provide and maintain in neat, sanitary conditions such accommodations for the use of their employees as be necessary to comply with the requirements and regulations of the State Department of Health or of other authorities having jurisdiction.

106.4 Public Safety and Convenience

The safety of the public and the convenience of traffic shall be regarded as of prime importance. Unless approval has been given by the City Engineer, all portions of a roadway shall be kept open to traffic. It shall be the entire responsibility of the Developer/Contractor to provide for traffic along and across a roadway as well as ingress and egress to private property. The Contractor shall plan and execute their operations in a manner that will cause the minimum interference with traffic. The Contractor shall secure the City Engineer's approval of their proposed plan of operation, sequence of work, and methods of providing for the safe passage of traffic before it is placed into operation. At no time shall the removal and replacement of concrete within a public ROW exceed 14 calendar days for any given segment. If at any time during construction, the approved plan does not accomplish the intended purpose due to weather or other conditions affecting the safe handling of traffic, the Contractor shall immediately make necessary changes therein to correct the unsatisfactory conditions. All equipment and materials shall be stored in such a manner and at such locations so as not to interfere with the safe passage of traffic. If in the opinion of the City Engineer the above requirements are not complied with, the City Engineer may direct such work as he may consider necessary, however, this shall not change the legal responsibilities. The expense for such work performed by the City will be borne by the Developer/Contractor.

106.5 Barricades and Danger, Warning, Detour Signs, and Traffic Handling

The Contractor shall have the sole responsibility for providing, installing, moving, replacing, maintaining, cleaning, and removing upon completion of the work all barricades, warning signs, barriers, cones, lights, signals, and other such type devices, and the handling of traffic. All barricades, warning signs, barriers, cones, lights, signals, and other such type devices shall conform to the Texas Manual of Uniform Traffic Control Devices for Streets and Highways, as amended.

106.6 Protection of Property

The Developer/Contractor shall take proper measures to protect private and public property which might be injured or damaged by any process of construction; and in case of any injury or damage resulting from any act or omission on the part of

or on behalf of the Developer/Contractor, he shall restore, at their own expense, the damaged property to a condition equal to or better to that existing before such injury or damage was done, or he shall make good such injury or damage in an acceptable manner.

106.7 Responsibility for Damage Claims

The Developer/Contractor agrees to indemnify and be responsible for all damages or injury to property of any character occurring during the prosecution of the work resulting from any act, omission, neglect, or misconduct on themselves or their agent's part in the manner or method of executing the work; or from failure to properly execute the work; or from defective work or materials. The Developer/Contractor's attention is directed to the fact that the location of pipelines and other underground installations are not always exact. The Developer/Contractor shall save and hold harmless the City from any and all claims resulting from these responsibilities.

SECTION 200 GENERAL DESIGN PROCEDURES

ITEM 201 PRELIMINARY RESEARCH REQUIREMENTS

Step one in the Preliminary Research Process is to contact all applicable City departments and discuss concepts outlining what is to be proposed and its usage. Depending on the location and size of development, the initial contact may be handled by phone, online meeting, or a meeting at the city offices. The Developer/EOR should verify that no restrictions are existing that will deny the approval of the concept and research all existing utilities and right-of-way and easement information with the City, State, County and other authorities whose approval will be necessary for the proper use of the development. The Developer/EOR shall research all laws, ordinances, rules and regulations that may pertain to the development.

Developer/EOR shall submit adequate, complete digital prints of plans for feasibility, preliminary and final review to the City's Engineering/Planning Development Review Committee. Planning material submitted shall in all instances be in such detail as to permit a comprehensive review.

ITEM 202 PRELIMINARY DESIGN REQUIREMENTS

The Developer/EOR shall provide the City Engineer with construction drawings, reports, and calculations to support the proposed design. The submitted design will not be considered unless they have been prepared under the direction of a Texas Licensed Professional Engineer. Construction drawings showing the interim seal of the Engineer responsible placed on each sheet is required. Reports showing the interim seal of the responsible professional shall be required on preliminary documents. Final reports shall have the seal of the responsible professional on the cover sheet. Preliminary Design requirements involve the review of construction drawings to ensure that all proposed facilities are designed in accordance with the most current League City Standards and criteria. All developments shall follow proper filing procedures through the City and comply with the current Ordinances.

For all capital improvement projects, a preliminary report proposing processes, methods or procedures not covered by these specifications or a request for an exception to any portion of the regulations, shall be submitted during preliminary design. Preliminary engineering report requirement may be waived by sole discretion of the City Engineer.

ITEM 203 FINAL DESIGN REQUIREMENTS

After the preliminary submission and addressing all comments from the City Engineer, final construction plans may be submitted. Final design requirements

involve the review of detailed construction drawings to ensure all comments from the preliminary design review have been addressed. All plans, reports, and specifications submitted for final review must be sealed and dated by a Texas Licensed Professional Engineer.

ITEM 204 PLAN SUBMITAL REQUIREMENTS

This ITEM is for the intent of supplying the submitting Developer/EOR with a guideline of what is required when submitting a set of plans and/or reports. Prior to submitting plans to the City Engineer, the plans must follow the League City Public Infrastructure Submittal process and checklist. Information regarding this can be found at:

League City Website (www.leaguecity.com) > Your Government > Engineering > Land Development

Capital Improvement Project (CIP) plans shall be submitted via email to the City Project Manager, Developer subdivisional or site projects with City Infrastructure requirements shall be submitted to Assistant City Engineer in pdf format on 22”x34” sheets and will consist of but not be limited to:

1. Cover sheet with vicinity map, sheet index, City signature block and preconstruction note if infrastructure is to be public.
2. Construction and or general notes.
3. Overall site plan layout sheet.
4. Topographic survey sheet(s).
5. Paving and grading sheet(s).
6. Drainage sheet(s) including but not limited to providing the HGL, limits of ponding, inlet calculations and the drainage area map.
7. Utility sheet(s) (water, sanitary, storm)
8. If applicable, Lift Station sheet(s) including pertinent calculations
9. Plan and Profile sheets if necessary.
10. Photometric survey. (for business plans)
11. If applicable, a Tree Disposition Plan including pertinent calculations
12. Detail sheets.
13. Storm water pollution prevention plan sheet.
14. Provide State Plane Coordinates (x, y and flowlines) NAD 88 for water valves, sanitary sewer manholes, storm manholes, storm outfalls, and storm inlets.
15. If required, provide documentation for a newly established City benchmark in accordance with Item 104.

Plan submittals to other departments may be required for additional approvals.

Accompanying documents:

a. TxDOT approvals for driveway, utilities, and drainage into their jurisdiction (if applicable).
b. Pipeline company approvals on pipeline letterhead (if applicable).
c. Storm Water Quality Management Plan and Permit
d. Traffic Impact Assessment (if applicable).
e. Lift Station Report (if applicable)
f. Arborist Letter (if applicable)
g. Drainage Impact Assessment (if applicable)

ITEM 205 FINAL PLAN APPROVAL

Approval from all applicable governmental agencies, all utility companies, and applicable City Commissions and Departments and Zoning must be obtained prior to final plan approval.

All developments shall conform to the City of League City's current Code of Ordinances.

Final plans shall be submitted through the City's digital submittal process. Signatures on final plans will be provided digitally. At the preconstruction meeting, EOR shall provide City with 1 full size and 2 half size sets of the signed final plans.

ITEM 206 RECORD DRAWING REQUIREMENTS

When the work provided for in the approved plans and specifications has been completed to the satisfaction of the City Inspector, "Record Drawings" plans will be required to replace the approved plans that are on file with the City Engineer. These plans shall be labeled "Record Drawings" and certified and dated by the EOR. Record drawings shall be submitted to the City Engineer within 10 business days of final punch list completion. Failure to submit Record Drawings in a timely manner can delay the recordation of the development's final plat.

A PDF reproducible (electronic set) of the final As-Built plans will be required to be submitted to the City Project Inspector for verification. Upon approval from Inspector an electronic pdf shall be sent to the City Engineering Dept for archival in the City's system.

Record drawings shall contain information within tolerances pertinent to the intended function of the design. Tolerances shall be in accordance with the following table:

Table 206.1

Infrastructure	Horizontal Tolerance (ft)	Vertical Tolerance (ft)
Waterlines	1.0	0.5
Gravity Wastewater	0.5	0.05
Pressure Wastewater	1.0	0.5
Drainage	0.5	0.05
Roadway	0.5	0.05

All public facilities shall be shown to be located within public rights-of-ways or within an appropriate easement and illustrated as such in the construction plans.

All easements and rights-of-way required for the construction of a proposed project must be accepted, approved, and filed for record with Galveston County or Harris County, as appropriate, prior to City acceptance.

Inside the City limits, easements and rights-of-way shall be either a part of the dedication on the plat or dedicated to League City by separate instruments. It shall be required and the duty of the person seeking to dedicate such easement and/or right-of-way to furnish the City Engineer with a reproducible map showing the easement and/or right-of-way location and a copy of the recorded instrument along with a letter from the property owner stating the intent to obtain or dedicate the necessary easements or rights-of-way.

SECTION 300 GENERAL DESIGN AND PLAN REQUIREMENTS

ITEM 301 SURVEY REQUIREMENTS

The following guidelines are provided for use by Engineers in the development of plans. The intention of these requirements is to provide all the evidence available for the proper location of improvements within functional and legal boundaries. All survey activity shall be performed under the direction of a qualified survey licensed to practice in the State of Texas.

301.1 Field Work Required for Plans

Field Work Required for Plans. The transit or base line must be monumented at its beginning, end, and at all angle points with markers of a permanent nature. Monuments shall be set on long lines at intervals not to exceed 1000 feet.

The existing right-of-way monuments or property corners that are found must be plainly shown on the plans and located by station and distance, “Right” or “Left” from the transit line or construction center line. Those monuments that were used to determine the construction center line, must be identified as “control points”, and their relationship to the construction center line and to proposed or existing right-of-way lines must also be shown.

NGS datum must be used for elevations, and the complete numerical designation of the monuments must be identified on the plans, as well as the year of the datum of the monuments must also be identified on the plans.

Plans must show centerline angles of intersections of side streets with the main roadway and the centerline station on the main roadway. Where bearings are used, care should be taken so that bearings are shown on both base line and constructions center line. The source of the bearings shall be clearly stated.

All topographic features within the right-of-way must be shown. The topography on intersecting streets shall be shown a minimum of fifty feet beyond the intersection of the right-of-way lines and shall include all information and conflicts that may influence the design and/or use of the public improvements.

Where plans identify proposed utility lines, the location of manholes, service connections, angel points, valves, fire hydrants, bends, etc. must be identified by station and distance from transit or baseline with relationship to the right-of-way lines.

All existing pipelines, utilities, and other features that may conflict with design shall be field verified vertically and horizontally for actual location.

All cross sections taken will be made at intervals not to exceed 50 feet. Elevation shots shall be taken on the centerline of all driveways at approximately the existing or proposed right-of-way line.

301.2 Right-of-Way Maps

All maps shall be sealed, dated and signed by a Texas Registered Public Land Surveyor.

ITEM 302 GRAPHIC REQUIREMENTS

All plans shall be prepared and submitted in a pdf format. Plans shall be standard sheet size 22” X 34” over all dimensions.

The seal, date, and original signature of a Texas Licensed Professional Engineer are required on each sheet.

A cover sheet shall be required for all projects involving three or more sheets. All plan sheet numbers should be included on the cover sheet or area key map. A signature block shall be placed on the cover. A vicinity map should always be included to show the project location. Service area shall be delineated on the cover sheet or area map.

For Public projects, add the note “A PRE-CONSTRUCTION MEETING WITH CITY OF LEAGUE CITY PMO DEPARTMENT IS REQUIRED AT LEAST 10 WORKING DAYS PRIOR TO ON SITE CONSTRUCTION ACTIVITIES. CALL (281) 554-1436 FOR A MEETING DATE AND TIME. A PRE-CONSTRUCTION MEETING FOR THIS PROJECT MAY NOT BE SCHEDULED AND CONSTRUCTION OF THE PROJECT MAY NOT COMMENCE PRIOR TO APPROVAL OF THESE PLANS BY THE CITY ENGINEER WORKS DEPARTMENT AS EVIDENCED BY THESE SIGNATURES.”

For New Development projects, add the note “A PRE-CONSTRUCTION MEETING WITH THE CITY OF LEAGUE CITY ENGINEERING DEPARTMENT IS REQUIRED AT LEAST 10 WORKING DAYS PRIOR TO ON SITE CONSTRUCTION ACTIVITIES. CALL 281-554-1439 FOR A MEETING DATE AND TIME. A PRE-CONSTRUCTION MEETING FOR THIS PROJECT MAY NOT BE SCHEDULED AND CONSTRUCTION OF THE PROJECT MAY NOT COMMENCE PRIOR TO APPROVAL OF THESE PLANS BY THE CITY ENGINEER AS EVIDENCED BY HIS SIGNATURE.”

At a minimum, a copy of the approved preliminary plat should be included with the construction plans.

Key overall layouts may be drawn at a scale of 1” = 100’ or 1” = 200’. Major thoroughfares (Arterials and Collector level streets) or special intersection plan and profile sheets should be drawn at a scale of 1” = 2’ vertical; 1” = 20’ horizontal and plan. Minor streets and easements plan and profile should be drawn at a scale of 1” = 5’ vertical; 1” = 50’ horizontal and plan, or 1” = 4’ vertical; 1” = 40’ horizontal and plan.

Details of special structures and standard details, such as stream and gully crossings, special manholes, etc., should be drawn with the vertical and horizontal scales equal to each other.

Temporary benchmarks and NGS datum shall be described on each sheet and be tied to the City’s existing Benchmark system.

Label each plan sheet as to street widths, right-of-way widths, pavement width and thickness, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities type, location, etc. Provide spot elevation for top of pavement. Add note to the paving sheet: Contractor shall notify Engineer if any grading discrepancies are found in the existing and proposed grades prior to placement of pavement or utilities.

Stationing must run from left to right, except for short streets or lines originating from a major intersection where the full length can be shown on one single plan and profile sheet.

A north arrow is required on all sheets and should be oriented either upward or to the right. It is the intent of this requirement that all stationing should start from cardinal points of the compass and increase as construction moves to the North or East.

Show all lot lines, property lines, right-of-way lines, and easement lines, where obtainable provide property addresses. Include finished floor elevations for lots within project area.

If a roadway exists where plans are being proposed to improve or construct new pavement or to construct a utility, this roadway should be labeled as to its existing width, type of surface, and base thickness.

All existing utility lines four inches in diameter or larger within the right-of-way or construction area should be shown in the profile view. All utility lines, regardless of size, should be shown in the plan view.

Show flow line elevations and direction of flow of all existing ditches.

Show natural ground profiles at each right-of-way or easement lines. Centerline profiles will be satisfactory for right-of-way or easements, except where there is a difference of 0.50’ or more from one right-of-way or easement line to the other.

Resolve all construction conflicts of proposed utilities and facilities with existing or future utilities or facilities.

All street and/or road alignments shall be shown on plans. Plans shall be drawn to accurate scale, showing proposed pavement typical cross section and details, lines and grades, and all existing topography within the street right-of-way; and at intersections, the cross street shall be shown at sufficient distance in each direction along the cross street for designing adequate street crossings and future extensions.

Grades should be labeled for the top of the curb except at railroad crossings. Centerline grades are acceptable only for paving without curbs and gutters. Curb return elevation for turnouts shall show in the profile. Gutter elevations are required for vertical curves where a railroad track is being crossed.

The surface elevation at the property line of all existing driveways should be shown in the profile.

Roadway intersections plus an additional 50 feet on both sides of the intersection, shall fall within one plan sheet. Split the intersection in any way at a match line will not be allowed within 50 feet of an intersection.

The design of both roadways is required on all pavement sections with an esplanade. Station all esplanade noses, both existing and proposed.

Station all P.C.’s, P.T.’s, radius returns, and grade change P.I.’s in the profile with their respective elevations.

ITEM 303 GENERAL UTILITY LOCATIONS

Water mains, sanitary sewer lines, and storm sewer lines shall be located within a public right-of-way or within an abutting dedicated easement specified for the exclusive use of the particular utility. These municipal utilities shall not be located in combination easements without the specific approval of the City Engineer.

All other utilities: electric, gas, communications, and cable TV should be located in perimeter lot easements and back-to-back lot easements wherever possible. These utilities shall not be located in a public right-of-way or a specified easement, prohibiting its use, without the approval of the City Engineer. The locations of these utilities within general utility easements shall be in accordance with the “Standard Details.” The location of these utilities within a public right-of-way or specified

easement shall be considered for approval, on an individual basis, by the City Engineer. It is expected that all utilities will be placed underground unless specifically approved otherwise.

ITEM 304 EASEMENT REQUIREMENTS

For Municipal Utilities a minimum of ten feet (10') is required for front and side utility easements. A minimum of fourteen feet (14') is required for multiple-use easements located along shared back lot lines (seven feet (7') on either side of the lot line). A minimum of seven feet (7') may be accepted along back lot lines in certain circumstances as deemed appropriate by the City Engineer.

Utility easements shall be located adjacent to and contiguous with public or semi-public street right-of-way wherever possible and be dedicated for the purpose of constructing, reconstructing, and maintaining the specified utility or general utilities. Utility easements may be fenced by the builder, developer, or subsequent property owner. The City or utility company shall have the right to remove said fence for the purpose of entry into the easement and shall not bear the responsibility for replacement of landscaping features, irrigation systems, buildings, fences, nor for the care and preservation of same.

Drainage easements shall be dedicated for the purpose of constructing, reconstructing, and maintaining open ditch, channel/swale facilities, and conduit drainage systems. Drainage easements shall be maintained unobstructed of all improvements.

304.1 Water System Easements.

Dedicated waterline easements shall be restricted to water-mains and appurtenances only. Location of and required widths of easements shall be determined on a case-by-case need. The minimum easement width for waterlines shall be ten feet (10').

Public fire hydrants located outside of public rights-of-way, waterline or utility easements shall be encompassed by a ten-foot (10') easement and be contiguous of waterline easement. Fire hydrants shall not be located in water meter easements.

Water meter easements shall be provided in accordance with ITEM 406, "Location of Water Meter Service."

304.2 Sanitary Sewer Easements.

Dedicated sanitary sewer easements shall be restricted to sanitary sewer lines and appurtenances only. Location of easements shall be determined on a case-by-

case need. The total width of the easement shall be at least twice the sewer diameter plus the depth of the proposed sewer, but not less than fifteen feet (15') unless adjacent to a City ROW which then the minimum sewer easement width shall be ten feet (10').

304.3 Storm Sewer Easements.

Dedicated storm sewer easements shall be restricted to storm sewer lines and appurtenances only. Storm sewer easements may be located along side lots for outfall pipes, swales, and structures only. The basic minimum width shall be fifteen feet (15') with storm sewers centered in the easement. For storm sewers greater than forty-two inches (42") in diameter, the minimum width of easement shall be twice the diameter plus ten feet (10').

304.4 Drainage Easements.

Channels/Drainage Ditches

One of the most important considerations in the design of flood control and drainage facilities is the right-of-way or easement necessary for long-term operation and maintenance. The easement width shall be determined by the width necessary for the channel combined with the adjacent berm areas required for channel maintenance. Minimum widths required for earthen channels and concrete-lined channels are presented in the Master Drainage Plan. All major drainage channels shall be dedicated as right-of-way in fee simple.

Generally, right-of-way or easement dedication requirements are in accordance with the ultimate drainage requirements for the area as defined by the Master Drainage Plan for a watershed developed by the City of League City.

SECTION 400 WATER DESIGN STANDARDS

ITEM 401 GENERAL

This section covers the design and construction of potable water distribution facilities including water mains, flushing valves, and service connections. In addition to these standards, all public drinking water systems will be provided in accordance with the current guidelines promulgated by TCEQ, The Texas Administrative Code, and local requirements.

All potable water distribution systems, including pump stations, mains, ground and elevated storage, shall be designed, installed and constructed in accordance with current AWWA Standards, with reference to materials used and construction procedures to be followed. Fire flow for water systems shall be designed to comply with the City's current edition of the International Fire Code.

Construction plans are required for all water mains. A profile is required for all water mains 8 inches or larger, or for 4 inches or larger water mains/services when any of the following circumstances exist:

- Crossing and/or within corridors where there are several existing utilities present and the space available for the water main is limited;
- Crossing an arterial roadway;
- Creek crossings;
- By other than open cut crossings;
- Gas line crossings;
- Transmission main crossings; and/or,
- Other circumstances requiring special design considerations.

All water distribution systems shall be designed and constructed so as to provide at all times a minimum residual pressure of 20 psi under combined peak day and fire flow conditions for the system. Under normal operation conditions, minimum pressures should be not less than 35 psi. Working design pressure shall be 65 psi.

The system shall be provided with sufficient valves and fire hydrants so that necessary repairs can be made without undue interruption of service over any considerable area and for the purpose of flushing the system. Ninety (90) degree bends are not allowed, unless approved by City Engineer. Two 45-degree bends in a series shall be separated by a distance of five pipe diameters instead of a 90-degree bend.

Water mains shall be sized and extended through the limits of a development to provide a connection for ultimate development of adjacent properties. The distribution system shall be designed to provide effective circulation of water, where dead ends are necessary as a stage in growth of the system; the dead-end fire hydrants shall be located and arranged to accommodate future connections with adequate circulation. Approved temporary dead-end mains shall be identified with a blue dead end fire hydrant. Approved permanent dead-end mains shall be identified with a red dead end fire hydrant.

Connections to existing water mains (4-inch and larger), shall be designed with a tapping sleeve and valve. If requested, size on size taps may be allowed by the City Engineer under certain circumstances. If allowed a full body tapping sleeve will be required.

In accordance with American Water Works Association (AWWA) standards and manuals of practice, combination air release/vacuum valves shall be installed in locations such to exhaust trapped air from the water distribution system. These locations include, but are not limited to, high points, the downstream side of mainline valves, increased downslopes or decreased upslopes, long ascents or descents, and the beginning and end of horizontal runs. Refer to AWWA M51 for all suggested locations and sizing for testable, combination air release/vacuum valves.

An approved backflow preventer shall be installed on each non-residential and multi-family service line to a customer's system at or near the property line. Backflow preventer may be allowed immediately inside the building being served with prior approval from City Engineer.

Gate valves are allowed for main sizes 4-inch through 24-inch. Manufacturers and models shall be in accordance with the City's Approved Product List. 24-inch gate valves require spur gearing and shall be horizontally mounted.

Valves larger than 24-inch (I.D.) shall be butterfly valves, unless approved by City Engineer. All butterfly valves 24-inch and larger with a gear box must be enclosed in manholes or vaults. The size of the manhole or vault lid shall be adequate to access and remove or service the valve, gear box, and sleeve from the enclosure. The valve must be installed with a sleeve to allow removal of the valve and must be mechanically thrust anchored with stainless all-thread or other approved system.

Water main markers shall be included in the construction of water mains every 500 feet per standard details. Auto-Flushers shall be installed on all dead-end water mains 16 inches and larger. Water quality devices should be included as needed to ensure TCEQ water quality can be maintained.

ITEM 402 WATER MAIN SIZING

Water mains shall be eight inches or greater in diameter. Standard sizes shall consist of the following diameters (in inches): 8, 12, 16, 18, 20, 24, 30, 36, and multiples of 6-inch thereon. Listed below is a minimum recommendation and should be exceeded when the design engineer deems it necessary. The use of 4" and 6" water mains shall be addressed on case-by-case basis.

Residential development submittals shall include the total number of units and the total acres of the proposed development. Non-residential development submittals shall include estimated water use records showing the minimum hourly demand, maximum hourly demand, maximum daily demand, total building square footage, and the total acres for the proposed development.

Water mains shall be sized to meet “Maximum Hour,” or “Maximum Day” plus Fire Flow, whichever is greater. Full consideration shall be given to fire flow requirements as superimposed upon the maximum day conditions, elevation, and the type of development proposed, in arriving at the final water main capacity. Water mains shall be sized to have maximum velocities of 8 fps for maximum daily demands and maximum velocities of 10 fps for combined maximum daily demand and fire flow demands.

If use is approved by City Engineer, six-inch lines may be a maximum of one-thousand feet in length when supported at both ends by larger lines. Six-inch lines shall support no more than one fire hydrant.

Eight-inch lines are used for normal distribution. Water mains serving more than two fire hydrants must be a looped system. Looped water mains through the site shall be connected to two different existing water mains to provide system redundancy. Eight-inch lines may support more than one intermediate fire hydrant. Temporary dead-end eight-inch lines, when necessary, as extension of subdivision sections occur, shall be no more than five hundred feet in length with a temporary fire hydrant at the end per detail 33 14 19-03 (End of Line Fire Hydrant and Valve for Future Line Extension).

Twelve-inch and larger lines shall be used where the Design Engineer or City Engineer determine it necessary or for future extension.

ITEM 403 LOCATION OF WATER MAINS

All water mains shall be located within a public right-of-way, dedicated waterline or utility easement. Water mains within State Right-of-Ways shall only be used for crossing.

Water mains should not be installed closer than nine feet, horizontally, to any wastewater facility. See Item 503.1, Separation Distance and City of League City detail 33 00 00-01 (Sanitary Sewer Installation Crossing or Parallel to Water Line) for further information. In cases where the nine-foot separation cannot be met; the water-main location shall comply with TCEQ requirements.

403.1 Easements

See Item 304.1 – Water System Easements

403.2 Rights-of-Way

The following table indicates the maximum distance from the right-of-way line that a pipe can be installed based on right-of-way width and pipe size.

Table 403-1

Width of Right-of-Way (ROW)	Pipe Size	Maximum Distance between Main & Back of Curb
100 ft +	≤ 8 in	8 ft
	≥ 12 in	7 ft
80 ft	≤ 8 in	7 ft
	≥ 12 in	6 ft
70 ft – 60 ft	All	5 ft

When necessary, water mains may be located within the esplanade section of boulevard type streets. Mains should be located as near the centerline as possible to avoid conflict with future pavement widening and street lighting.

Along rights-of-way with open ditch drainage, all twelve-inch and smaller water mains are to be located five feet from the right-of-way line, and sixteen-inch and larger mains shall be located subject to the City Engineer's approval. When directed by the City Engineer or city engineering staff, all joints under pressure where cover is less than 4 feet shall have a restraining device as described in the City's details.

403.3 Depth-of-Cover

In an open ditch section, mains shall have a minimum depth of five foot of cover over the top of pipe. A variance of this depth of cover may be granted by the City Engineer in special cases. The following table summarizes the minimum depth of cover requirements:

Table 403-1

Pipe Size	Minimum Depth of Cover
≤ 12 in	4 ft
≥ 16 in	5 ft

Changes in grade to clear obstructions or underground features which result in a less than standard depth of cover over the top of pipe, a restrained joint section with a 4" thick by 2' wide protective blue dyed slab over the pipe will be used with the standard depth of cover maintained at each connection. This practice may be used until the top of the pipe is two feet below the sub-grade in roadway sections. When directed by the City, all joints under pressure where cover is less than 4 feet shall have a restraining device as described in the City's details.

403.4 Alignment

When a water-main is placed parallel to another utility line other than wastewater and at near the same grade, it shall have a minimum of five feet horizontal separation. When the other utility is a wastewater facility, the minimum horizontal space shall be

9 feet, measured from the outside diameter of the water and wastewater facilities. The wastewater facility that is parallel to a water main shall be installed in a separate trench. When the 9-foot separation distance cannot be achieved, water mains and wastewater facilities shall be separated per TCEQ Rules and Regulations. When a water main crosses another utility, a minimum of twelve-inch clearance should be obtained unless approved by the City Engineer.

ITEM 404 LOCATION OF VALVES

The water system shall be provided with sufficient block (gate) valves so that necessary repairs can be made without undue interruption of service over any considerable area.

Valve box caps shall be painted blue, and a “V” saw cut made on the adjacent curb.

All fittings shall be mechanically restrained using restrained fittings shown on the City’s Approved Water Materials List. Restrained lengths required beyond the fitting, valve, and other appurtenances shall be shown on the profile for water mains 12 inches and larger.

For main diameters less than 12 inches, all joints within 15 feet of fitting shall be restrained.

404.1 Spacing

The following table shows the maximum valve spacing based on the size of the water line.

Table 404.1

Pipe Size	Maximum Valve Spacing
6 in – 12 in	1,000 ft
16 in – 24 in	1,500 ft
≥ 30 in	Determined by City Engineer

At the intersection of all mains, a tee shall require three valves and a cross four valves.

404.2 Location

All lateral lines of less than thirty inches shall be valved within the street right-of-way or easement. Valve locations are normally along the street right-of-way line as projected across the main. Intermediate valves not located on the projection of the right-of-way line may be located on lot lines or five feet from fire hydrants. Tees shall have three valves and crosses shall have four valves unless approved otherwise.

Whenever possible, valves shall be anchored to adjacent fittings at tee and cross fittings and on fire hydrant leads. Valves shall not be used at the dead end of mains as a plug. New mains shall be connected with existing water mains with a valve and sections for future connections with a plug to avoid leakage when pressure testing.

All fire hydrants shall have an isolation valve as shown per Standard Details.

ITEM 405 LOCATION OF FIRE HYDRANTS

All fire hydrant locations must be approved by the League City Fire Marshal's office. All dead-end mains, where approved, shall terminate with a blue dead end fire hydrant. Bends and offsets are not permitted in fire hydrant leads unless approved by City Engineer.

Fire hydrants shall be designed to maintain sufficient water pressure for service to adequately protect public safety in residential area. The system must also be designed to provide firefighting capability to maintain a minimum pressure of 20 psi under combined fire, irrigation, and drinking water flow conditions.

405.1 Spacing

Residential or low risk areas; fire hydrants shall be installed within a maximum five hundred street feet of each other.

Higher risk developments (Mercantile Districts); fire hydrants shall be installed within a maximum three hundred feet of each other.

Fire hydrants should be located at street intersections where possible.

Preferred water line connections through and around cul-de-sacs can be found in the Standard Details.

405.2 Location

Fire hydrants should be located a minimum of three feet behind the back of curb or proposed future curb and set at the point of curve of the intersection curb radius.

On all state highways and open ditch roadways, fire hydrants shall be installed within three feet of the right-of-way line unless approved by City Engineer. Fire hydrants should also avoid the side slope of ditches, and fully reside on the top of bank.

Fire hydrants located between right-of-way intersections, whenever possible, shall be set on the lot lines as extended to the pavement; however, this location may be adjusted five feet to avoid driveways or other obstructions, in which case the fire hydrant shall be no closer than three feet from a curbed driveway or five feet from a non-curbed driveway.

If approved by City Engineer, fire hydrants may be located in the esplanade section of City streets if it is not feasible to locate them back of curb; in such case it is

preferable to locate the fire hydrant seven feet behind the esplanade back of curb to provide access for parkway mowers; but no instance shall they be closer than three feet.

Fire hydrants shall not be installed within nine feet vertically or horizontally of any wastewater line regardless of construction.

All fire hydrants shall have a 4”x4” 2 way blue reflective street marker placed per the following locations: on un-striped roadways, blue markers shall be set in the center of the roadway; on undivided striped roadways, blue markers shall be set 6” to the hydrant side of the center stripe; on divided roadways, the blue marker shall be set 6” to the side of the lane striping which is closest to the hydrant; in locations where hydrants are situated on corners, blue markers shall be installed on both approaches which front the hydrant. Manufacturers and models shall be in accordance with the City’s Approved Water Materials List.

Adjustments in the location of fire hydrants after acceptance of the distribution system shall be provided in accordance with current city policy. Plans shall be submitted to City Engineer for approval.

405.3 Depth of Bury

The depth of bury for all hydrants shall be per the City details. If at any time the finish grade is lowered or raised, it shall be the responsibility of the individual who caused the grade to be adjusted to adjust the hydrant.

ITEM 406 LOCATION OF WATER METER SERVICES

Meters may be in water-main easements or at the right-of-way line provided the location is such that the accessibility and protection of the meter is provided. Service meters within private property that are 2" and smaller should be set in a separate easement with minimum dimensions of 5'x5' and shall be located in easily accessible areas but protected from traffic behind curbed sections.

Service meters within private property that are 3" and larger shall be set in a separate easement with minimum dimension of vault width plus 4' and shall be located in easily accessible areas but protected from traffic behind curbed sections unless approved by City Engineer.

The location of the service lines shall be designated on the construction plans for informational purposes only in the appropriate location to serve the future meters. Water meters shall not be located in residential driveways. Water meters should avoid non-residential property driveways whenever possible.

All apartments or townhomes proposed in a private street development shall install meters as directed and in compliance with League City Standard Detail Drawings or as approved by the City Engineer.

ITEM 407 MATERIALS

Materials shall be stored, handled and used as described under ITEM 105, "Control of Materials." All pipe installed within dedicated public rights-of-way or easements shall be PVC water pipe AWWA C 900 (DR 18) for sizes 4" through 24"; If allowed by City Engineer, ductile iron pipe Class 52 may be used for sizes 4" thru 36"; All service connections 3/4" thru 2" shall be polyethylene tubing in conformance with material specifications set out herein. AWWA approved alternative pipe material will be considered with prior approval from City Engineer.

The use of manufactures names and catalog numbers that may be used to describe various products is not intended to be proprietary, but merely to clearly indicate the respective type of material that can be accepted. Submittals for product acceptance must be directed to the City Engineer by the EOR representing the Developer, accompanied with a letter from the EOR stating that the material meets City standards. Contractor submittals will not be accepted.

The City of League City reserves the right to engage, at any time during the progress of the work, a Material Testing Laboratory to test and inspect all pipe and accessories.

ITEM 408 TRENCHLESS CONSTRUCTION

Roadway crossings under existing pavement shall be placed by jacking and boring, unless special permission is granted by the City Engineer. The installation of lines under private driveways in rights-of-way shall be placed by jacking or boring unless special permission is granted by the property owner. All lines placed by jacking or boring shall consist of smooth-wall pipe with welded joints and seams and shall be continuous. Restrained service connections may omit casing if service material is continuous, without joints, and is a smooth wall pipe or tubing. Only straight pipe alignments for both horizontal and vertical alignment are allowed. Utility bores shall, where practicable, be located at approximately right angles to ROW, streets, and alleys. All bores shall have a vertical profile on the construction plans.

Construction shall be made in such a manner that it will not interfere with the operations of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure.

408.1 Auger Boring

Engineers should consider the location, size, and depth of boring and receiving pits when choosing the beginning and ending stations for boring. The location of the bore/jacking pit and receiving pit shall be shown and dimensioned on the plan and profile views of the utility construction plans. Size of the bore pit and receiving pit shall be adequate to accommodate the boring/jacking equipment and the pipe joint lengths being used. Wet bore crossings are not allowed.

A bore pit typically exceeds 20 feet in length to accommodate one joint of pipe. Bore pit width varies depending on the depth and size of pipe, with the narrowest width approximately 5 to 7 feet. A profile is required for all bores greater than 20 feet in length for mains larger than 4 inches.

Auger boring shall be designed in accordance with the Standard Details. The anticipated size and location for all bore pits should be included in the design for the main and shown on the drawings. Launching pits shall be located at the lower elevation end of the tunnel.

Water mains shall include valves at each side of a cased bore or tunnel within effective distances at each side of the crossing to allow isolation of the water main within the bore. Valves and fitting shall be at least 20 feet on each side of casing unless pre-approved by City Engineer.

Casing pipe length shall be determined by the respective governing authority. Plan and profile view of the bore shall include all existing utility lines, trees, signs, guidelines/wires, light poles, and other obstacles.

ITEM 409 CONDUIT LAYING

All conduits shall be laid and maintained in the required lines and grades, with all appurtenances at the required locations. Allowable joint deflection shall be designed to one half of the published manufacturer's accepted joint deflection allowance.

All recommendations of the manufacturer shall be carefully observed during handling and installation of each material. During handling and placement, materials shall be carefully observed and inspected, and any damage, defective, or unsound materials shall be rejected and removed from the job site.

409.1 Conduit Bedding and Embedment.

Except where otherwise approved by the City Engineer, all pipes, boxes, and appurtenances shall be installed in a continuous envelope of specified bedding material. Specified bedding material for drainage structures shall be cement stabilized sand, extending from a minimum 6" below to minimum 1' above the outer part of the conduit (see Detail 33 05 06 – 04), extending for the full width between the undisturbed trench walls. The bedding material required beneath the conduit shall be placed, graded, and tamped to the conduit sub-grade profile over the entire width between undisturbed trench walls and cut-outs made for the projection of the pipe bells.

The conduit shall be placed and adjusted to proper grade on this prepared bedding, then jointed, braced and blocked, as required. After conduit is graded into place, bedding material shall be placed simultaneously on both sides of the conduit and

worked carefully into place without disturbing the conduit alignment, in accordance with Detail 33 05 06 – 04.

806.3 Assembling Conduit.

Assembly shall meet the manufactures recommendations for conduit and accessories being used. Unless otherwise directed, conduits shall be laid with bell ends facing up-grade.

All connections shall be watertight and made so that a smooth uniform flowline will be obtained throughout the system.

ITEM 410 APPROVAL AND ACCEPTANCE

When the work provided for in the plans and specifications has been satisfactorily completed and all clean-up work has been performed, as provided elsewhere in these specifications; the inspector assigned to the work will notify the City Engineer to make the "Final Inspection." Such inspection will be scheduled within 7 business days after such notification. "Final Inspection" by League City representatives shall be concurrent with the final inspection by representatives of the Developer, EOR, contractor, and other authorities whose approval is necessary for the proper use of the facilities. All deficiencies that are noted shall be corrected to the approval of all the authorities involved.

When formal acceptance is required, the Developer shall submit to the City Engineer the following items (in pdf format): The Developer's Request for Acceptance of the work, Engineer’s Certificate of Completion, Summary of Infrastructure Cost, and "As Built Drawings" along with a warranty bond for the public infrastructure.

Neither formal acceptance by City Engineer nor any action by a representative of the City shall relieve the Developer/Contractor of the obligation for fulfillment of the warranty of the work.

The Developer, the contractor and/or surety will be required by the City to repair, replace, restore and/or make to comply strictly in all things with these specifications and the plans and any and all work and/or materials, which within a period of two years from and after the date of formal City Acceptance of any such work or material, are found to be defective or to fail in any way to comply with these specifications. Effective date for beginning two-year guarantee shall be the date of issuance of the formal Acceptance Letter or date of issuance for the permit of occupancy for the facility. Should the developer/Contractor fail to remedy the defects as outlined herein within a reasonable length of time, the City may have such work done and charge the cost to the Developer/Contractor or the surety company.

SECTION 500 WASTEWATER DESIGN STANDARDS

ITEM 501 GENERAL

These standards for wastewater collection systems have been adopted to establish criteria compatible with existing state statutes pertaining to effluent quality, and to provide facilities which will be designed in accordance with good public health and water quality engineering practices. In addition to these standards, all wastewater systems will be provided in accordance with current guidelines promulgated by The Texas Department of Water Resources of the Texas Commission on Environmental Quality.

It will be the responsibility of the EOR to show capacity calculations on plans and in provided reports. Wastewater facilities will be designed considering the estimated contributing population to be served in the future. The peak flow of domestic sewage, peak flow of waste from industrial plants, peak flow for institutional and commercial flows shall be considered in determining capacities. Strict attention shall be given to minimizing infiltration/inflow into the system.

The use of pressure sewers may be considered when justified by unusual terrain, low population density, or other circumstances where a pressure system would offer an advantage. A pressure system will not be considered a substitute for a conventional gravity system.

Onsite Sanitary Sewer Facilities (OSSF) installation and approvals shall be in accordance with Galveston County Health Department and other regulatory authorities.

ITEM 502 SANITARY SEWER LINE SIZING

All sewer lines installed shall be at a size to conform to designs permitting an orderly expansion of the City's wastewater system. A sanitary sewer design report will be required, and applicable design details shall be included on the construction plan set. The design shall avoid a duplication of lines in the future. The first cleanout off of the sewer main is the demarcation point between public and private gravity sewer pipes.

No sewers other than individual service connections and force mains shall be less than eight (8) inches in diameter unless approved by the Director of Engineering.

Six (6) inch service connections shall not serve more than two single family lots or more than six (6) dwelling units.

City Engineer may allow four (4) inch gravity sewer services in limited special cases including infill development. Four (4) inch services will be considered the property of those which they serve.

ITEM 503 LOCATION OF SANITARY SEWER LINES

All public sewers shall be located in public rights-of-way, sanitary sewer easements, and utility easements. Non-sanitary sewer easements or fee strips, such as pipelines, power utility easements, drainage easements, railroad, etc., are in and of themselves insufficient and not acceptable to permit the installation of sanitary sewers or force mains. Sanitary sewer lines installed in sanitary sewer easements shall be centered in the easement unless instructed otherwise by the City Engineer.

Sewers should be installed in straight alignment with uniform grade between manholes. Wastewater markers shall be included in the construction of sanitary sewer per standard details.

503.1 Separation Distance

When sanitary sewers are installed parallel with existing or proposed water lines and their appurtenances, they shall be installed no closer than nine (9) feet horizontally, pipe wall to pipe wall, and must be installed in separate trenches. All sewer and water line crossings shall comply with the TCEQ Chapter 290, Subchapter D, Rule 290.44 (e) (B), Public Drinking Water, New Waterline Installation-Crossing Lines, paragraphs (i) through (vi) and all sub paragraphs therein.

Sanitary sewer lines shall not be installed within nine (9) feet clear horizontally of a fire hydrant, regardless of construction.

When a sanitary sewer is placed parallel to another utility other than water, it shall have a minimum of five (5) feet horizontal separation unless approved by the City Engineer.

Minimum clearances between lines that cross each other shall be determined by the amount of bedding and backfill required as shown on the details in the given set of plans.

503.2 Depth-of-Cover.

The sanitary sewer should be laid with the top of the pipe a minimum of three and one-half (3 1/2) feet below the surface of the ground. Where this minimum cover is not possible, City Engineer may allow special material thickness class design or casing evaluated on a case-by-case basis.

503.3 Slopes and Velocities.

All sewers shall be designed and installed with hydraulic slopes sufficient to give a velocity when flowing full of not less than 2.0 feet per second or more than 10.0 feet per second. The design and installed grades shall be based on Manning's Formula and an "n" factor of 0.009 – 0.011 and shall be the minimum acceptable slopes.

The minimum grades for sanitary sewers shall be as follows:

Pipe Size	Minimum Slope
8”	0.40%
10”	0.30%
12”	0.24%
15”	0.17%
18”	0.14%

All grades shall be shown to the nearest one hundredth percent (0.01%). When the slope of a sanitary sewer main changes, a manhole will be required. Gravity sanitary sewer mains must be uniform in grade between manholes. No vertical curves will be allowed.

ITEM 504 LOCATION OF MANHOLES

Manholes shall be placed at points of changes in alignment, grade or size of sewer, and at the intersection of sewers and the end of all sewer lines.

The maximum manhole spacing for sewers with straight alignment and uniform grades shall be five hundred (500) feet.

Manholes shall be installed where a sewer main crosses a street.

Force main discharge manholes shall be located at least one hundred and fifty (150) feet from occupied structures, unless otherwise approved by City Engineer.

In special cases and upon approval by the City Engineer, manholes may be used as cleanouts at the end of service lines shall be considered as an extension to the system and will require plan and profile engineered drawing. Any service lead past said manhole will be considered private.

ITEM 505 LOCATION OF SERVICE LEADS

Sewer service leads shall be installed integrally with the construction of the sewer main whenever possible. Service leads shall end with a cleanout located at the right-of-way. Service leads which are 8-inch and larger shall have a manhole at the right-of-way instead of a cleanout. All manholes constructed on city mains for the purpose of providing private service shall be designed to COLC standards and the construction plans shall be approved by the City Engineer and inspected by the Public Works Department. A 48-hour notification is required before construction begins and/or needed inspections of the work performed.

Service leads shall be installed as nearly perpendicular as possible to the sewer main and the lot line. Service leads shall be kept as free from bends as conditions will permit. If bends are required for the installation of the service, a cleanout or manhole shall be required at all horizontal and vertical changes in direction and installation shall meet the minimum requirements as outlined in the City's adopted Building Code(s).

Stacks shall be installed for service leads on all sewer mains having a depth of six (6) feet or greater.

Single service leads shall have a clean-out and plug adjacent to a lot line or double service at each second lot line of both lots. Clean-out and plug will be located at the right-of-way line or easement line. Double service leads shall include a wye with cleanout be installed per Standard Details. An "X" saw cut shall be made on the adjacent curb where clean-outs are located. The "X" should be painted green.

Service leads from commercial/industrial developments with more than 5,000 gal/day discharge shall discharge directly into a proposed or existing manhole.

ITEM 506 GREASE, SAND, OIL, AND LINT INTERCEPTORS

Establishments classified as serving food individually, in bulk, or carry out and served in boxes or on plates and washaterias shall have a Park Equipment Grease Interceptor Series GT (DWG NO. GT-1 or 2) or approved equal, installed. Size of interceptor shall be determined by the developers' engineer and shown on plans. Engineer shall supply all design calculations and paperwork on interceptor sizing.

Car washing establishments shall have a Park Equipment Sand /Oil Interceptor (DWG NO. SOCMP-1) or approved equal, installed. Developers' engineer shall determine that the size is adequate for proposed car wash and shall present any design calculations and paperwork stating so.

Establishments that require an interceptor or separator shall have a Park Equipment Sample Well Basin (DWG NO. SWB 15) or approved equal, installed.

Sample wells shall be placed after required equipment on private property and before any other adjoining sanitary service lines.

ITEM 507 MATERIALS

All pipes for gravity sanitary sewer lines installed within dedicated public rights-of-way or easements shall be in accordance with the material specifications set out herein.

The use of manufacturers' names and catalog numbers, as may be used to describe various products, is not intended to be proprietary, but merely to clearly indicate the respective type of materials that can be accepted. The use of other materials and products will require approval prior to installation. Submittals for product acceptance must be submitted to the Engineering Department by the EOR representing the Developer. Contractor submittals will not be accepted.

507.1 Iron Pipe and Fittings

Iron mains are not typically allowed unless approved by City Engineer. If allowed iron pipe shall be bell and spigot joints where possible. Other jointing may be necessary for special applications when approved by the City Engineer.

All pipe and fittings shall be wrapped with 8 mil (min) polyethylene film meeting ANSI/AWWA C 105 with all edges and laps taped securely to provide a continuous and water-tight wrap.

507.1.1 Ductile Iron Pipe

Iron mains are not typically allowed unless approved by City Engineer. If allowed, ductile iron pipe and fittings for pressure and gravity sewer applications shall be provided in accordance with City technical specifications. Ductile iron sewer pipe shall be thickness class 50 for pipes from 3" to 24" and Pressure Class 350 for 30" to 64".

507.2 Polyvinyl Chloride (PVC) Gravity Pipe and Fittings

PVC pipe shall meet the requirements of ASTM D 3034 (SDR 26) for sizes 6" through 15", and ASTM F 679 (wall thickness T-1) for sizes 18" through 27". All PVC fitting shall be solid molded (no glue and heat fabrication) for sizes up to 15", for sizes over 15" product specifications shall be submitted for approval.

PVC gravity pipe and fittings shall be green in color and installed in accordance with UNI-B-5-86 and as specified herein.

507.3 Polyvinyl Chloride (PVC) Pressure Pipe

PVC pressure pipe shall meet the requirements of AWWA C900 (DR 18) for sizes 4" through 36". The pipe shall be made of PVC plastic having a cell classification of 12454 B as defined in ASTM D 1784. Pipe and fittings shall be accordance with City specifications and shall be green in color.

507.4 Triple Wall and Dual Wall Polypropylene Gravity Pipe and Fittings

Polypropylene Dual and Triple Wall Pipe for use in gravity flow sanitary sewer shall be in strict accordance with the requirements and test methods of ASTM F2736 – "Standard Specification for (6 inch to 30 inch) Polypropylene Corrugated Single Wall pipe and Double Wall Pipe" and ASTM F2764 – "Standard Specification for (30 inch to 60 inch) Polypropylene Triple Wall pipe and Fittings for Non-Pressure Sanitary Sewer Applications". Pipe shall have a green stripe impregnated within the pipe.

Triple Wall Pipe shall consist of a smooth inner wall and outer wall separated by annular corrugations manufactured in accordance with ASTM F2764.

Dual Wall Pipe shall consist of a smooth inner wall and outer wall annular corrugations manufactured in accordance with ASTM F2736.

12-inch to 60-inch diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer.

Pipe shall have a minimum stiffness of 46 psi when tested in accordance with ASTM D2412 "Test Method for External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading".

507.5 Fiberglass Reinforced Plastic Pipe

Where the application of fiberglass reinforced plastic pipe is approved by the City Engineer, pipe shall be equal to that manufactured by HOBAS Pipes with a minimum stiffness class 72. Pipe shall be green or have a green stripe or placement of sanitary marker tape above the pipe.

Applications of fiberglass reinforced plastic pipe will only be considered for gravity sewers sizes 18" and larger. Smaller pipe sizes shall not be accepted.

507.6 High-Density Polyethylene Pipe

Polyethylene pipe shall be made from HDPE material having a material designation code of PE4710 or higher. The material shall meet the requirements of ASTM D 3350 and shall have a minimum cell classification of PE445474C. In addition, the material shall be listed as meeting NSF-61.

The pipe and fittings shall meet the requirements of AWWA C906.

The HDPE pipe shall be rated for use at a pressure class of 250 psi. The outside diameter of the pipe shall be based upon ductile iron pipe size sizing system.

The pipe shall be marked in accordance with the standards to which it is manufactured. Color identification by the use of stripes on the pipe to identify pipe service shall be required and colored green for wastewater.

507.7 Manholes

Manholes shall be constructed of pre-cast concrete sections or when and where approved concrete cast-in-place. Detailed drawings of various types and sizes of manholes are included in the "Standard Details" and each manhole shall be constructed in strict accordance with these drawings. Manholes shall be installed vertical and symmetrically above sewer main. Offset manholes may be allowed if approved by City Engineer.

Manholes shall have inverts in them in which flow channels to the spring line of the pipes are constructed, inverts equal in depth to one-half the diameter of the pipes connected to that manhole. Where sewer lines enter the manhole higher than 6 inches but less than 24 inches above the manhole invert, the invert shall be filled and formed to prevent solids deposition. A drop pipe shall be provided in accordance to the "Standard Details" for a sewer main entering a manhole more than 24 inches above the manhole invert.

The top of a manhole shall be adjusted by the installation of pre-cast concrete rings. The maximum adjustment of the confined man-way shall be 18 inches.

Access steps shall not be installed in manholes.

All interior concrete above the manhole invert shall be coated complete with FE100 Thane coat, per manufactures recommendation, a minimum thickness of 25 mil.

507.7.1 Discharge Manholes

Force main discharge manholes shall be located at least one hundred and fifty (150) feet from occupied structures, unless otherwise approved by City Engineer. Force main discharge manholes shall be coated with approved system. Refer to detail for the drop force main entrance. Force main diameter up to 8-inch are covered by this standard, larger force mains will be a specific design submittal for approval by City Engineer.

507.7.2 Pre-Cast Concrete Manholes and Bases

Pre-cast reinforced concrete manholes and bases shall be manufactured in accordance with ASTM C 478. Steel reinforcement shall be in accordance with ASTM C 478 latest revision. Design loads shall be for H-20 live load and 16 kips wheel load. The section joint shall be a confined "O" ring rubber gasket, conforming with ASTM C 443. Manholes shall be furnished with formed holes for all planned connections with compression seals of pre-molded polyurethane pipe adapters.

507.7.3 Fiberglass Manholes

Fiberglass manholes are to be used in special situations only and must be approved by the City Engineer. If approved by the City Engineer, fiberglass manholes will be required to use Inserta-Tee.

507.8 Service Leads

All service leads shall be constructed per the City Detail. Sewer service leads shall be installed integrally with the construction of the sewer main, where possible, using "All Bell" gasket fittings. The minimum service connection shall be six (6) inches in diameter.

Direct taps on an existing PVC sewer main shall be made with a gasket PVC Saddle with stainless steel clamps, all bell Wye or Tee. Risers or vertical stacks shall be required for service leads to sewer mains six (6) feet and deeper. Connection fittings and pipe material shall be same as specified above.

Service taps into existing manholes shall be a minimum of 6-inches in diameter and be made by means of core cutting into the manhole with approved equipment. (Chipping into manhole will not be allowed.) The core cut shall be of sufficient size as to allow for 6-inch service line and approved gasket type (Link-Seal) sealing material.

Service leads and all fittings shall be Inserta-Tee only and installed in strict conformance with the "Standard Details."

507.9 Steel Pipe and Fittings

Steel carrier pipe and fittings shall be used for special installations only when approved by the City Engineer.

Steel Casing shall be used for gravity and pressure sewer lines bored or jacked. Sewer service connections may omit casing when pipe material used is

continuous, smooth wall, and without joints for the entire length of bore or jack. Metal liner plate shall be used for all tunneling.

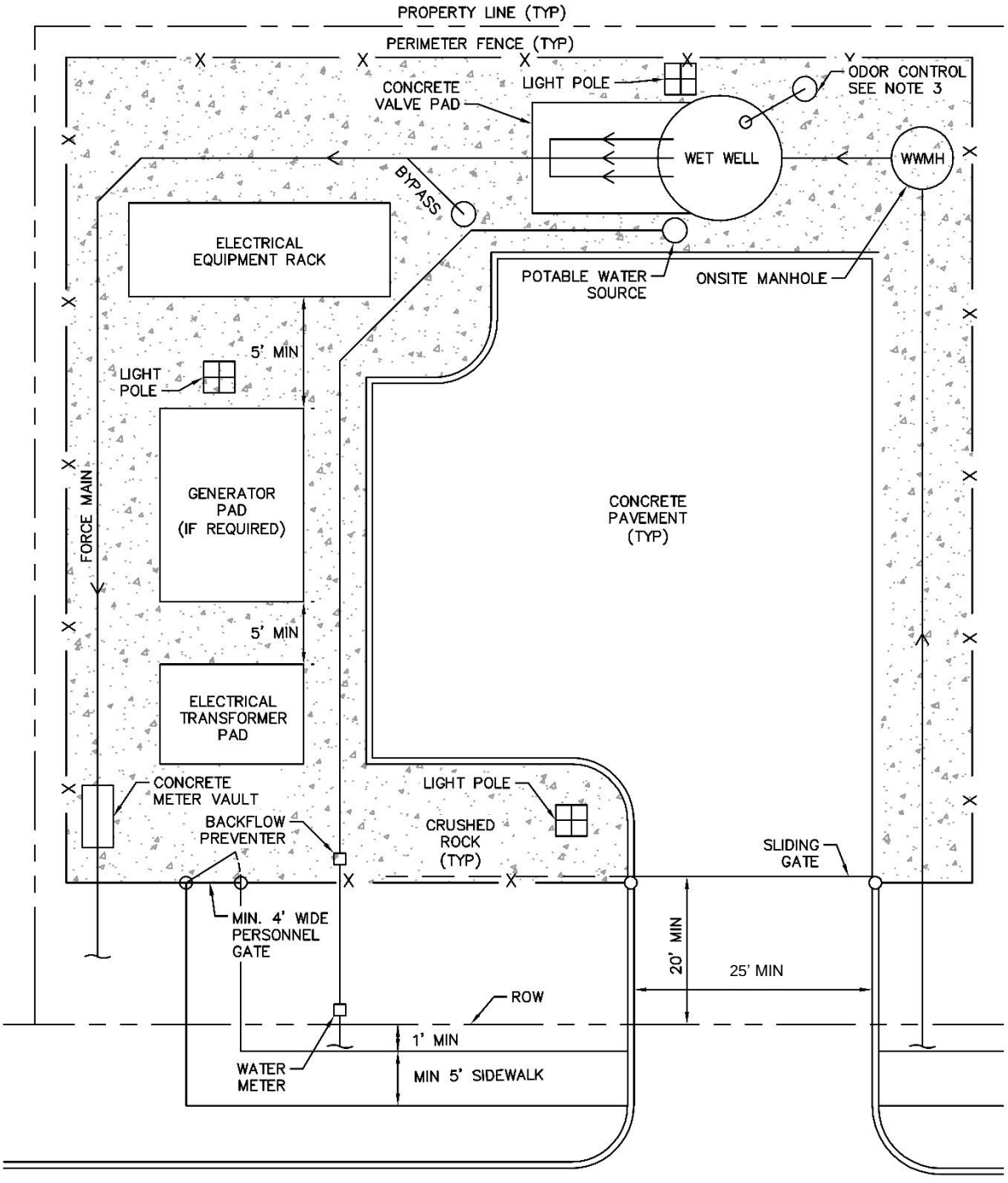
ITEM 508 LIFT STATIONS

Design and construction of lift stations, pumps, and motor control units shall be in accordance with current TCEQ Criteria and The City's "Lift Station Design Guidelines". Application and materials shall be approved by the City Engineer.

All lift stations shall be designed using wet pit submersible pumps, reinforced concrete or fiberglass wet wells with valve pad and flow meter vaults.

Permanent lift stations and all appurtenances shall be constructed on property dedicated to the city in fee simple. Temporary lift stations and appurtenances may be placed in a public easement. Whether a lift station is temporary or permanent shall be determined by the Public Works Department.

SECTION 508 - LIFT STATION SITE LAYOUT EXHIBIT (TYPICAL)



NOTES:
1. DESIGN ENGINEER TO ORIENT ELECTRICAL PANEL AND ODOR CONTROL DEVICE UPWIND FROM THE WET WELL BASED ON SITE PREDOMINANT WIND DIRECTION.
2. PROVIDE A MINIMUM OF 5' SPACING BETWEEN STRUCTURES.
3. ODOR CONTROL UNIT SIZE AND FOOTPRINT WILL VARY DEPENDING ON LIFT STATION SIZE.

508.1 Force Mains

Force mains shall be designed per 30 TAC §217. Plan and Profile drawings are required for force mains.

Force mains are to be installed at least 4 feet below finished ground surface, and higher than the gravity inlet line elevation. Force mains shall transition to a gravity line within a manhole via drop manhole as to minimize turbulence. The crowns of the force main and outlet gravity line shall match where possible, with bench grouting installed to direct flow into the outlet with a minimal change in the gravity flow angle to minimize turbulence.

The design should minimize the number of peaks and valleys along the force main profile to limit the accumulation of gases. All high points shall have a 2-inch minimum air and vacuum release valve rated for raw sewage. Combination Air/Vacuum Release Valves must be installed in a dry vault with a minimum inner diameter of 6 feet and with a minimum 30-inch access opening. Location of force main and air release valve within dry vault must be in a manner that will provide safe working space and safe access.

Isolation valves shall be required every 1,000-feet to help facilitate initial testing and subsequent maintenance and repairs.

The plan of record for project shall show GPS coordinates of all valves installed along force mains.

Force mains within a Lift Station shall follow requirements outlined in the City's Lift Station Design Guidelines.

The force mains pressure rating shall be at least 1.333 times greater than the pressure generated by instantaneous pump stoppage due to a power failure under maximum pumping conditions as determined by dynamic pressure analysis, but in no case shall be rated less than 150 psi. See City's Lift Station Design Guidelines for further information.

Minimum force main size will be 4-inch (except for grinder pumps); however, size force mains so that flow velocity is between three (3.0) and three and a half (3.5) feet per second (velocities slightly above 3 feet per second are recommended) with one pump in operation. Maximum flow velocities shall be four and a half (4.8) feet per second with two pumps in operation and six (6.0) feet per second with three pumps in operation. For lift stations with more than 2 pumps, flow velocities may be as low as two (2.0) feet per second with one pump in operation, but when three or more pumps operate a flow velocity equal to, or greater than five (5.0) feet per second must be generated.

ITEM 509 MAIN CONNECTIONS TO THE EXISTING SYSTEM

Unless otherwise approved by the City Engineer, all connections of a sewer main made to existing sewer mains shall be made at manholes, either existing or constructed by developers, with the crown of the inlet pipe being installed at the same elevation as the crown of the existing pipe. Extreme care shall be exercised to prevent material from depositing in the existing pipe as the core cut taps are being made.

When connections to existing mains are made, a temporary plug, that is a type approved by the City Engineer, must be installed in the manhole to prevent water and debris from the construction activity from entering the existing system before final acceptance. These plugs shall not be removed prior to final acceptance. After final acceptance of the work, the contractor shall remove these plugs immediately.

When required by Public Works Department all multiple taps and tie-ins to an existing sewer system shall be tested in accordance with the League City Specifications.

ITEM 510 APPROVAL AND ACCEPTANCE

Refer to Section 4, ITEM409 for the approval and acceptance process.

SECTION 600 RECLAIMED WATER DESIGN STANDARDS

ITEM 601 GENERAL

The following are the minimum Standard Design Criteria that must be met for all reclaimed water improvements in order to meet the requirements of 30 Texas Administrative Code (TAC) Chapter 210, 217, and 290, and current editions of the City of League City Subdivision Ordinance, the City of League City Policy for the Installation of Community Facilities, and City Code Chapter 35 to be approved for incorporation into the League City Reclaimed Water System.

Once a reclaimed water service agreement is executed for reclaimed water to be provided by the City, all public and privately owned and maintained reclaimed water mains must meet the requirements of the standard reclaimed water agreement set forth in City Code Chapter 35 as well as the requirements within 30 TAC Chapter 210.

Reclaimed water mains must be designed in accordance with acceptable engineering practices and must be labeled and separated from other mains to protect human health and the environment.

ITEM 602 RECLAIMED WATER MAIN SIZING

Reclaimed water lines shall be a minimum of 4-inches in diameter. Standard sizes shall consist of the following diameters (in inches): 4, 6, 8, 12, 16, 20, 24, 30, 36, and multiples of 6-inch thereon. The reclaimed water mains should be sized in accordance with applicable master plan established for that area, if available. If a master plan is not available, the sizing of the main must be based on engineering analysis of initial and future demand of the reclaimed water users. A Loading Analysis or Water Study shall be performed to determine the demand/loads created by proposed development and if any necessary improvements to the existing system to support the development are needed. Water demand calculations and assumptions should be submitted for review.

Reclaimed water main pipe design requires an additional allowance for transient pressures due to system operation. This allowance should be coordinated with the City Engineer to determine an appropriate pressure to be applied to account for possible transient conditions in the system.

Continuous supply of reclaimed water is not guaranteed. All system designs should incorporate provisions to accommodate an alternate supply, if needed.

An alignment walk with the City Staff and/or study may be required if the water main is outside of the public right-of-way. Reclaimed water mains 16-inch and larger in diameter will require an alignment walk.

ITEM 603 LAYOUT OF RECLAIMED WATER MAINS, SERVICE LINES, AND APPURTENANCES WITHIN RIGHT-OF-WAY

Location of all new reclaimed water mains shall be considered on a case-by-case basis generally on the opposite side of the street from any existing or proposed water mains. Reclaimed water mains should be located where maintenance can be accomplished with the least interference with traffic, structures, and other utilities. When mains are located outside of the right-of-way, they shall be within a dedicated reclaimed water main easement.

603.1 Valves

In general, valve locations for reclaimed water mains should meet the same requirements as water mains. Valves should be located at all reclaimed water main intersections and should typically be located within the street intersection at reclaimed water main crosses or tees. Valve locations shall align with projected property line, unless other locations are approved by the City Staff.

603.2 Service Locations

The preferred location for reclaimed water service lines is within the parkway in front of the right-of-way line, and adjacent to the opposite property line from the water service. Reclaimed water service lines should be separated a minimum distance of 9 feet from water service lines and 4 feet from the wastewater service lines as measured from the outside diameters of each line.

ITEM 604 RECLAIMED WATER MAIN SEPARATION FROM WATER AND WASTEWATER MAINS

In accordance with 30 TAC Chapter 210.25 requirements, where a reclaimed water main parallels a wastewater main, the reclaimed water main shall be constructed in accordance with subsection (1) of this section. The horizontal separation distance shall be 3 feet (outside diameter to outside diameter) with the reclaimed water main at the level of or above the wastewater main. Reclaimed water mains which parallel wastewater mains may be placed in the same benched trench. Where a reclaimed water main crosses a wastewater main, the requirements of Chapter 290.44 shall be followed, with "reclaimed water main" substituted in for "water main."

In accordance with 30 TAC Chapter 217.70 requirements, a Type I reclaimed water pipe must be at least 4 feet from a potable water pipe, as measured from the outside surface of each of the respective pipes. A physical connection between a potable water pipe and a reclaimed water pipe is prohibited. Where a 4-foot

separation distance cannot be achieved, a reclaimed water main must meet additional separation requirements set forth in 30 TAC Chapter 217.70.

ITEM 605 RECLAIMED WATER MAIN MATERIALS AND EMBEDMENT

All piping shall be manufactured in purple, painted purple, taped with purple metallic tape, or bagged in purple. Any exposed piping should be stenciled in white with a warning reading “Non-Potable Water”. Other material and embedment requirements for reclaimed water mains shall be as defined in the City’s Standard Construction Specifications and Details for water mains.

605.1 Trench Water Stops

If encountered during construction, or if groundwater is known to be present, trench water stops should be installed at 500-foot intervals to prevent migration of water within the water main trench, unless otherwise determined by the Engineer.

If a project is within the jurisdiction of the City Code Chapter 125 and the City Tree Ordinance, all onsite underground utilities with backfill other than onsite material shall have a trench water stop every 200 feet for the entire length of the utility placement.

ITEM 606 CONNECTIONS TO EXISTING RECLAIMED WATER MAINS

Connections are to be made in locations where existing valves can be closed to isolate the connection point while keeping as much of the surrounding system in service as possible. Cut-in tees are the preferred method of connecting a new reclaimed water main to an existing reclaimed water main. If this method is determined not to be feasible by the Water Department Staff, a tapping sleeve and valve may be used. Cut-in connections may require an additional valve on the existing main to reduce the number of service disruptions.

ITEM 607 GATE VALVE REQUIREMENTS

Spacing between valves for reclaimed water mains shall be at a minimum of every 1,500 feet, or as needed for operation of the reclaimed water system.

All new reclaimed water main connections (reclaimed water services, mains etc.) shall contain a valve at connections to an existing or proposed reclaimed water main. Unless approved by the City Engineer, only gate valves will be used in the distribution system for reclaimed water mains. The minimum size of gate valve allowed is 6 inches. Any valves needed for 4-inch or smaller connections should be increased with a 6-inch reducer fitting and 6-inch gate valve. All valves shall be installed in the vertical direction. No horizontal orientations will be allowed. Valves

must be placed perpendicular to the existing/proposed ground elevation. Valves shall open in the clockwise direction. Valve boxes shall be painted purple.

All valves that are 16-inches, or larger, shall be installed in a valve vault in accordance with City's Standard Construction Specifications and Details.

ITEM 608 CLEANING, TESTING, AND SAMPLING

In strategic locations along water mains, cleaning wyes shall be provided for passing cleaning pigs through the reclaimed water main to sweep trash, dirt and debris from the pipe. These wyes shall be supplemented with sampling points, as required, for testing of the reclaimed water main.

Locations for insertion of cleaning pigs and clean-out wyes shall be located on the construction drawings and in accordance with City of League City Standard Construction Specifications and Details. The Wastewater Department Staff will review the cleaning pig insertion locations and clean-out wyes on the drawings. Cleaning wyes should include a receiving cage to accommodate pressure differentials during pigging operations.

If reclaimed water is not available for cleaning and testing, provisions should be made in the construction drawings to temporarily connect the reclaimed water main to a potable water main. The temporary connection must include proper backflow prevention device to prevent a cross-connection, and the temporary connection shall be removed upon completion of testing.

All sampling points, including automatic flushing devices, shall be designed with a direct discharge connection to a wastewater main. The connection must include proper cross-connection design in accordance with TCEQ requirements.

ITEM 609 COMBINATION AIR VALVE ASSEMBLIES

In accordance with American Water Works Association (AWWA) standards and manuals of practice, combination air release/vacuum valves shall be installed in locations such to exhaust trapped air from the water distribution system. These locations include, but are not limited to, high points, the downstream side of mainline valves, increased downslopes or decreased upslopes, long ascents or descents, and the beginning and end of horizontal runs. Refer to AWWA M51 for all suggested locations and types of air release/vacuum valves. Table 609 includes general sizes of combination air valve assemblies but shall be verified by the Engineer.

Table 609-1: Combination Air Valve Assemblies

Water Main Size	Size of Relief Valve	Type of Relief Valve
16-inch and smaller	2-inch	Combination
24-inch to 30-inch	4-inch	Combination
36-inch	6-inch	Combination
42-inch	6-inch	Combination
48-inch	8-inch	Combination
54-inch and larger	8-inch	Combination

A smaller size relief valve may be used if calculations sealed by a Licensed Professional Engineer are provided to demonstrate that the smaller valve size is sufficient for system design.

Combination relief valves shall be installed in vaults in accordance with the City's Standard Construction Specifications and Details.

ITEM 610 BLOW-OFF ASSEMBLIES

Blow-off valves and vaults are required in the system to drain the mains and shall be placed at low points along transmission mains (16-inch and larger). Blow-off assembly valve sizes are shown in Table 610. Blow-off assemblies must be designed to discharge into a wastewater main manhole with an appropriate backflow prevention device to prevent a cross-connection. In addition, capacity of the receiving discharge wastewater main must be evaluated to determine whether the main has sufficient capacity to receive the addition demand.

Table 0-1: Blow-off Valve Size

Water Main Size	Size of Blow-off Valve
16-inch	6-inch
24-inch and larger	8-inch

ITEM 611 BACKFLOW PREVENTION DEVICE

A backflow prevention device shall be installed at each delivery point and discharge point to protect the reclaimed water system from potential cross contamination. Air gaps and reduced pressure principal backflow prevention assemblies are acceptable methods of backflow prevention for reclaimed water systems in accordance with 30 TAC Chapter 290.47(f), effective July 30, 2015. The Engineer is responsible for adhering to the most current version of these requirements.

ITEM 612 HOSE BIBS AND FAUCETS

The language in this section is a summary from 30 TAC Chapter 210.25 requirements, effective February 12, 1997 and are included only for reference. The Engineer is responsible for adhering to the most current version of these requirements.

All hose bibs and faucets shall be painted purple and designed to prevent connection to a standard water hose. Hose bibs shall be located in locked, below grade vaults which shall be clearly labeled as being of non-potable quality. As an alternative to the use of locked, below grade vaults with standard hose bibs services, hose bibs may be placed in a non-lockable service box which can only be operated by a special tool so long as the hose bib is clearly labeled as non-potable water. Signage requirements must be met by the user or provider, for any area where reclaimed water is stored or where there exists hose bibs or faucets.

612.1 Signage Requirements

Signs shall have a minimum size of 8 inches by 8 inches and shall be posted at all storage areas and on all hose bibs and faucets reading, in both English and Spanish, “Reclaimed Water, Do Not Drink” or similar warning. The area shall be secured to prevent access by the public.

ITEM 613 SERVICE LINE AND RECLAIMED WATER METER REQUIREMENTS

Reclaimed service lines shall meet the same criteria as set forth in ITEM 406 (Location of Water Meter Services) for water service lines.

Reclaimed water meters should meet the same criteria as set forth in ITEM 406 (Location of Water Meter Services) for water meters. Drawings must show the location of the reclaimed meter and specify purple meter and lids. Meter boxes and vaults shall be locked, or accessible only with special tools, square, or rectangular, with “Reclaimed Water” cast into the lid. The number of meters allowed on one lot shall not exceed 4.

Sample test points shall be required and shall be locked, plugged, or capped to prevent access to the reclaimed water system. Drawings shall show irrigation lines, sizes, and specify pipe color to be purple. All sprinkler heads, control box, and meter covers shall be purple.

ITEM 614 APPROVAL AND ACCEPTANCE

Refer to Section 4, ITEM409 for the approval and acceptance process.

SECTION 700 ROADWAY DESIGN STANDARDS

ITEM 701 GENERAL

Standards established by the City of League City for the design and construction of its streets shall provide for pavements with long service life and low maintenance. Excess maintenance of inadequate pavements is an unnecessary drain on tax dollars. An investment in adequately designed and constructed streets needing little maintenance over a long service life frees more dollars for capital improvements necessary to serve the community.

Pavements are designed for both economy and long service. The EOR shall take into consideration the street classification and traffic which will include the axle weights and volumes, thickness design, surface material quality, base material quality, sub-grade material quality, geometric design, and jointing.

Standards of this publication shall be considered minimum for any specific location and the EOR should base his design upon the actual conditions which exist within the development under consideration for design.

Provisions must be made for the un-interrupted extension of main thoroughfares as shown on the major street plan for the City. Streets must provide for free circulation within developments and interconnectivity to adjacent developments.

A street is a public way for purposes of vehicular travel including public transit and refers to and includes the entire area within the right-of-way. The street also serves pedestrian and bicycle traffic and usually accommodates public utility facilities within the right-of-way. The improvement or development of streets shall be based on the street classification that is part of a comprehensive community development plan for League City. The design values shall be those for the ultimate planned development.

All streets shall be designed with a thorough understanding of the capabilities of the vehicle-driver system and a sound knowledge of traffic engineering principles.

For balance in street design, all geometric elements shall, as far as economically feasible, be determined to provide safe, continuous operation at a speed likely under the general conditions for that street’s classification.

ITEM 702 ROADWAY SECTION DESIGN

702.1 Street Classification.

The following street classifications are used in the League City 2018 Master Mobility Plan Update (Master Mobility Plan):

- Residential / Local Streets: Typically up to 700 vehicles per day (vpd)
- Neighborhood Collector: Typically 700 to 2,500 vpd
- City Collector: Typically 2,500 to 15,000 vpd
- Arterial: Typically over 15,000 vpd

The Master Mobility Plan in chapter 6 includes a section called “Recommended Roadway Sizing.” This section describes a design approach to adjusting corridor widths based on system-wide demand modeling. The roadway design engineer is requested to review this section. If the corridor warrants expansion, the design engineer is requested to obtain written clarification from the City Engineer before proceeding.

The roadway design engineer is requested to review the recommended roadway cross sections in Chapter 6 and additional cross-sections in the Appendices of the Master Mobility Plan. In case of discrepancy between the Master Mobility Plan and these design guidelines, the design engineer is requested to obtain written clarification from the City Engineer before proceeding.

Table 702.1 summarizes the major design features by each thoroughfare classification.

Table 702.1 Typical Design Requirements for Thoroughfares

DESIGN FEATURE	MAJOR ARTERIAL	MINOR ARTERIAL	CITY COLLECTOR	NEIGHBORHOOD COLLECTOR	RESIDENTIAL/ LOCAL
Number of Lanes	4 to 6	2 to 4	2 to 4	2 to 4	2
Right-of-Way (Typ.)	120’	100’	80’	70’	60’
Min. Pavement Width (FtoF) a) divided one-way b) undivided two-way	a) 2-30’ * roadways b) N/A	a) 2-30’ * roadways b) N/A	a) 2-30’ roadways b) 42’-44’	a) 2-30’ roadways b) 42’-44’	a) N/A b) 28’
Lane Width a) lane width b) parking lane width	a) 12’	a) 12’	a) 12’ b) 9’-10’ parallel parking on undivided streets	a) 11’ or 12’ b) 7’ parallel parking on undivided streets	a) 10’ b) 8’
Median Width (min.)	18’	18’	18’	18’	Not recommended
Design Speed (mph)	50 mph	40 mph	35 mph	35 mph	25 mph
Intersection Design a) length b/w intersections b) intersecting street angle (min.)	Traffic engineer to design based on expected traffic volumes	Traffic engineer to design based on expected traffic volumes	a) 300’ min, 1200’ max. b) 75°	a) 300’ min, 1200’ max. b) 75°	a) 1200’ max b) 75°
Horizontal Alignment a) centerline radius simple curve (min.) b) centerline radius reverse curve (min.) c) tangent length reverse curve (min.)	a) 500’ * b) N/A * c) 100’ *	a) 500’ * b) N/A * c) 100’ *	a) 500’ b) N/A c) 100’	a) 500’ b) N/A c) 100’	a) 160’ b) 300’ c) 100’
Grades	0.40% min. * (0.35% acceptable with prior approval from City Engineer)	0.40% min. * (0.35% acceptable with prior approval from City Engineer)	0.40% min. 0.35% acceptable with prior approval from City Engineer	0.40% min. 0.35% acceptable with prior approval from City Engineer	0.40% min. 0.35% acceptable with prior approval from City Engineer
Pavement Crown	2%	2%	2%	2%	2%
Pavement Type (min. thickness)	8”	8”	7”	7”	6”
Storm Inlet Spacing (max.)	300’	300’	300’	300’	300’
Sidewalks (min.)	5’ both sides	5’ both sides	5’ both sides	5’ both sides	4’ both sides w/ passing zones as needed
Cul-de-Sacs & Turnarounds a) length (max.) b) diameter (min.) c) right-of-way width	N/A	N/A	N/A	N/A	a) 880’ b) 100’ c) exceed diameter by 20’

* Alternate Cross Sections may be approved on a case-by-case basis by the City Engineer

Residential and local streets primarily service streets in residential subdivisions or serve as access to farms or other abutting property not planned as urban style development. Traffic generally consists of vehicles serving the homes plus an occasional heavy truck. Traffic volumes range from less than 200 to 700 vehicles per day with 1% to 2% heavy commercial traffic. Trucks using these streets have a maximum tandem-axle load of 36 kips and 20 kips maximum single axle load.

The collector street is intended to serve the collection function for a group of access roads and ideally not the immediate access needs of individual residences. However, the collector street does serve the access function for higher density residential development and for some neighborhood facilities.

The design of minor arterials covers from two-lane to multi-lane roads. Minor arterial streets bring traffic to and from major arterial streets and expressways and serve major movements of traffic within and through and urban area. Traffic volumes are over 15,000 vehicles per day with 5% to 7% heavy commercial traffic. Trucks using these streets have a maximum tandem axle load of 46 kips and a 35-dip maximum single-axle load. The principal characteristic of the arterial should be mobility with limited or restricted service to local development.

The major arterial system serves the major centers of activity, the highest traffic volume corridors, and longest trip desires and carries a high proportion of the total city area travel on a minimum of mileage. The system should be integrated both internally and between major rural connections. The major arterial system carries most of the trips entering and leaving the city, as well as most of the through movements by passing the central city. In addition, significant intra-area travels, such as between central business districts and outlying residential areas, between major inner-city communities and between major suburban centers, is served by this class of facility.

The design of major arterials covers a broad range of roadways, from four-lane to six-lane, and is the most difficult class of roadway design because of the need to provide a high standard of operation. The designer must be thoroughly familiar with the standards established by the American Association of State Highway and Transportation Officials (AASHTO) in order to skillfully blend the various geometric aspects into a functional network. All major arterials shall be provided in accordance with the requirements of the Texas Department of Transportation (TxDOT).

702.2 Pavement Type.

Streets of all classifications shall be provided with a standard curb, gutter and storm sewer design. These streets shall consist of a pavement composed of Portland Cement concrete constructed on a prepared sub-grade. The prepared sub-grade shall have a minimum thickness of eight inches (8") and the typical minimum

pavement thickness shall be as follows, unless otherwise specified in the geotechnical analysis:

- Residential / Local: six inches (6”)
- Neighborhood and City Collector: seven inches (7”)
- Minor and Major Arterial: eight inches (8”)

The pavement design span shall be 30 years for local and rural roads and 50 years for collectors and arterials. Reinforcing Steel shall be 60 ksi. The use of hot mix asphalt pavement, rollover curbs, or open drainage ditch design requires written approval from the City Engineer.

702.3 Pavement Width.

Residential/Local: On residential streets in areas where the primary function is to provide land service and foster a safe and pleasant environment, at least one unobstructed moving lane must be ensured even where parking occurs on both sides. The level of user inconvenience occasioned by the lack of two moving lanes is remarkably low in areas where single-family units prevail. Residential streets shall have a minimum pavement width of twenty-eight feet (28’). This face-of-curb to face-of-curb width provides for 8 feet parking lanes. Opposing conflicting traffic will yield until there is sufficient width to pass. If the use of rollover curbs is approved by the City Engineer, the pavement width must be expanded to twenty-nine feet (29’).

Two travel lanes usually can accommodate the normal traffic volumes on local roads. Streets that are approved to have an open ditch design shall be provided with a minimum pavement width of twenty-six feet (26'). Two-foot (2’) roadway shoulders shall be constructed adjacent to all pavement edges that are not curbed.

Collector: Two moving traffic lanes plus additional width for parking are sufficient for most collector streets. Collector streets may be designed with two divided one-way roadways or a single two-way roadway. A median separating the two opposing traffic lanes is a highly desirable element in planned high-density areas.

Divided one-way roadways design shall provide for two 25-foot width roadways. This face-of-curb to face-of-curb width shall provide for two 12-foot width traffic lanes and if needed two 12 foot parking lanes, allowing parking on the outer two lanes until development necessitates use of all four lanes for moving traffic. Collector streets with two divided one-way roadway designs may be constructed in stages with development with prior written approval from the City Engineer.

A single two-way roadway shall include two 15-foot width traffic lanes. Parallel parking lanes from 9 to 10-foot width shall be provided on both sides of traffic lanes. This face-of-curb to face-of-curb width will vary from 42 to 44 feet as the conditions and intensity of development may require.

Minor and Major Arterial: A minimum of four moving traffic lanes is required to handle the capacity of urban minor arterials. Pavements shall be widened through intersections by the addition of one or two lanes to accommodate turning vehicles. Parking on an arterial street should only be considered when provision is required because of existing conditions. Medians shall be provided for all minor arterial streets. The divided one-way roadways design shall provide for two twenty-five feet (25') width roadways. This back-of-curb to back-of-curb width shall provide for two twelve-foot (12') travel lanes in each direction.

702.4 Right-of-Way Width.

The right-of-way width shall be sufficient to accommodate the ultimate planned roadway including traffic requirements, median (if used), sidewalks (if required), intersection design (if applicable), utility strips in the border areas, roadway shoulders, necessary drainage facilities and outer slopes. Every opportunity shall be taken to provide the required width along all of the facility. The typical right-of-way widths per roadway classification is outline in Table 702.4.1. Any street designed with open ditches (if approved by City Engineer) shall require all open ditches to be in private drainage easements that will not be owned or maintained by the City. Additional easements adjacent to the right-of-way may be required for multiple utility installations.

Table 702.4.1 Typical Minimum Right-of-Way Designations

Classification	Minimum Right-of-Way
Residential / Local	60’
Neighborhood Collector	70’
City Collector (undivided)	80’
City Collector (divided)	90’
Minor Arterial	100’
Major Arterial	120’

Additional Right of Way is required at major intersections. Operational conditions can diminish when insufficient turn-lane capacity is available. To mitigate the issue an additional 22 feet of ROW is required at key intersections. Table 702.4.2 identifies distances by roadway classification for the additional width required to meet storage and transition requirements.

Table 702.4.2 Critical Intersection Additional ROW Requirements

Classification	Major Arterial	Minor Arterial	Collector
Major Arterial	350’	350’	300’
Minor Arterial	300’	300’	260’
Collector	300’	260’	-

702.5 Median.

A median is defined as the portion of a divided street separating the traveled way for traffic in opposing directions. The median width is expressed as the dimension between the through-lane edges. For maximum efficiency, a median should be highly visible both night and day and in definite contrast to the through-traffic lanes. Medians should be as wide as feasible but of a dimension in balance with other components of the cross section. Medians with grass shall be of raised curb and gutter design while continuous turning lane medians shall be flush with the pavement surface.

Residential/Local: Medians are not recommended.

Collector/Minor Arterial/Major Arterial:
For collector and arterial streets, median treatment shall comply with Traffic Section ITEM 807 – Median Design of this manual. The minimum median width is eighteen feet (18') to provide a twelve-foot (12') left turn lane and a six-foot (6') pedestrian refuge. A continuous left-turn lane, flush with the adjoining traffic lanes and striped, may be an acceptable approach, with prior written approval from the City Engineer.

On collector streets with raised median, openings shall be designed in accordance with ITEM 807 of this manual. Median openings shall be designed to include left turn lanes as needed and designed per ITEM 801 of this manual.

Median openings must have adequate sight distance, and the design shall comply with ITEM 807 of this manual.

702.6 Design Speed.

The following listed speed limits shall be the default design:

- Residential/Local: 25 Miles Per Hour (MPH)
- Neighborhood Collector: 35 MPH
- City Collector: 35 MPH
- Minor Arterial: 40 MPH
- Major Arterial: 45 MPH

Speed limits in this section will be superseded by the City Council approved Ordinance (Ord. No. 2008-38, § 2, 10-28-2008) or the current version if changed.

ITEM 703 GEOMETRIC DESIGN

703.1 Cul-de-Sacs and Turnarounds.

Residential/Local: A residential street that is designed to leave one end permanently closed shall not exceed 880 feet in length and shall be provided at the closed end with a turnaround. Length shall be measured from the centerline of the adjoining street to the center of the cul-de-sac bulb. The surface portion of the turnaround shall have a minimum diameter of hundred feet (100'). The minimum right-of-way shall exceed the turnaround diameter by twenty feet (20') to provide at least a ten-foot (10') border area adjacent to the street.

Collector: A collector street shall terminate at a residential street and/or a minor/major arterial.

703.2 Sight Distance.

Residential/Local: Passing sight distance is not applicable. Corner intersection sight distance should comply with Traffic Section ITEM 805 – Intersection Sight Distance of this manual.

Collector: Design Engineer to provide sight distance exhibit in Construction Documents for review by the City Engineer. Sight distance shall comply with current minimum AASHTO standard. Intersection corner sight distance shall comply with ITEM 805 of this manual.

Minor and Major Arterial: The provision of adequate sight distance is important in urban minor arterial design. Stopping sight distance is based upon posted speed and AASHTO guidelines. Design for passing sight distance seldom is applicable on urban minor arterials with two divided one-way roadways. Intersection corner sight distance shall comply with Traffic Section ITEM 805 of this manual.

703.3 Intersection Design.

Residential/Local: Intersections, including median openings, shall be designed with adequate corner sight distance, and the intersection area shall be kept free of obstacles. Any landscaping in the sight distance triangle shall be low-growing and shall not be higher than two and one-half feet (2.5') above the level of the intersecting street pavements.

The intersecting streets should meet at approximately a 90-degree angle, but in no case less than a 75-degree angle or more than a 165-degree angle. The maximum lengths between intersections shall be 1200 feet, except cul-de-sac street shall be 880 feet.

Collector: Intersections, including median opening, shall be designed with proper corner sight distance, and the intersection area shall be kept free of obstacles. Where predicted turning volumes may be significant, speed-change lanes and channelization shall be incorporated into the intersection design. The intersection streets should meet at approximately a 90-degree angle, but in no case less than a 75-degree angle or more than a 165-degree angle. The maximum lengths between street intersections shall be 1200 feet with a minimum spacing of 300 feet. Intersections should be designed with a corner radius for pavement adequate for larger vehicles anticipated.

Minor and Major Arterial: Each individual intersection shall be carefully evaluated by a traffic engineer to determine the best design to handle the expected traffic volumes and adjacent developments. Where expected turning volumes are significant, speed change lanes and channelization shall be considered. Turn lane design shall comply with Traffic Section ITEM 801 of this manual. Intersection legs that will operate under stop sign or signal control shall be at right angles. Where necessary, cut slopes should be flattened, and horizontal or vertical curves shall be lengthened to provide additional sight distance.

Table 703.3.1 outlines the minimum curb radius required by roadway intersection angles.

Table 703.3.1 Minimum Intersection Curb Radius

Intersection Type	Minimum Curb Radius By Intersection Angle		
	90 Degrees	85-89 Degrees	75-84 Degrees
Collector - Local	25 FT	30 FT	30 FT
Collector - Collector	30 FT	30 FT	35 FT
Arterial - Collector	30 FT	35 FT	35 FT
Arterial – Arterial	35 FT	35 FT	40 FT

703.4 Horizontal Alignment.

Residential/Local: There is an advantage in residential areas in purposely arranging the alignment to discourage through traffic. The alignment design shall be such that the safety of the facility is not reduced. Street curves should be designed with as large a radius curve as feasible; the minimum center line radius on simple or compound curves being 160 feet, the minimum centerline radius on reverse curves being 300 feet with a minimum tangent length of 100 feet. Streets designed with less than the minimum curve radius shall include a bubble type intersection with a minimum surface radius of fifty feet (50') or the current minimum AASHTO standard.

Collector: The designer shall strive for as high a standard as practical for collector alignments. Horizontal and vertical alignments must complement each other and be considered in combination. Street curves should be designed with as large a

radius curve as feasible; the minimum centerline radius being 500 feet and a minimum tangent length in reverse curves of 100 feet, unless written approval from the City Engineer.

Minor and Major Arterial: Alignment of the minor arterial is ideally developed strictly with the design speed selected. It is desirable to use the highest alignment design possible with a minimum centerline radius being 1,200 feet and a minimum tangent length in reverse curves of 100 feet, unless written approval from the City Engineer.

703.5 Grades.

Longitudinal grades for all streets should be as flat as is consistent with the surrounding terrain. Where grades of 4 percent or steeper are necessary, the drainage and erosion control designs shall become critical. Vertical curves shall be installed when algebraic differences in grade exceeds 1 percent. Vertical curves shall meet the sight distance criteria for the design speed.

Residential/Local: The minimum gradient on a street gutter line shall be 0.40 percent; However, a 0.35 percent grade is acceptable to facilitate drainage with prior written approval from the City Engineer. All streets shall be cleaned, flooded, and inspected for surface cracks and birdbaths prior to initial and final acceptance. A minimum 1 percent fall around curb return radius is required at intersections with a twenty-five-foot (25') radius. Grades for larger radius shall be determined on an individual basis. The minimum grade for a cul-de-sac street with a fifty-foot (50') curb radius shall be 0.60 percent along the gutter. A minimum gradient of 0.40 percent around the longest radius is required on an L-type street intersection. Drainage across street intersections by means of "valley" gutters shall be prohibited.

Collector/Minor Arterial/Major Arterial: Grades for collector streets should be as level as consistent with the surrounding terrain. The minimum percent grade is 0.40 percent; However, a 0.35 grade is acceptable to facilitate drainage with prior written approval from the City Engineer. Street grades are depressed below the surrounding terrain to accommodate adjacent property sheet drainage to the curb area and accumulation in the storm drainage system.

703.6 Pavement Crown.

Undivided streets shall have a center crown to drain to the outer curbs. Divided streets shall be sloped to drain to the outer curbs. All lanes shall have a normal cross slope of 2 percent unless prior written approval from the City Engineer.

703.7 Roadside Shoulders.

Residential/Local: A shoulder is the portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use and for lateral support of sub-base and surface pavement. When approved by the City Engineer, roadway shoulders shall be constructed adjacent to all pavement edges that are not curbed and be minimum five feet (5') wide.

Shoulders shall be surfaced to provide a better all-weather load support than that afforded by the native soil. Materials used to surface shoulders include gravel, shell, crushed rock, mineral or chemical additives, bituminous surface treatments, and various forms of asphaltic or concrete pavements.

Shoulders are important links in the lateral drainage systems. Shoulders shall be flush with the roadway surface and abut the edge of the travel lane. Shoulders shall provide an adequate cross slope for drainage of the roadway.

703.8 Roadside Slopes.

When approved by the City Engineer, back-slopes, fore-slopes and roadside ditches shall have gentle well-rounded transition. Roadside ditches shall provide for a fore-slope of 4:1 or flatter. Flat Fore-slopes increase safety by providing maneuvering area in emergencies, are more stable than steep slopes, aid in establishment of plant growth, and simplify maintenance work. Back-slopes of roadside ditches shall be 4:1 or flatter to make it easier for motorized equipment to be used in maintenance.

ITEM 704 BACK OF CURB DESIGN

704.1 Border Area.

The border between the roadway and the right-of-way line shall be wide enough to serve several purposes; including provisions of a buffer space between pedestrians and vehicular traffic, sidewalk space, and an area for placement of utilities. The roadway shall be centered within the designated right-of-way and the border area sloped from the property line to the top of the curb at a minimum grade of one-quarter's inch (1/4") per foot. Traffic signals, utility poles, fire hydrants, and other utilities shall be placed as far back of the curb as practical for safety reasons. Breakaway features should be built into structures when feasible and as an aid for safety considerations.

704.2 Sidewalks. Sidewalks shall be constructed on both sides of the street. The sidewalks shall be located as far as practical from the traffic lanes and usually close to the right-of-way lines. On residential and local roads, clear sidewalk width shall be four-foot (4') minimum and comply with ADA requirements for passing. On collector and arterial streets, clear sidewalk width shall be five-foot (5') minimum or six-foot (6') minimum if sidewalk is within two-foot (2') of the roadway. Curb-cut ramps shall

be provided at cross walks to accommodate physically handicapped persons. Sidewalks and curb-cut ramps shall be provided in accordance with ITEM 806 – Pedestrian Facilities (Sidewalks and Wheelchair Ramps). Additional requirements may be applicable as a result of the City's Master Trails Plan.

704.3 Driveways.

Residential: A driveway is an access constructed within the public way, connecting the public roadway with adjacent property and intended to be used in such a way that access into the adjacent property will be complete and will not cause the blocking of any sidewalk border area or street roadway. Driveways shall be constructed in accordance with ITEM 801 – Access Management Standards and League City "Standard Details".

704.4 Street and Roadway Lighting.

Design and Installation shall be per City's "Development Services Roadway lighting Policy".

Residential/Local: In residential areas, not along major thoroughfares, streetlights shall be evenly spaced and located on an average of 500 feet apart from one another. Streetlights shall be located at street intersections and at the end of cul-de-sacs, if the cul-de-sac is longer than 200 feet in length. Streetlights should not be installed closer than 300 feet or further than 500 feet from one another unless an intersection, major thoroughfare, or bridge necessitated spacing less than the 300-foot minimum or as approved by the City Engineer. Streetlights shall use LED bulbs. Streetlight poles shall be metal unless approved otherwise by the City Engineer. Streetlight pole location should be 3-feet from the back of curb. Design of utilities and sidewalks should be designed so as to not cause conflict with the placement of the streetlight pole. All streetlight poles should be located on or near the property line whenever possible and be located a minimum of 3-feet from the edge of a driveway or concrete wing.

Collector: Streetlights shall be provided at all intersections with other roadways and at approximate 250-foot intervals along the roadway. Streetlights shall use LED bulbs. Streetlight poles can be either metal or concrete. To maintain visual uniformity, the use of common materials will be required within a single corridor unless approved otherwise by the City Engineer.

For 2-lane collector roadways, streetlight poles should be located on the side of the street that has the least conflicts with other utilities. All streetlight poles should be 3-feet from the back of curb. If this is not possible, longer bracket arms may be allowed by the City Engineer to accommodate larger offsets from the back of curb.

For collector roadways wider than 2 lanes, it may be necessary to light the street from both sides in order to achieve continuous lighting. The desired pole arrangement for this type of corridor would be to stagger the streetlights across the street.

Minor and Major Arterial: Streetlights shall be provided at all intersections with other roadways and at approximate 200-foot intervals along the roadway. Streetlights shall use LED bulbs. Streetlight poles can be either metal or concrete. To maintain visual uniformity, the use of common materials will be required within a single corridor unless approved otherwise by the City Engineer.

On undivided arterials, the streetlight poles shall be located minimize the number of conflicts with overhead power and underground utilities. Where situations allow, consideration should be given to a staggered arrangement to provide the best lighting for the corridor.

For divided arterials with raised medians, streetlight poles with 2 luminaires oriented 180^{o} apart may be in the center of the raised median. Longer bracket arms may be required in these cases. For divided arterials with depressed medians, the streetlight poles shall be located on the outside curb lines with a minimum offset of 3-feet from the back of curb. The arrangement of poles on the outside edges should typically be paired together.

Responsibility for Installation and Maintenance in New Developments: The responsibility to install and maintain streetlights as installed with a new development continues to the end of the two-year maintenance period outlined in Section 4, ITEM 409 for the approval and acceptance process.

704.5 Access Control.

Minor and Major Arterial: Control of access is highly desirable on an arterial facility. Residential driveways shall not be designed for access to arterial streets. Commercial driveways shall be allowed access to arterial and shall comply with Traffic Section ITEM 801 of this manual.

ITEM 705 ROADWAY DRAINAGE DESIGN

705.1 Residential and Local Drainage.

Surface sheet flows are usually intercepted by the street section of curb and gutter and conveyed to appropriate outlets, for urban streets, the flow is transferred at frequent intervals from the street cross section by curb-opening inlets to basins and from there by storm sewer conduit to major outfalls. To avoid undesirable flow line conditions, the minimum gutter grade shall be 0.40 percent; However, a 0.35 grade is acceptable to facilitate drainage with prior written approval from the City Engineer.

Inlets shall be located in such a manner that the more restrictive of the following criteria will govern:

a) Maximum storm water ponding depth as measured at the gutter low point is no more than nine (9) inches, and

b) Storm water is not carried more than 300 feet along the curb line from the high point of a gutter to an inlet opening.

Inlets should be placed away from collector streets or arterial streets and on the side streets at street intersections. An attempt should be made to place the proposed inlets away from the esplanade openings and out of intersections. No inlets or grates shall be placed within residential driveways. Storm sewers and inlets shall be provided in accordance with ITEM 803 "Closed Conduit Systems".

Roadside drainage channels perform the vital function of collecting and conveying surface sheet flows from the roadway and adjacent property. When approved by the City Engineer, roadside drainage channels, therefore, shall have capacity for the design run-off, shall provide for unusual storm water without saturation of the pavement subgrade, and shall be located and shaped to avoid hazard to traffic. The channel grade does not have to follow that of the roadbed. The minimum grade shall be 1.0 percent if earthen or 0.30 percent with an approved concrete pilot channel.

705.4 Collector and Arterial Drainage.

A drainage system to accommodate design run-off shall be included in the design of every arterial street. Street flows from adjacent property that is intercepted by the street section of curb and gutter shall be limited to a property depth of 150' along and adjacent to the right-of-way. For urban streets, the flow is transferred at frequent intervals from the street cross section by curb-opening inlets to basins and from there by storm sewer conduit to major outfalls. To avoid undesirable flow line conditions, the minimum gutter grade shall be 0.50 percent; However, a 0.35 grade is acceptable to facilitate drainage with prior written approval from the City Engineer. Inlets shall be located in such a manner that the more restrictive of the following criteria will govern:

a) Maximum storm water ponding depth as measured at the gutter low point is no more than nine (9) inches, and
b) Storm water is not carried more than 300 feet along the curb line from the high point of a gutter to an inlet opening.

Inlets should be placed away from arterial streets, on side streets, at intersections. Storm sewers and inlets shall be provided in accordance with ITEM 803, "Closed Conduit System".

ITEM 706 TRAFFIC CONTROL DEVICES

Residential: Consistent and uniform application of traffic control devices is important. Details of the standard devices and warrants for many conditions are found in the Texas Manual on Uniform Traffic Control Devices. Geometric design of streets shall include full consideration of the types of traffic control to be used. Multi-way stops shall require a multi-way stop warrant study.

Collector: Traffic control devices shall be applied consistently and uniformly. Details of the standard devices and warrants for many conditions are found in the

TMUTCD. Geometric design of streets shall include full consideration of the types of traffic control to be used, especially at intersections where multiple phases of actuated traffic signals are likely to be needed. Traffic signals are a major element in the design of major collector street intersections. Successful operations of a collector street depend largely on proper pavement markings. Pavement markings shall be provided in accordance with the TMUTCD.

Minor and Major Arterial: Traffic control devices such as signs, markings, signals, and islands are placed on or adjacent to a street to regulate, warn, or guide traffic. Each device is designed to fulfill a specific need with regard to traffic operation, control, or safety. The need for traffic control devices shall be determined by an engineering study made in conjunction with the geometric design of the street. The TMUTCD shall be used to ensure standard design and uniform application of the various traffic control devices.

Traffic signal design shall comply with Traffic Section ITEM 803 of this manual.

Successful operation of an arterial street depends largely on proper pavement marking. Recent development in products for pavement markings shows considerable promise in providing adequate long-life marking. Pavement markings shall be provided in accordance with the TMUTCD and the "Standard Details".

ITEM 707 APPROVAL AND ACCEPTANCE

Refer to Section 4, ITEM 410 for the approval and acceptance process.

SECTION 800 DRAINAGE DESIGN STANDARDS

ITEM 801 GENERAL

The intent of this section is to present minimum standards for storm water quality and the design and construction of hydraulic structures for the secondary system of storm sewers and roadside ditches. Hydraulic structures for these secondary systems should convey storm water safely, control erosion, be cost effective, require minimal maintenance, and add safety and esthetics to the drainage system.

The City as of Resolution No. 2011-07 adopted The Harris County Flood Control District (HCFCD) Criteria Manual for the design of flood control and drainage facilities. The manual includes acceptable design criteria for appropriate rainfall frequency and discharge methodology, specific hydrologic and hydraulic criteria used for the planning of storm sewers, channel improvements and detention facilities. The manual also includes criteria for structural designs of primary channels, lateral outfall channels, detention facilities, drop structures, culverts, bridges, storm sewer outfalls, and detention reservoir control structures. Design engineers shall follow the HCFCD Manual except where superseded by city policies, resolutions, and ordinances, or as approved by the City Engineer and with the following modifications:

a) Maximum storm water ponding depth during a 1% event as measured at the gutter low point is no more than nine (9) inches,
b) Detention facilities shall have two (2) feet of freeboard above the 1% annual exceedance probability (100-year) storm water surface elevation, or three (3) inches above the 0.2% annual exceedance probability (500-year) storm water surface elevation, whichever is higher,
c) Overflow path and pipes shall be sized to convey the 0.2% annual exceedance probability (500-year) peak inflow, and
d) Detention ponds, including amenity ponds, shall have a maximum basin side slope ratio of 4:1.
e) System and roadway drainage network will provide positive overflow to detention pond and outfall channel.

Storm water management for construction activities shall follow the “Stormwater Management Handbook for Construction Activities”, jointly published by the City of Houston, Harris County, Harris County Flood Control District, 2006 or current edition except where superseded by city policies, resolutions, and ordinances.

ITEM 802 CULVERTS

Culverts allow for roadway, railroad, driveway and other utility crossings of open ditches. Materials used for culvert construction shall include pre-cast reinforced concrete pipe, monolithic reinforced concrete boxes and pre-cast reinforced concrete boxes.

The size and flow line of a culvert will depend on the hydraulic requirements, with the minimum pipe diameter of 24 inches (or non-circular equivalent to a 24-inch circular pipe) and the minimum box size comparable to 24 inches x 24 inches.

All culverts for public roadway crossings shall follow Item 705 of this manual. If required slopes are not able to be met, a headwall will be required. Culverts with a depth greater than 4 feet shall include headwalls to protect the embankment from erosion. Protective traffic rated guardrails shall also be included along culvert headwalls for the protection of the general public.

ITEM 803 CLOSED CONDUIT SYSTEMS

Closed conduit systems for storm sewers shall be constructed of High-Density Polyethylene (HDPE) pipe (not allowed under pavement), reinforced concrete pipe (RCP), monolithic reinforced concrete boxes or pre-cast reinforced concrete box structures (RCB).

The size and flowline of a pipe or box structure will depend on the hydraulic requirements. Inlet leads servicing curb opening inlets shall have a minimum pipe diameter comparable to 24 inches.

803.1 Alignment.

All closed conduit systems shall be typically designed in a straight line with inlet lead perpendicular to the storm sewer system.

Storm sewers shall be located in public street right-of-way's or in a storm sewer easement adjoining and parallel to a street right-of-way. If reinforced concrete pipe is to be used for the storm sewer, the location of the storm sewer may be installed in the roadway with a five-foot (5') offset from the centerline of the roadway. The location of a storm sewer shall not be within side lot easements that prohibit future maintenance access, unless prior written approval from the City Engineer. Closed conduit systems may be installed within adequately sized drainage easements or drainage fee strips.

803.2 Manholes/Junction Boxes.

A manhole is used for access to closed conduit systems for maintenance and inspection. Manholes shall be placed at changes in conduit size, material, grade, alignment, junction of two or more conduits, and at intervals no greater than 600 feet on continuous runs.

803.3 Inlets.

Inlets to closed conduit drainage systems shall be designed to convey the design storm discharge. Inlets shall be designed so debris will not reduce the entry capacity below the design storm discharge.

Curb inlets for roadways shall be spaced so that the maximum travel distance of water in the gutter will not exceed 300 feet. Inlets should be placed away from

collector streets or arterial streets and on the side streets at street intersections. An attempt should be made to place inlets away from esplanade openings and out of major intersections. Inlets should be located along the street at the extension of a lot line in order to avoid conflicts with future or existing driveways. Curb inlets should be located at the point of curve of the intersection curb radius along urban residential streets. Curb inlets should be located out from under the pavement surface. Curb inlets shall have a minimum 5 five-foot (5') throat width. Curb inlets shall have a minimum capacity of 5 cubic feet per second (cfs). Grate top inlets will not be permitted in unlined open ditch areas.

803.4 Storm Sewer Outfalls.

All storm sewer outfall pipe sewers for unlined channels shall be constructed of RCP or HDPE. A standard manhole must be placed just outside of the ultimate channel right-of-way or drainage easement. The storm pipe should have a minimum velocity of three feet per second (fps) when flowing full. Erosion protection will be required for all storm sewer outfalls.

ITEM 804 MATERIALS

Approved materials for storm sewer conveyance include RCP, RCB, and HDPE only. Refer to construction specification for specific requirements. Corrugated metal pipe is only permitted when written approval has been provided by the City Engineer prior to submitting plans.

ITEM 806 CONDUIT LAYING

All conduits shall be laid and maintained in accordance with ITEM 409 "Conduit Laying".

ITEM 808 VISUAL TEST

All drainage facilities shall be inspected visually to verify accuracy of alignment and freedom from debris and obstruction. All Storm Sewers will be inspected with television equipment.

The developer is responsible for the TV inspection of newly constructed storm sewer lines. The TV inspection shall take place before the final walk-through inspection is performed.

Personnel from the City's Storm Water Department or the City's Engineering Department shall witness the TV inspection, which shall be performed during the City's normal working hours.

The method for the inspection shall include:

1. Cleaning the lines, (if not already cleaned);
2. Removing downstream plugs, if any;
3. Digital Recording of the system.

The contractor shall provide the City with one copy of the TV videotape and one copy of the TV inspection report. For each segment the video tape and corresponding written report shall clearly identify.

1. Each line segment being inspected;
2. The size and type of pipe being inspected;
3. Accurate footage of the line segment inspected;
4. Deficiencies in materials, alignment, pipe shape, grade, or any other apparent deficiencies; and

Any drainage structure which when expected has excess ponding of water greater than an inch, misaligned joints, settled conduits or other defects; shall be cause for rejection.

Any system designed as a submerged system shall be inspected in the dry, prior to flooding. All other drainage systems shall be dry and clean prior to visual test.

ITEM 809 STORM SEWER CONNECTIONS TO THE EXISTING SYSTEM

Unless otherwise approved by the City Engineer, all connections of a proposed storm sewer system to existing storm sewer systems shall be made at manholes or junction boxes with the soffit of the proposed pipe installed at the same elevation as the soffit of the existing pipe.

ITEM 810 APPROVAL AND ACCEPTANCE

Refer to Section 4, ITEM 410 for the approval and acceptance process.