



City of Alvin

**Subdivision Ordinance &
Design Criteria Manual
Revised March 5, 2020**

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Chapter 21 SUBDIVISIONS AND PROPERTY DEVELOPMENT

ARTICLE I. IN GENERAL

Sec. 21-1. Application and compliance with chapter.

(a) Application.

The rules and regulations of this chapter shall apply to and govern the approval and requirements of subdivisions and property development (as such terms are defined herein) within the corporate limits and that portion of the extraterritorial jurisdiction of the City of Alvin over which the City has retained jurisdiction pursuant to a written agreement with the appropriate county under the provisions of Chapter 242 of the Local Government Code; provided, however, that the site plan requirements of this chapter shall not apply to the city's extraterritorial jurisdiction.

(b) Compliance with chapter.

Any person who subdivides any tract, lot or parcel of land within the City of Alvin or its extraterritorial jurisdiction must submit to the City for its approval a preliminary and final plat or abbreviated plat, as applicable. No subdivision of any tract, lot or parcel of land shall be lawful until such time that the plat has been approved in accordance with the terms of this chapter. Unless and until a preliminary and final plat, abbreviated plat, amending plat or replat of a subdivision shall have been first approved in the manner provided herein by the City, no person shall construct or cause to be constructed any street, utility, facility, building, structure, or any other improvement on any lot, tract, or parcel of land within such subdivision except as specifically permitted in this chapter.

No building, plumbing, electrical or mechanical permit shall be issued by the city for the construction or repair of any structure on a lot or tract in a subdivision for which a final plat, abbreviated plat or site plan has not been approved by the city and filed for record (if filing is required by this chapter) No building, plumbing, electrical or mechanical permit shall be issued by the city for the construction or repair of any structure on a lot or tract in a subdivision in which the required storm drainage

improvements have not been constructed and the permanent public improvements have not been approved and accepted by the city.

Sec. 21-2. Definitions.

The following definitions shall apply in the interpretation and enforcement of this chapter. The terms not defined herein shall be construed in accordance with the ordinances of the city or their customary usage and meaning in municipal planning and engineering practices.

(a) "**Abbreviated plat**" means a complete and exact subdivision plat prepared by a professional land surveyor in conformity with the provisions of this chapter and in a manner suitable for recording with the Brazoria County Clerk's office. For purposes of this chapter an abbreviated plat is considered a final plat.

(b) "**Access Point**" refers to a means of vehicular approach, entry to, or exit from property.

(c) "**Access Easement**" refers to an easement created for the purpose of providing vehicular or pedestrian access to a property or area.

(d) "**Accessory Building or Structure**" refers to a detached subordinate structure, the use of which is incidental to that of the principal structure and located on the same lot.

(e) "**Accessory Building Elements**" include exterior doors, overhead doors, down spouts, exterior utility receptacles, building-mounted service boxes, exterior lighting fixtures, frames and mullions of all doors and windows, trim, accent, and decorative building elements such as canopies, doors, and trim.

(f) "**Administratively Complete**" means the determination made by the City Community Development Department that any application(s) or plan(s) required to be submitted under the city's Code of Ordinances to obtain an approval for development of land subject to this Chapter contain all information and components applied by applicable regulations.

(g) "**Alley**" means minor ways which are used primarily for vehicle service access to the back or the side of properties otherwise abutting on a street.

(h) **"Block"** refers to an area of land bounded by a street, or by a combination of streets and public land, waterways, exterior boundaries of a subdivision, corporate boundaries, or any other barrier to the continuity of development.

(i) **"Collector Street"** refers to a street designed to carry moderate volumes of traffic from minor streets to arterial roadways or from arterial to arterial as designated on the Thoroughfare Plan.

(j) **"Common Access"** refers to access shared by adjacent property owners, which is privately owned and maintained.

(k) **"Conceptual plan"** means a plan showing all the proposed improvements including but not limited to, streets, lots, drainage ways, other public infrastructure, etc. as set forth in Section 21-19.

(l) **"Corner Lot"** refers to a lot located at the intersection of two or more streets.

(m) **"Design criteria"** means the design criteria manual for wastewater collection systems, water lines, streets, sidewalks and storm drainage that is titled "Subdivision and Property Development Manual" and is on file in the City's Community Development Department.

(n) **"Developer"** means any person who develops land in the City whether or not a subdivision of the land is required by this chapter. The term "developer" shall be synonymous with "subdivider" in cases where the subdivision of land is involved.

(o) **"Extraterritorial jurisdiction (ETJ)"** means the unincorporated area that is contiguous to and located within one mile of the corporate boundaries of the city.

(p) **"Family member"** means the following persons related to the individual who proposes to convey land: wife, husband, father, mother, son, daughter, sister, brother, grandfather, grandmother, granddaughter, grandson, aunt, uncle, niece, nephew, great grandson, great granddaughter, great grandfather, great grandmother, adopted son, adopted daughter, stepson and stepdaughter.

(q) **"Final plat"** means a complete and exact subdivision plat prepared by a registered professional land surveyor in conformity with the provisions of this chapter and the Texas Board of Land

Surveying regulations and in a manner suitable for recording with the county clerk of the county or counties in which the subdivision is located.

(r) **"Flag-shaped or Key-shaped lot"** means a lot whose frontage on and access to the street right-of-way is provided by a narrow driveway, access easement or other parcel of land being less than sixty (60) feet wide, which narrow area is referred to as the staff of the flag.

(s) **"Grade"** refers to the average level of the finished surface of the ground adjacent to the exterior walls of a building or structure.

(t) **"Governing body"** means the City Council of the City of Alvin, Texas.

(u) **"Infrastructure"** means streets, sidewalks, drainage facilities or improvements, water and sanitary sewer facilities, utilities, parks, and any other improvements for which the city may ultimately assume responsibility for maintenance and operation.

(v) **"Lot"** means a physically undivided tract or parcel of land having frontage on a public or private street, which is, or in the future may be offered for sale, conveyance, transfer or improvement and which is designated as a separate and distinct tract and identified by numerical or letter identification on a duly and properly recorded subdivision plat.

(w) **"Maintained"** refers to preserved in a condition or state of equivalent quality to that which was approved or required by the City, or is adequate for safety and screening reasons.

(x) **"Master Preliminary Plat"** means a plat of a proposed subdivision, in which improvements will be constructed in phases, prepared in accordance with the provisions of this chapter illustrating the features of the development for the purpose of review and preliminary approval by the planning commission.

(y) **"Open Space"** refers to land and water areas retained for use as active or passive recreation areas or for resource protection in an essentially undeveloped state.

(z) **"Person"** means an individual, partnership, firm, association, corporation or any other entity howsoever formed and shall include any officer, agent, employee, trustee or servant thereof.

(aa) **"Planning Commission"** means the duly-appointed City Planning Commission of the City of Alvin.

(bb) **"Plat"** means a map, chart, survey, plan, replat or amending plat containing a description of the subdivided land with ties to permanent landmarks or monuments.

(cc) **"Preliminary plat"** means a plat of a proposed subdivision prepared in accordance with the provisions of this chapter illustrating the features of the development for purpose of review and preliminary approval by the Planning Commission and the City Council.

(dd) **"Resubdivision"** means any change in a map of an approved or recorded subdivision plat that affects any street layout on the map or area reserved thereon for public use or any lot line, or that affects any map or plan legally recorded prior to the adoption of any regulations controlling subdivisions.

(ee) **"Setback"** refers to the minimum distance by which any building or structure must be separated from a street right-of-way or lot line.

(ff) **"Site plan"** means a scaled drawing showing the use of a parcel of land and the locations of existing and proposed buildings, drives, sidewalks, parking areas, drainage facilities and other structures to be constructed in relation to surveyed boundaries.

(gg) **"Street"** means a public right-of-way dedicated for public use which provides vehicular access to adjacent land. Included in this definition are the following general classifications of streets:

- (1) **"Major thoroughfares or arterial streets"** are principal traffic arteries more or less continuous across the city which are intended to connect remote parts of the city and which are used primarily for fast or heavy volume traffic.
- (2) **"Secondary arterial streets"** are those which carry traffic from minor streets to the major system of arterial streets and highways, including the principal entrance streets of a residential development and streets for circulation within such development.

- (3) **"Minor streets"** are those which are used primarily for access to the abutting properties and which are intended to serve traffic within a limited area.
- (4) **"Marginal access streets"** are minor streets which are parallel to and adjacent to arterial streets and highways and which provide access to abutting properties and protection from through-traffic.
- (5) **"Boulevards"** are streets utilizing two 24-foot, minimum width, paved roadway sections divided by a 12-foot-wide raised median, which serves to separate traffic moving in opposite directions.

(hh) **"Subdivider"** means any person who does or participates in the doing of any act toward the subdivision of land within the intent, scope and purview of this chapter. The terms "subdivider" and "developer" are synonymous and are used interchangeably for purposes of this chapter in connection with subdivision of land.

(ii) **"Subdivision or subdivide"** means the division of any lot, tract or parcel or land by plat, map or description into two or more parts, lots or sites for the purpose, whether immediate or future, of sale, rental or lease, or division of ownership. Any dedication and the laying out (or realignment) of new streets, or other public accessways, with or without lotting, is a subdivision. An "addition" is a subdivision as defined herein. The term "subdivision" or "subdivide" includes the division of land whether by plat or by metes and bounds description, and, when appropriate to the context, shall relate to the process of subdividing or to the land subdivided.

(jj) **"Traffic Impact Analysis (TIA)"** refers to an analysis of the effect of traffic generated by a development on the capacity, operations, and safety of the public street system.

Sec. 21-3. Fees.

- (a) The schedule of fees set forth in Chapter 28 of this Code shall apply to this chapter.

(b) Fees and inspection charges shall be paid in advance of any review by the city staff and whether or not the plat is approved or denied. No plats or site plans will not be accepted or processed until fees are paid.

Sec. 21-4. Variances.

Upon written request, City Council may authorize a variance from this chapter. In granting a variance, the Council shall prescribe those conditions it deems necessary or desirable to the public interest. In making the findings herein above required, the Council shall take into account the nature of the proposed use of the land involved, the existing use of the land in the vicinity, the number of persons who will reside or work in the proposed subdivision, and the probable effect of such variance upon traffic conditions and upon public health, safety, convenience and welfare in the vicinity. Any variance request shall first be reviewed by the planning commission, with a recommendation to council workshop, prior to city council action.

Sec. 21-5. Enforcement.

The City of Alvin will refuse to furnish city services to any person, who violates the terms of this chapter, and in addition shall have the right to prohibit or correct violation(s) by writs of injunction or other legal process. The City will withhold improvements of any nature whatsoever, including issuance of building permits, the maintenance of streets and furnishing of water and sewer service to all additions until the subdivision plat has been approved by the City Council, all the infrastructure improvements have been formally accepted by the City and final construction plans have been provided to the City.

Sec. 21-6. Compliance with city thoroughfare plan.

All applications for development, subdivision, or plat approval under this chapter must comply with the City's thoroughfare plan.

Sec. 21-7. Exemptions from subdivision plat requirements.

Except as otherwise provided herein, the provisions of this chapter with respect to subdivision plat requirements (preliminary plats, final plats and abbreviated plats) shall not apply to the following:

(a) A tract or parcel of land legally platted and approved prior to the effective date of this ordinance with frontage on an approved public street; provided, however, that construction of facilities must conform to the current design criteria in effect at the time of construction.

(b) Land constituting a single, contiguous tract or tracts with frontage on an approved public street for which a legal deed of record describing the boundary of the tract or parcel was filed of record in the Brazoria County Deed Records on or before November 2, 1967.

(c) Divisions of land created by order of a court of competent jurisdiction.

(d) A division of land into parts greater than five (5) acres where each part has frontage on an approved public street and no public improvement is required to be dedicated.

(e) Land conveyed as a gift between family members.

(f) Construction of a single-family residence for a single owner on/across more than one lot; provided, however, that a platting exemption will not apply if (i) the residence is proposed to be built across an existing easement, or (ii) the residence is proposed to be built on property where a drainage, street, water or sewer easement, or any other type of right-of-way is required by the city, or (iii) multiple lots are owned by the same owner who proposes to sell the lots for future construction of two (2) or more residences.

Sec. 21-8. Offenses.

(a) It shall be unlawful to construct two (2) single family dwellings on a single lot, parcel or tract of land.

(b) Unless otherwise exempted herein, it shall be unlawful to construct or install or cause to be constructed or installed a building or structure across or over a lot line or property line.

(c) Unless otherwise exempted herein, it shall be unlawful to subdivide any tract, lot or parcel of land without complying with the terms of this chapter.

(d) It shall be unlawful for any person to violate a provision of this chapter.

Sec. 21-9. Penalty.

Any person who shall violate any provision of this chapter shall be guilty of a misdemeanor and upon conviction shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.

Sec. 21-10. Effective date.

All subdivision applications filed for initial plat approval on or after the effective date of this article shall be subject to these regulations. A subdivision application filed or which has received plat approval prior to the effective date of this ordinance shall be subject to the subdivision regulations in effect at the time of filing the application for initial plat approval.

Secs. 21-11.--21-17. Reserved.

ARTICLE II. SUBDIVISION AND DEVELOPMENT PROCESS

Sec. 21-18. Subdivision and development conferences.

- (a) *Conceptual plan conference.* If a conceptual plan is submitted, a predevelopment meeting between the developer and city staff will be held to discuss the plan concepts and approval procedures. This is an informal process to allow an exchange of information between the developer and staff. No approval will be issued for conceptual plans and such plans are not binding on the developer or the city. At this conference the developer is encouraged to identify any proposed variances for early review.
- (b) *Plat conference.* Prior to the submission of a plat, the subdivider shall confer with the public services department staff on an informal basis to receive comments and suggestions on the procedures, specifications and standards required by the city as conditions for subdivision plat approval. At this meeting, staff shall also discuss the proposed plat and its conformity with the comprehensive plan, its relationship to surrounding property, availability of utilities, drainage, street patterns and any other matters governed by this chapter.

(c) Site plan conference. Prior to submission of a site plan the developer shall confer with the city staff on an informal basis to receive comments and advice on the procedures, specifications and standards required by the city as conditions for site plan approval.

Sec. 21-19. Conceptual plans.

Prior to submitting a preliminary plat, a subdivider may submit a conceptual plan of the entire development for review by the Planning Commission and council workshop. No approval shall be issued for a conceptual plan.

The conceptual plan shall contain the following information:

1. The proposed name of the development.
2. The total acreage included in the entire development.
3. The scale of the plan.
4. The boundaries of the total acreage of the subdivision and the boundaries of the proposed land uses within the subdivision.
5. The proposed number of lots and the typical and minimum lot sizes.
6. Proposed streets, direction of manmade and natural drainage flows, location of schools, parks, detention ponds and other public or private facilities.

Sec. 21-20. Preliminary plat process.

(a) Following the staff conference, a subdivider of land within the city or its extraterritorial jurisdiction may submit a preliminary plat according to the following (unless the abbreviated plat provisions of Section 21-24 are applicable and are utilized):

- (1) The preliminary plat shall be drawn to a scale of one hundred (100) feet to the inch or larger, and shall show on the face of the plat as specified below or be accompanied by:
 - a. The proposed name of the subdivision. (face of plat)
 - b. The location map, north point, scale and date. Each plat and plans submitted must have the current date and must read month, day, and

year on face of plat. Date must be located under the name of plat or plans.

- c. The names and addresses of the subdivider, the owner of record, the registered professional civil engineer responsible for the design and the registered professional land surveyor responsible for the land survey. (face of plat)
- d. The approximate boundary line (accurate in scale) of the tract to be subdivided. (face of plat)
- e. Contours with intervals of five-tenths (0.5) feet, more or less, referred to sea level datum, as required to show at least two (2) contours within the subdivision in addition to those necessary to clearly show outfall drainage including a benchmark on/or adjacent to the property. (face of plat)
- f. Proper adjoining information including the names of adjacent subdivisions. (face of plat)
- g. The location, widths, and names of all existing or platted streets or other public rights-of-way on-site and adjacent to the tract and within 200 feet of the tract as circumstances require. (face of plat)
- h. Existing pavement, sewers, water mains, culverts, or other underground structures adjacent to the tract and within 200 feet of the tract with pipe sizes, grades and locations indicated. (face of plat)
- i. All parcels of land intended to be dedicated for public use or reserved in deeds for the use of all property owners in the proposed subdivision, together with the purpose of conditions or limitations of such reservations, if any.

- j. The layout, names and widths of proposed streets and easements; the radius of all arcs, length of the tangents, and the length of tangents between curves. (face of plat)
- k. The layout, numbers and approximate dimensions of the proposed lots with building setback lines shown. (face of plat)
- l. The draft of any protective covenants whereby the subdivider proposes to regulate the use of the land in the subdivision; provided, however, that such restrictive covenants, conditions or limitations shall never be less than the minimum requirements of the city under the terms of this chapter. Where infrastructure design criteria is based on a specific type or density of development the covenants shall require development to conform to the design criteria.
- m. A preliminary drainage plan shall be submitted with each preliminary plat (at the same scale) which shall include the following:
 - 1. Overall layout of lots or parcels.
 - 2. Contours.
 - 3. Any defined water ways on or adjacent to the site.
 - 4. Drainage area map showing on-site and off-site areas draining across or adjacent to the site with preliminary calculations of flows.
 - 5. Flood zones and flood ways as determined by FEMA maps. Elevations in Zone "A" areas on-site or within 200 feet shall be shown. Actual elevations shall be compared with limits shown on FEMA maps and needed adjustments indicated.

6. Proposed drainage improvements including detention areas and depths with preliminary calculations.
7. Proposed easements.

(b) **Three (3) copies of the preliminary plat and supporting data and three (3) copies of the drainage plans required by this chapter shall be submitted to the planning and development staff for review on or before the first day of the month, by noon, of the month in which approval by the Planning Commission is sought.** The plats shall be reviewed by city staff for compliance with state law, this chapter, and the city's ordinance, policies, rules and regulations. Staff will issue a comment letter, within ten (10) business days, requesting that any required changes be made, and will request that fifteen (15) folded copies of the revised plat and two (2) sets of revised plans be returned by a specified date. On receipt by city staff of an administratively complete application, staff shall schedule the application for action by the Planning Commission at its next available and appropriate meeting. The Planning Commission shall render a decision within thirty (30) days of the city's receipt of an administratively complete application, provided that the application is not withdrawn prior to Commission review. The Planning Commission's decision may consist of a recommendation of approval, disapproval or conditional approval.

(c) Upon action by the Planning Commission, city staff will schedule the preliminary plat for action at a regularly-scheduled City Council meeting to be held within thirty (30) days of the Planning Commission meeting date at which action was taken on the preliminary plat. The planning commission recommendation, along with the necessary copies of any corrected plats, plans or supporting documentation will be forwarded to the City Council for action at the next scheduled meeting date. The subdivider must submit corrected plats, plans or supporting documentation to the City not less than ten (10) days prior to such scheduled City Council meeting date.

(d) Following approval of the preliminary plat and prior to actual construction of any water and sanitary sewer facilities, the Texas Natural Resource Conservation Commission shall be notified if required by Title 30, Chapter 317 of the Texas Administrative Code.

(e) The approval of the preliminary plat does not constitute acceptance of the subdivision, but is merely an authorization to proceed with the preparation of the final plat. The approval of the preliminary plat shall expire two (2) years after City Council approval unless the final plat has been submitted for final approval during that time. Prior to the expiration of the initial term, and upon written request of the subdivider, an extension of time may be given at the discretion of the City Council for a single extension period of one (1) year, provided the subdivider has shown that he is proceeding in good faith to complete the work necessary before filing the final plat.

Sec. 21-21. Master preliminary plat procedure for a large tract in which improvements will be constructed in phases.

(a) Where the proposed subdivision constitutes a unit of a larger tract which is intended to be subsequently subdivided as additional units of the same subdivision, a master preliminary plat shall be submitted, showing the tentative proposed layout of the streets, blocks and drainage of the entire area. The master preliminary plat, if approved by the city council, shall be filed in the permanent files of the city. Thereafter, fractional final plats of subsequent units of such subdivision may be submitted for approval. Any request for change to the over-all layout must be submitted according to the procedures prescribed in this section.

The subdivider shall prepare or cause to be prepared a master preliminary plat, together with other supplementary information as specified herein. The plat shall reflect any conditions or requirements for approval imposed by the planning commission, together with the following requirements which must be shown on (as specified below) or accompany the plat:

(a) The master preliminary plat shall be drawn to a scale of one hundred (100) feet to the inch or

Larger, and shall show on the face of the plat as specified below or be accompanied by:

- (a) The proposed name of the subdivision. (face of plat)
- (b) The location map, north point, scale and date. Each plat and plans submitted must have the current date and must read month, day, and year on the face of plat. Date must be located under name of the plat or plans.
- (c) The names and addresses of the subdivider, the owner of record, the registered professional civil engineer responsible for the design and the registered professional land surveyor responsible for the land survey. (face of plat)
- (d) The approximate boundary line (accurate in scale) of the tract to be subdivided. (face of plat)
- (e) Contours with intervals of five-tenths (0.5) feet, more or less, referred to sea level datum, as required to show at least two (2) contours within the subdivision in addition to those necessary to clearly show outfall drainage including a benchmark on/or adjacent to the property. (face of plat)
- (f) Proper adjoining information including the names of adjacent subdivisions. (face of plat)
- (g) The location, widths, and names of all existing or platted streets or other public rights-of-way on-site and adjacent to the tract and within two hundred (200) feet of the tract as circumstances require. (face of plat)
- (h) Existing pavement, sewers, water mains, culverts, or other underground structures adjacent to the tract and within two hundred (200) feet of the tract with pipe sizes, grades and locations indicated. (face of plat)
- (i) All parcels of land intended to be dedicated for public use or reserved in deeds for the use of all property owners in the proposed subdivision, together with the purpose of conditions or limitations of such reservations, if any.

- (j) The layout, names and widths of proposed streets and easements; the radius of all arcs, length of the tangents, and the length of tangents between curves. (face of plat)
- (k) The layout, numbers, and approximate dimensions of the proposed lots with building setback lines shown. (face of plat)
- (l) The draft of any protective covenants whereby the subdivider proposes to regulate the use of the land in the subdivision; provided, however, that such restrictive covenants, conditions or limitations shall never be less than the minimum requirements of the city under the terms of this chapter. Where infrastructure design criteria is based on a specific type or density of development the covenants shall require development to conform to the design criteria.
- (m) A preliminary drainage plan shall be submitted with each master preliminary plat (at the same scale) which shall include the following:
 - 1. Overall layout of lots or parcels.
 - 2. Contours.
 - 3. Any defined water ways on or adjacent to the site.
 - 4. Drainage area map showing on-site areas draining across or adjacent to the site with preliminary calculations of flows.
 - 5. Flood zones and flood ways as determined by FEMA maps. Elevations in zone "A" areas on-site or within two hundred (200) feet shall be shown. Actual elevations shall be compared with limits shown on FEMA maps and needed adjustments indicated.
 - 6. Proposed drainage improvements including detention areas and depths with preliminary calculations.
 - 7. Proposed easements.

- (b) **Three (3) copies of the master preliminary plat and supporting data, and three (3) copies of the preliminary drainage plans required by this chapter shall be submitted to the planning and development staff for review on or before the first day of the month, by noon, of the month in which approval by the Planning Commission is sought.** The plats shall be reviewed by city staff for compliance with state law, this chapter, and the city's ordinance, policies, rules and regulations. Staff will issue a comment letter within ten (10) business days, requesting that any required changes be made, and will request that fifteen (15) folded copies of the revised plat and two (2) sets of revised plans be returned by a specified date. On receipt by city staff of an administratively complete application, staff shall schedule the application for action by the planning commission at its next available and appropriate meeting. The planning commission shall render a decision within thirty (30) days of the city's receipt of an administratively complete application, provided that the application is not withdrawn prior to commission review. The planning commission's decision may consist of a recommendation of approval, disapproval or conditional approval.
- (c) Upon action by the planning commission, city staff will schedule the master preliminary plat for action at a regularly scheduled city council meeting to be held within thirty (30) days of the planning commission meeting date at which action was taken on the master preliminary plat. The planning Commission recommendation, along with the necessary copies of any corrected plats, plans, or supporting documentation, will be forwarded to the city council for action at the scheduled meeting date. The subdivider must submit corrected plats, plans, or supporting documentation to the city not less than ten (10) days prior to such scheduled city council meeting date.
- (d) The approval of the master preliminary plat shall expire five (5) years after city council approval. Such approval may be reinstated after review by the city council for single extensions of one (1) year with a showing of good cause by the subdivider.

Sec. 21-22. Construction plans.

Prior to approval of the final plat, construction plans meeting the requirements of the city's design criteria and other applicable ordinances, rules, policies and regulations shall be submitted for all improvements proposed on the final plat. After a final plat has been approved by the city council and the final construction plans have been approved by the city engineer, the subdivider may proceed with construction of the public infrastructure.

Sec. 21-23. Final plat procedure.

(a) No final plat shall be considered until a set of final construction and drainage plans have been approved by the city engineer for the public infrastructure improvements.

(b) The subdivider shall prepare or cause to be prepared a final plat, or plats, together with other supplementary information as specified herein. The final plat shall conform substantially to the master preliminary plat as approved (for large developments constructed in phases) and shall reflect any conditions or requirements for final approval imposed by the city council, together with the following additional requirements which must be shown on (as specified below) or accompany the plat:

- (1) The final plat shall be drawn to a scale of one hundred (100) feet to one inch or larger.
- (2) Name of the subdivision. (face of plat)
- (3) The names and addresses of the subdivider, the owner of record, the professional engineer responsible for the design, and the registered professional land surveyor responsible for the land survey. (face of plat)
- (4) A list showing the names of person(s) to whom notice of hearing shall be sent (for replats only).
- (5) Location map, north point, scale and date. Each plat and plans submitted must have the current date and must read month, day, and year on face of plat. Date must be located under name of plat or plans. (face of plat)

- (6) A signed certificate of the professional registered land surveyor who surveyed, mapped, and monumented the land shall be placed on the face of the plat. (face of plat)
- (7) A title report from a title company that is less than ninety (90) days old, and shall include a certificate of ownership of the land and show all liens on the property.
- (8) A statement of express dedication of all streets, easements, alleys, parks, playgrounds, public places and any other rights-of-way within or outside the subdivision necessary to satisfy the requirements of this chapter to the public use forever, shall be executed by all persons, owning an interest in the property subdivided, resubdivided and platted; and shall be acknowledged in the manner prescribed by the laws of the State of Texas for conveyance of real property. Lienholders must execute a subordination agreement subordinating their liens to all public streets, alleys, parks, school sites and other public areas shown on the plat of such subdivision or resubdivision as being set aside for public use and purpose. (face of plat)
- (9) A field note description of the tract of land subdivided. (face of plat)
- (10) A statement and express representation on the face of the plat that the parties joining in such dedication are the sole owners of such tract of land.
- (11) The boundary lines with accurate distance and bearings, the exact location and width of all existing or recorded streets intersecting the boundary of the tract. The names of adjacent subdivisions and/or the names of owners of adjacent unplatted land (streets, alleys, and lot lines in adjacent subdivisions shall be shown by dotted lines). All necessary data to reproduce the plat and each lot on the ground must be shown on the plat. (face of plat)

- (12) Bearings and distances to the nearest established street lines or official monuments, which shall be accurately described on the plat; the plat also shall show ties to municipal, county, or section lines. (face of plat)
- (13) The exact layout which must include the following on the face of the plat:
 - a. Streets and street names.
 - b. The length of all arcs, internal angles, points of curvature, length and bearing of the tangents, and the length of tangent between curves.
 - c. All easements or rights-of-way provided for drainage, public services or utilities and any limitations of the easements/rights-of-way.
 - d. All lot and block numbers.
 - e. All lot lines with accurate dimensions.
 - f. All alleys.
 - g. Location and description of monuments.
- (14) Building setback lines from all adjacent streets. (face of plat)
- (15) Boundary closure calculations, the minimum of which shall be 1: 15,000.
- (16) The draft of any protective covenants whereby the subdivider proposes to regulate the use of the land in the subdivision; provided, however, that restrictive covenants, conditions, or limitations shall never be less than the minimum requirements of the city under the terms of this chapter or other city ordinances. The protective covenants must include language establishing the person(s) responsible for maintenance of the drainage detention facilities.
- (17) A waiver of claim for damage occasioned by the establishment of grades or alterations of the surface of any portion of the streets.

- (18) A County certified Tax Certificate, that is less than ninety (90) days old, which shows that all taxes have been paid on the tract to be subdivided, and that no delinquent taxes against the property are outstanding.
- (19) Such other certificates, data, affidavits, and endorsements or dedications as may be required by the City Council for the enforcement of these regulations.
- (20) Certificate of approval for City Council signature. (face of plat)
- (21) Letters from utility companies indicating that the required easements are shown on the plat.
- (22) No infrastructure improvements shall be shown on a final plat.
- (23) A notation on the plat that sidewalks must be constructed as part of the issuance of a building permit for each tract.
- (24) A notation on the plat that no building permits will be issued until all the storm drainage improvements, which may include detention, have been constructed.
- (25) Contours with intervals of five-tenths (0.5) of a foot, more or less, referred to sea level datum, as required to show at least two (2) contours within the subdivision in addition to those necessary to clearly show outfall drainage including a benchmark on/or adjacent to the property. (face of plat)
- (26) Existing pavement, sewers, water mains, culverts, or other underground structures adjacent to the tract and within two hundred (200) feet of the tract with pipe sizes, grades, and locations indicated (face of plat).
- (27) The location, widths, and names of all existing or platted streets or other public rights-of-way on-site and adjacent to the tract and within two hundred (200) feet of the tract as circumstances require (face of plat).

(c) **Three (3) copies of the final plat and three (3) sets of final construction plans, along with all supporting data shall be submitted to planning and development staff for review on or before the first day of the month, by noon, of the month in which approval by the Planning Commission is sought.** The plats and plans shall be reviewed by city staff for compliance with state law, this chapter, and the City's ordinances, policies, rules and regulations. Staff will issue a comment letter, within (10) business days, requesting that any required changes be made and will request that fifteen (15) folded copies of the revised plat and two (2) sets of revised plans be returned by a specified date. On receipt by city staff of an administratively complete application, staff shall schedule the plat for action by the Planning Commission at its next available and appropriate meeting. The Planning Commission shall not review or approve any final plat without all of the documentation being complete and satisfying all requirements of this ordinance. The Planning Commission shall render a decision within thirty (30) days of the city's receipt of an administratively complete application, provided that the application is not withdrawn prior to Commission review. The decision may consist of a recommendation of approval or disapproval. No final plat shall be processed until final construction plans are approved.

(d) Upon action by the Planning Commission, city staff shall schedule the final plat for action at a regularly-scheduled City Council agenda meeting to be held within the thirty (30) days of the Planning Commission meeting date at which action was taken on the final plat. The planning commission recommendation, along with the necessary plats and supporting documentation, will be forwarded to the city council for action at the scheduled meeting date. If the plat conforms to all conditions and requirements established by this chapter, the City Council shall approve the plat. Should the final plat, as submitted, fail to meet the conditions and requirements of the City Council, then the council shall disapprove the plat and note its disapproval thereon and attach thereto a statement of the reasons for disapproval. A disapproved final plat may be resubmitted to the planning commission with correcting changes within thirty (30) days of the Council action.

(e) The final plat and any applicable restrictions shall be recorded by the City in the office of the county clerk according to the following time frames:

(i) after all public infrastructure improvements have been constructed, inspected, the required Engineering inspection fee paid, a one year maintenance bond in the amount of fifty (50) percent of the costs of the infrastructure improvements valid for one year from the date the infrastructure is accepted by the city (For plats in the ETJ the bond shall be made payable to the City of Alvin and Brazoria County), and infrastructure improvements accepted by the city (in cases where public infrastructure improvements are required by this chapter) or

(ii) within thirty (30) days of final plat approval by the city council (in all other cases not involving construction of public infrastructure improvements). At the time of submission of the final plat, the subdivider must deposit with the city sufficient funds for recording of the plat.

Sec. 21-24. Abbreviated platting procedure.

(a) An abbreviated platting procedure may be followed in instances where a simplified plat or replat of a subdivision is proposed. When all requirements of this section are satisfied and the written approval of the City Engineer is obtained, the subdivider shall be required only to comply with the final plat provisions and procedures of this chapter.

To qualify for the abbreviated platting procedure the proposed subdivision or resubdivision must meet all the following requirements:

(1) All lots of the proposed subdivision must front on a public street or streets that meet the following criteria:

a. The street(s) has/have been previously dedicated to and accepted by the City, County or State, as applicable, is/are being maintained by the entity with jurisdiction, and is/are being traveled by the public.

- b. The street(s) exist(s) within a right-of-way of sixty-foot minimum width, or the proposed plat will dedicate the necessary additional rights-of-way to provide a minimum of thirty-foot width from the centerline of the existing or original right-of-way;
- (2) No additional streets or alleys or extensions of existing streets or alleys are required for the proposed subdivision.
- (3) The public (City or County, as applicable) utilities and public drainage facilities required by this Code are in place to serve each lot in the proposed subdivision and require no alterations or extensions, or the utilities and drainage facilities would be satisfactory with minor alterations proposed by the subdivider and acceptable to the City Engineer when necessary assurance of the alteration has been provided. Construction and drainage plans for each improvement must have been approved by the City prior to approval of the plat; provided, however, that in cases where a subdivision of land involves two (2) or fewer lots, is required for conveyance of ownership only, and no immediate improvements are proposed to be constructed, a note shall be placed on the plat stating that a drainage plan in compliance with the city's design criteria must be submitted at the time of application for a building permit. In areas where water and sewer services are not within tie-on range as defined in Section 25-25 of this Code, approved septic systems and water wells shall be acceptable.
- (4) All necessary easements and/or public dedications are either existing or will be dedicated by the owner/subdivider. All such easements and/or public dedications must be acceptable in width and configuration. Minimum easement dedications shall be as set forth in Section 21-35(a) of this Chapter.

Sec. 21-25. Vacating plat.

(a) The developer of the tract covered by a plat may request to vacate the plat at any time before any lot in the plat is sold. The plat is vacated when a signed, acknowledged instrument declaring the plat vacated is approved and recorded in the manner prescribed for the original plat.

(b) If lots in the plat have been sold, the plat, or any part of the plat, may be vacated on the application of all owners of lots in the plat with approval obtained in the manner prescribed for the original plat.

(c) The county clerk will write legibly on the vacated plat the word "Vacated" and will enter on the plat a reference to the volume and page at which the vacating instrument is recorded.

(d) On the execution and recording of the vacation instrument, the vacated plat has no effect.

(e) The procedure for vacating a plat shall conform to the current Texas Local Government Code and be subject to the same approval process for a final plat.

Sec. 21-26. Replatting without vacating preceding plat.

(a) A replat is a redesign of all or a part of a recorded plat or subdivision of land which substantially changes the elements of the plat. The same procedures shall be followed as for final or abbreviated plat. The replat must be in accordance with the requirements of the current Texas Local Government Code. A replat of a subdivision or part of a subdivision may be recorded and is controlling over the preceding plat without vacation of that plat if the replat:

- (1) Is signed and acknowledged by only the owners of the property being replatted;
- (2) Is approved by City Council, after a public hearing on the matter at which parties in interest and citizens have an opportunity to be heard;
- (3) Does not attempt to amend or remove any covenants or restrictions.
- (4) Identifies the lots or portions of the lots being replatted and provides a reason for the replat.

(b) A replat without vacation of the preceding plat must also conform to the requirements of this subsection if any of the area being replatted was limited by deed restrictions to residential use for not more than two (2) residential units per lot. These requirements are:

(1) Notice of the hearing required by this section 21-26 shall be given in accordance with subsection (c) below.

(2) If the proposed replat requires a variance and is protested in accordance with this subsection (b)(2), the proposed replat must receive, in order to be approved, the affirmative vote of at least three-fourths of the members present of both the Planning Commission and City Council. For legal protest, written instruments signed by the owners of at least 20 percent of the area of the lots or land immediately adjoining the area covered by the proposed replat and extending 200 feet from that area, but within the original subdivision, must be filed with the City of Alvin prior to the close of the public hearing. In computing the percentage of land area above, the area of the streets and alleys shall be included. Compliance with subsection (b)(2) is not required for approval of a replat or part of a preceding plat if the area to be replatted was designated or reserved for other than single or duplex family residential use by notation on the last legally recorded plat.

(c) Notice of the hearing required under section 21-26 of this chapter shall be given before the 15th day before the date of the hearing by:

(1) publication in the official newspaper of the City; and

(2) by written notice, with a copy of section 21-26 (b) attached, forwarded by the City to the owners of lots that are in the original subdivision and that are within 200 feet of the lots to be replatted, as indicated on the most recently approved municipal tax roll or in the case of a subdivision within the extraterritorial jurisdiction, the most recently approved county tax roll of the property upon which the replat is requested.

The written notice may be delivered by depositing the notice, properly addressed with postage prepaid, in a post office or postal depository within the boundaries of the city

All costs for these notices and letters shall be paid by the developer.

(d) The final replat shall meet the requirements of and be subject to the approval process for final plats.

Sec. 21-27. Amending plat.

a. The City Council, after recommendation of the Planning Commission, may approve and issue an amending plat, which may be recorded and is controlling over the preceding plat without vacation of that plat, if the amending plat is signed by the applicants only and is solely for one or more of the following purposes:

- (1) to correct an error in a course or distance shown on the preceding plat;
- (2) to add a course or distance that was omitted on the preceding plat;
- (3) to correct an error in a real property description shown on the preceding plat;
- (4) to indicate monuments set after the death, disability, or retirement from practice of the engineer or surveyor responsible for setting monuments;
- (5) to show the location or character of a monument that has been changed in location or character or that is shown incorrectly as to location or character on the preceding plat;
- (6) to correct any other type of surveyor or clerical error or omission previously approved by the City Council, which may include lot numbers, acreage, street names, and identification of adjacent recorded plats;
- (7) to correct an error in courses and distances of lot lines between two adjacent lots if:
 - a. both lot owners join in the application for amending the plat;
 - b. neither lot is abolished;

- c. the amendment does not attempt to remove recorded covenants or restrictions; and the amendment does not have a material adverse effect on the property rights of the other owners in the plat;
- (8) to relocate a lot line to eliminate an inadvertent encroachment of a building or other improvement on a lot line or easement;
- (9) to relocate one or more lot lines between one or more adjacent lots if:
 - (a) the owners of all those lots join in the application for amending the plat;
 - (b) the amendment does not attempt to remove recorded covenants or restrictions;and
 - (c) the amendment does not increase the number of lots;
- (10) to make necessary changes to the preceding plat to create six or fewer lots in the subdivision or a part of the subdivision covered by the preceding plat if:
 - (a) the changes do not affect applicable zoning and other regulations of the city;
 - (b) the changes do not attempt to amend or remove any covenants or restrictions;and
 - (c) the area covered by the changes is located in an area that the City Council has approved, after a public hearing, as a residential improvement area; or
- (11) to replat one or more lots fronting on an existing street if:
 - (a) the owners of all those lots join in the application for amending the plat;
 - (b) the amendment does not attempt to remove recorded covenants or restrictions;and
 - (c) the amendment does not increase the number of lots; and
 - (d) the amendment does not create or require the creation of a new street or make necessary the extension of municipal facilities.

(b) The amending plat procedures shall be in accordance with the current Texas Local Government Code and the approval process set forth in this chapter for final plats.

(c) The amending plat shall contain all the informational requirements set forth in this chapter for a final plat.

Sec. 21-28. Site plans.

(a) In cases where a subdivision of land is not involved or is not required by this chapter, a site plan must be submitted in conformance with this chapter unless an exemption set forth in this section applies. The purpose of site plans is to establish a site plan review process for land development to ensure that the proposed development is coordinated with existing infrastructure, provides the minimum facilities needed for the type of development, and conforms to state law, and city codes, policies and regulations. In addition to other applicable provisions of this chapter, the provisions of Article III (Minimum Requirements for Subdivision and/or Resubdivision) of this chapter shall apply to site plans.

(b) A builder or developer should attend a predevelopment meeting with the city staff prior to submittal of a complete site plan. Two (2) copies of the site plan shall be submitted to the planning and development staff. City staff will review the site plan for conformance with this chapter and any other applicable city ordinances, policies and regulations. Site plans will be subject to the approval of the City Engineer.

(c) Drainage plans are required and shall be sealed by a registered professional engineer. The city shall not issue a building permit or any other type of permit for development on a lot or tract subject to the site plan requirements of this chapter until the site plan is filed with and finally approved by the City Engineer.

(d) The site plan shall include, as a minimum, the following:

- (1) Property lines, lot lines, and setbacks. (A boundary survey prepared by a registered professional land surveyor must be provided in cases where the subject property has not been previously platted).

- (2) Existing and proposed contours and/or spot elevations to define the drainage patterns on the property and the relationship to adjacent properties.
 - (3) Footprint of all existing and proposed buildings, structures or improvements with dimensions of the buildings, structures, or improvements in relation to the property lines.
 - (4) Locations of existing and proposed pavement, water, sanitary sewer, and open or enclosed drainage facilities on and adjacent to the property.
 - (5) Locations of drives, parking spaces, fire lanes, and sidewalks including all facilities required by the Americans with Disabilities Act.
 - (6) Flood zone and minimum building elevation to be above the 100-year flood level.
 - (7) Proposed stormwater detention areas with calculations for the volume and outlet capacity in accordance with the City's requirements in the design criteria.
 - (8) Proposed dumpster location(s) and screening.
 - (9) Existing and proposed fencing, screening, and landscaping.
 - (10) Each easement and right-of-way within or abutting the boundary of the property.
 - (11) The dimensions of each street, sidewalk, alley, square, park, or other part of the property intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on or adjacent to the street, sidewalk, alley, square, park, or other part.
 - (12) Location map, north arrow, scale, title block and legend. The scale of this site plan shall be not smaller than 1" = 100'.
- (e) The following improvements shall be exempt from the requirement of filing a site plan:
- (a) Construction or alteration of a single-family residence on a single lot or an accessory building for a residence.
 - (b) Construction of an agricultural building where the structure is not within 25 feet of a property line.
 - (c) Building additions of less than 700 square feet.

- (d) Parking lot additions of less than 5 spaces.
- (f) The Public infrastructure improvements shall conform to the City’s design criteria.
- (g) Where a site requires more than 200 parking spaces, a traffic impact study shall be required that defines existing traffic conditions adjacent to the site and the impact of traffic from the proposed development on adjacent roadways. The report shall include recommendations for access points to the site with lane recommendations and street and/or intersection improvements needed to accommodate the traffic. The developer shall be responsible for the construction of the recommended improvements.

Sec. 21-30—21-31. Reserved.

ARTICLE III. MINIMUM REQUIREMENTS FOR SUBDIVISION AND/OR RESUBDIVISION

Sec. 21-32. Established.

The subdivider shall comply with the following minimum requirements before consideration will be given to any final plat of any subdivision or resubdivision within the city limits of the City of Alvin or within the ETJ of the City of Alvin. The provisions of this article that do not conflict with Section 21-24 shall apply to abbreviated plats.

Sec. 21-33. Streets.

(a) *Arterial streets.* The arrangement, character, extent, width, grade, and location of all arterial and collector streets shall provide for the continuation or appropriate projection to existing and planned streets, for topographical conditions, for public convenience and safety, and for their appropriate relation to the proposed uses of the land to be served by such streets.

(b) *Minor streets.* Minor streets shall be so laid out that their use by through traffic will be discouraged.

(c) *Marginal access streets; reverse frontage, etc.* Where a subdivision abuts or contains an existing or proposed arterial street, the City may require marginal access streets, reverse frontage with screen planting contained in a non-cross reservation along the rear property line, deep lots with rear service alleys, or such other treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.

(d) *Right-of-way parallel streets.* Where a subdivision borders on or contains a railroad right-of-way or a highway right-of-way, the City may require a street approximately parallel to and on each side of such right-of-way, at a distance suitable for the appropriate use of the intervening land, as for park purposes in residential districts, or for commercial or industrial purposes in appropriate districts. Such distances shall also be determined with due regard for the requirements of approach grades and future grade separations.

(e) *Multiple Access Points* – All subdivisions except single dead-end streets shall have a minimum of two access points to existing (or future) public streets. This may be a boulevard where a second access is not available.

(f) *Street jogs.* Street jogs with centerline offsets of less than one hundred twenty-five (125) feet shall be avoided.

(g) *Reverse curves.* A tangent at least one hundred (100) feet long shall be introduced between reverse curves on arterial and collector streets.

(h) *Connecting street lines.* When connecting street lines deflect from each other at any one point by more than ten (10) degrees, they shall be connected by a curve with a radius adequate to insure sight distances of not less than fifty (50) feet for minor and collector streets and of such greater radii as the Council shall determine for special cases.

(i) *Intersections.* Streets shall be laid out so as to intersect as nearly as possible at right angles and no street shall intersect any other street at less than sixty (60) degrees.

(j) *Property lines at street intersections.* Property lines at street intersections shall be rounded with a radius of fifteen (15) feet, or of a greater radius where large truck traffic is anticipated.

(k) *Rights-of-way widths.* All street rights-of-way widths shall be not less than sixty (60) feet.

(l) *Half streets.* Half streets shall be prohibited, except where essential to the reasonable development of the subdivision in conformity with the other requirements of this chapter; and where the Council finds it will be practicable to require the dedication of the other half when the adjoining property is subdivided. Wherever a half street is adjacent to a tract to be subdivided, the other half of the street shall be dedicated.

(m) *Dead-end streets.* Dead-end streets, designated to be so permanently, shall not be longer than 1200 feet and shall be provided at the closed end with a turn-around having an outside roadway diameter of at least eighty (80) feet and a street property line diameter of at least one hundred (100) feet.

(n) *Street names.* No street names shall be used which will duplicate or be confused with the names of existing streets. Street names shall be subject to the approval of the Council.

(o) *Street Design.* The details of the street design shall conform to the City's Design Criteria. Concrete paving is required.

Sec. 21-34. Alleys.

(a) *Generally.* Alleys may be provided in subdivisions, and in the case of commercial and industrial districts may be required when other definite and assured provisions are not made for service access, such as off-street loading, unloading and parking consistent with an adequate space for the uses proposed.

(b) *Width of alleys.* The width of alleys in commercial and industrial districts shall be at least twenty (20) feet. The width of alleys in residential districts shall be twenty (20) feet where possible, however, a minimum width of sixteen (16) feet may be permitted.

(c) *Alley intersections.* Alley intersections and sharp changes in alignment shall be avoided, but where necessary, corners shall be cut off sufficiently to permit safe vehicular movement.

(d) *Dead-end alleys.* Dead-end alleys shall be avoided where possible, but when unavoidable, adequate turn-around facilities at the dead end shall be provided.

Sec. 21-35. Easements.

(a) *Generally.* Easements for utilities shall be provided across lots or centered on rear or side lot lines where necessary, and shall be at least seven & one half (7 1/2) feet wide on each lot so as to create a fifteen (15) foot total width. Where easements are all on one side of a lot, a minimum of ten (10) feet may be used if only one line is proposed to be installed. Where easements on one side or rear of a lot are to be used for multiple purposes the minimum width shall be fifteen (15) feet.

(b) *Stormwater easements or drainage right-of-way.* Where a subdivision is traversed by a watercourse, drainage way, channel, or stream there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse, and such further width for maintenance and construction, or both as will be adequate for the purpose. Parallel streets or parkways may be required in connection therewith.

Sec. 21-36. Blocks.

(a) *Lengths, widths and shapes.* The lengths, widths, and shapes of blocks shall be determined with due regard to the following:

- (1) Provision of adequate building sites suitable to the special needs of the type of use contemplated.
- (2) Needs for convenient access, circulation, control and safety of street traffic.
- (3) Limitations and opportunities of topography.

(b) No block shall exceed a length of one thousand two hundred (1,200) feet in residential or commercial developments.

Sec. 21-37. Lots.

(a) *Minimum setback lines.* Minimum front residential building setback lines shall be at least twenty-five (25) feet. Minimum side set backs shall be fifteen (15) feet on corner lots only when abutting another rear yard and when driveways are limited to front only. Lots abutting across walkways shall be treated as corner lots. Minimum rear residential, commercial, business and industrial setback lines shall be ten feet (10'). Minimum side residential, commercial, business and industrial setback lines shall be five feet (5'). Minimum commercial, business and industrial building front setback lines shall be at least twenty-five (25) feet, unless otherwise approved. Exception: Minimum setback lines shall increase ten (10) feet from a sixty-foot right-of-way where minor or major thoroughfare is planned in the Thoroughfare Plan of the City of Alvin.

(b) *Lot dimensions.* Lot dimensions shall be a minimum of sixty (60) feet in width at the building setback line and of a depth so as to provide an area not less than seven thousand (7,000) square feet.

- (1) Residential lots that are served by public water and not served by public sewer shall be not less than one hundred twenty (120) feet in width at the building setback line and shall not have an area less than one-half acre. Consideration should be given to the possibility of resubdivision at such time that sanitary sewer service becomes available.
- (2) Residential lots that are not served by public water and sewer shall be not less than one-hundred twenty (120) feet in width at the building setback line and shall not have an area less than one (1) acre.
- (3) Depth and width of properties reserved or laid out for business and industrial purposes shall be adequate to provide for the off-street service and parking facilities required by the type of use and development contemplated.
- (4) In an approved subdivision, lot sizes may be permitted to be increased in order to secure privacy within such lots, or to allow improvement on such lots to conform to the building

requirements. However, in no case shall lot size changes be permitted if they result in creating one or more lots of size less than the minimum area requirements of this chapter.

(c) *Access to public streets.* The subdividing of the land shall be such as to provide each lot with satisfactory access to a public street.

(d) *Double and reverse frontage lots.* Double frontage and reverse frontage lots should be avoided unless backing up to a major thoroughfare.

(e) *Side lot lines.* Side lot lines shall be substantially at right angles or radial to street lines.

(f) *Flag and key shaped lots.* No flag or key-shaped lots are allowed.

Sec. 21-38. Public sites and open spaces.

In conformity with the master plan of the City of Alvin where a proposed park, school, playground or other public facility is located in whole or in part in a subdivision, the subdivider may dedicate such land to public use or shall provide the appropriate political subdivision a one-year purchase option on such land.

Sec. 21-39. Monuments.

Monuments set as exterior boundary markers shall be a minimum of 5/8 inch iron rod or 3/4 inch iron pipe at least 24 inches long, encased in concrete for a minimum of 18 inches below the surface of the ground.

Permanent reference monuments ("PRM") shall be set at all boundary line angle points, block corners, angle points, points of curvature, and at intervals not to exceed 1000 feet. Permanent reference monuments shall be a minimum 1/2 inch iron rod or 1/2 inch iron pipe encased in 18 inches of concrete.

All monuments shall be set to the standard of the Texas Board of Professional Land Surveying Practices Act and the general rules of practices and procedures of the Texas Board of Professional Land Surveying and shall bear reference caps as indicated.

Interior lot corner monuments shall be a minimum of 1/2 inch iron rod or 1/2 inch iron pipe at least 24 inches in length.

Sec. 21-40. Additional Street Requirements.

(a) All streets shall be constructed in accordance with the City's design criteria.

(b) The developer shall be responsible for the construction of all roadways in the development according to minor street standards. Where the Thoroughfare Plan requires street widths over and above local street requirements, the developer shall dedicate the right of way required for the larger street and construct up to a 37-foot wide pavement. If the City requires a wider pavement, the City will provide funding for the increased width subject to the availability of funds and within legal limitations.

(c) The developer shall be responsible for the construction of necessary improvements on perimeter streets to bring the pavement and curbing to minor street standards for the half of the street abutting the development.

Sec. 21-41. Water, and Wastewater Facilities.

(a) Water and wastewater facilities shall conform to the City's design criteria.

(b) If the City's Masterplan requirements dictate a larger line size or a greater sewer line depth than that required for the subdivision, the City will pay the difference between the subdivision requirement and Masterplan requirements; subject, however, to the availability of funds and legal requirements.

Sec. 21-42. Sidewalks, ADA ramps, driveways and driveway approaches.

Sidewalks, Americans with Disabilities Act (ADA) ramps, driveways and driveway approaches shall be required and shall be constructed in accordance with the City's design criteria. ADA ramps shall be constructed at all street intersections and other locations deemed necessary for adequate accessibility. The construction of ADA ramps shall be included in the paving contract and are therefore the responsibility of the developer. If not constructed prior to issuance of a building permit, sidewalks,

driveways, and driveway approaches must be constructed as part of the issuance of the building permit for each tract.

Sec. 21-42.1.

(1) *Fee payment in lieu of sidewalk installation.* Where a sidewalk is required by the City of Alvin Subdivision Ordinance and the installation is not feasible due to construction or site constraints, the City Engineer may require the Developer/Property Owner to satisfy the sidewalk requirement by payment of a fee to the City's Sidewalk Fund in lieu of installing the sidewalk. Said payment shall be at the current rate of construction per square foot or square yard of sidewalk, and such rate shall be based on the City's most recent annual Concrete Maintenance Contract bid pricing. Once approved by the City Engineer payment of the fee shall be rendered at the time of building permit issuance.

(2) *Sidewalk Fund.* There is hereby established a special fund for the deposit of all sums paid in lieu of sidewalk installation under this section or any preceding ordinance, this fund shall be known as the "Sidewalk Fund". Funds shall only be utilized to build, maintain, or replace sidewalks within the City.

Sec. 21-43. Street lighting and signage.

The developer shall provide a layout of the proposed street lights and provide easements for power lines where such are required. The maximum allowable spacing between street lights is three hundred (300') feet. The City will arrange for installation through the power company for those subdivisions within the city limits. The developer shall provide street name signs and traffic control devices in accordance with the requirements of the Texas Manual on Uniform Traffic Control Devices.

Sec. 21-44. Drainage and drainage structures.

The subdivider shall furnish and install all necessary drainage improvements in accordance with the City's design criteria.

Sec. 21-45.-21-56. Reserved.

ARTICLE IV. REQUIRED IMPROVEMENTS FOR OPEN DITCH ROADSIDE DRAINAGE SYSTEMS

Sec. 21-57. New subdivisions with open roadside drainage systems.

(a) A subdivider may develop a subdivision on an existing roadside drainage system or construct an open ditch roadside drainage system as part of the subdivision under the conditions set forth in this article and the City's design criteria. All other requirements set forth in this chapter which are not inconsistent with the provisions in this article shall apply to subdivisions with open ditch roadside drainage systems. Additionally, all other applicable code provisions and laws shall apply to such subdivisions.

(b) The lot configuration shall conform to the following minimum requirements:

(1) Minimum size shall be one acre.

(2) Minimum lot width, measured at the right-of-way shall be:

a. Tangential or curved right-of-way with radius greater than eighty (80) feet: one hundred twenty (120) feet.

b. Curved right-of-way with radius of eighty (80) feet or less: fifty (50) feet.

c. No flag or key-shaped lots will be allowed.

d. Front building setback shall be 35 feet minimum.

(b) The roadway section shall conform to the requirements of the City's design criteria. The right-of-way shall be adequate to contain the pavement and ditches with the minimum width being seventy (70) feet. Additional width, however, may be required if necessary.

Sec. 21-58. Replat of an existing subdivision with an open roadside drainage system.

In all cases where a request is made to re-plat a subdivision with an open roadside drainage system in existence on the date of enactment of this chapter the following requirements shall apply:

- (a) the subdivision must have been legally platted and recorded according to the ordinances and criteria in effect at the time of the subdivision; and
- (b) the open roadside drainage system must be in existence at the time of enactment of this ordinance; and
- (c) the replatting of existing lots cannot result in the reduction of lot sizes if the size of the existing lots are already smaller than this chapter allows; and
- (d) the criteria set forth in section 21-24 for abbreviated plats must be met; and
- (e) the resulting reconfiguration of lots will not affect the approved drainage plan for the original subdivision on file with the city or, with minor modification(s) to existing drainage plans, it can be demonstrated to the City Engineer that the reconfiguration of existing lots will not have an adverse impact on drainage; and
- (f) the procedure set forth for replats in Section 21-26 are met.

Secs. 21- 59. – 21-69. Reserved.

ARTICLE V. MODULAR HOME SUBDIVISIONS

Sec. 21-70. Statement of public responsibility.

This article shall govern the establishment and operation of all modular home subdivisions in the corporate limits of the City of Alvin.

The design and use of modular home subdivisions is an important factor in the process of sound community growth, and becomes a public responsibility in that public services must be provided, and the health, safety and welfare of the community, as well as harmonious development of the area, must be maintained.

Therefore, this Code of Ordinances is hereby supplemented by creating a modular home subdivision classification reading as follows.

Sec. 21-71. Definitions

The following words and phrases shall have the following meanings as used in this article:

Alteration means the replacement, installation, addition, modification or removal of any structural component or any equipment which may affect the construction, fire safety, occupancy, plumbing, heat-producing or electrical system. It includes any modification made in the modular home which may affect the compliance of the home with the standards, but it does not include the repair or replacement of a component or appliance requiring “plug-in” to an electrical receptacle where the replaced item is of the same configuration and rating as the one being replaced. It also does not include the addition of an appliance requiring “plug-in” to an electrical receptacle, which appliance was not provided with the modular home by the manufacturer, if the rating of the appliance does not exceed the rating of the circuit to which it is connected.

Building official means the city inspector and any person designated by him to perform the duties set out in this article.

Manufacturer means a person licensed as a manufacturer by the State of Texas pursuant to Vernon’s Ann. Civ. St. art. 5221f.

Modular home means a dwelling that is manufactured in two (2) or more modules at a location other than the homesite and which is designated to be used as a residence to be used as a residence when the modules are transported to the homesite, and the modules are joined together and installed on a permanent foundation system. The term includes the plumbing, heating, air conditioning, and electrical system contained in the structure. It is expressly provided, however, that the term “modular home” shall not mean or apply to, and the following items are expressly excluded from the purview of this article:

- (1) Sectional or panelized housing in which the basic components assembled at the homesite are not at least three (3) dimensional modules;
- (2) A ready-built home which is constructed so that the entire living area is contained in a single unit or section at a temporary location for the purpose of selling it and moving it to another location; and,

(3) A home constructed in modules incorporating concrete or masonry as the primary structural component.

Owner means the person holding title to the property and any person having control over the property.

Permanent foundation system means that the modular home shall be permanently affixed to a foundation system which meets or exceeds performance requirements of the applicable state or local building code and the manufacturer's installation specifications for permanently affixing the unit, as distinct from mobile home installation. All modular homes shall be installed in accordance with the manufacturer's installation instructions. Modular manufacturer's installation instructions shall bear the seal of a professional registered engineer and shall include details of the construction of the foundation and materials, hardware, devices and components for attachment of the modular home to the foundation system. The foundation shall be designed for the soil characteristics and windloads prevalent to the individual site.

Retailer means any person engaged in the business of buying for resale, selling or exchanging modular homes, or offering such for sale, exchange, or lease purchase to consumers. No person shall be considered to be a retailer unless engaged in the sale, exchange or lease purchase of two (2) or more modular homes to consumers in any consecutive twelve-month period.

Subdivision means the division of a tract or parcel of land into two (2) or more parts or lots for the purpose of the sale of lots for residential occupancy in modular homes, or for the purpose of construction of modular homes on a lot or lots.

Sec. 21-72. Scope of article provisions; conflicting provisions.

(a) All provisions of the ordinances of the City of Alvin shall apply to the placement and the use of a modular home on any property within the city on the same basis as such ordinances are applicable to the construction and the use of any other structure except to the extent such ordinances of the city are consistent with state law, or are in conflict with the provisions of this article.

- (b) However, any modular home placed upon a lot or tract of land outside a modular home subdivision shall meet the requirements of the setback lines, building lines, and generally the requirements of the particular subdivision in which said modular home is to be build; and further shall meet the requirements of this chapter.
- (c) For purposes of all the ordinances of the City of Alvin, the placement of a modular home shall be deemed the construction of a structure.

Sec. 21-73. Plan approval and building permits.

- (a) It shall be unlawful for any person to construct, alter or extend any modular home subdivision area within the limits of the City of Alvin, unless he holds a valid building permit issued by the city inspector in the name of such person for the specific construction, alteration or extension proposed.
- (b) Also, all plans for specific construction, alteration or extension of a modular home subdivision shall have been submitted, reviewed and approved by the city engineer according to the procedures established by this chapter before a permit is issued by the city inspector.
- (c) A final plat shall be approved by the planning commission and by the city council, and the approval of the plat procedures shall be in accordance with the procedures established by this chapter.
- (d) A permit to construct, alter or extend any modular home subdivision area may be issued only when such area consists of at least two (2) acres in size.
- (e) Permit fees shall be in accordance with section 21-78 herein.

Sec. 21-74. Regulations for modular home subdivisions.

An area or premises shall be used and developed in accordance with the following regulations:

(1) Streets:

- (5) All streets are to be concrete curb and gutter;
- (6) All streets right-of-way widths are to be not less than fifty (50) feet;

- (7) All streets are to be twenty-seven (27) feet curb to curb.
- (2) Easements:
- (a) All water and sewer lines are to be located in the front easement;
 - (b) All lots to have a minimum of a ten-foot utility easement in the rear of the lot.
- (3) Minimum lot sizes:
- (a) Forty-five (45) feet in width;
 - (b) One hundred (100) feet in depth, including rear ten-foot utilities easement referred to above;
 - (c) Radial lots are to have a minimum width of thirty-eight (38) feet at the building line;
 - (d) Lot area minimum is to be four thousand five hundred (4,500) square feet (where served by sanitary sewers);
 - (e) Corner lots are to be five (5) feet wider than the average interior lots in the block;
 - (f) Corner lots siding on a major thoroughfare are to be at least ten (10) feet wider than the average interior lots in the block;
 - (g) Minimum usable lot depths for lots backing on natural drainage easements are to be one hundred (100) feet between the front lot line and the drainage easement.
- (4) Maximum lot coverage. Each detached dwelling unit within the above-mentioned modular home subdivision and the unit's accessory buildings shall occupy not more than forty (40) percent of lot area.
- (5) Additional requirements. In addition to the requirements above, there shall be no more than seven (7) modular home subdivision lots per acre in such division. Furthermore, there shall be a minimum rear yard of five (5) feet, a minimum front yard of fifteen (15) feet, and side lot lines to be three (3) feet from eave drip.
- (6) Off-street parking. In modular home subdivisions, there shall be at least two (2) off-street parking spaces per lot.

- (7) Temporary signs. Temporary nonilluminated signs shall not be more than four (4) square feet in area pertaining to the lease or sale of a modular home or premises on which such sign is located.
- (8) Minimum square footage. All modular homes contained within a modular home subdivision shall comply with a minimum square footage requirement of eight hundred fifty (850) square feet.
- (9) Skirting. All modular homes shall be skirted using materials such as concrete, brick, masonry, rock, or any acceptable manufactured material specially designed for this purpose, acceptable to the planning commission and to the city council.

Sec. 21-75. Modular homes to comply with city building code.

No structure originally constructed as a modular home shall be used for any purposes other than as a dwelling or a residence, for demonstration purposes at a sales lot, or as an office of a licensed retailer at a sales lot, unless such structure meets all requirements of the building code of the City of Alvin.

Sec. 21-76. Permit required prior to placement on lot.

No person shall permit, allow, suffer or cause a modular home to be on any property owned by him or under his control unless a permit has been issued by the City of Alvin for the modular home to be placed on such property; excepting that this provision shall not apply when such home was permanently installed on the property prior to the effective date of this article.

Sec. 21-77. Use of home as residence.

- (a) Application for permit. To obtain a permit to place a modular home on property within the City of Alvin when it is intended that such modular home shall be used as a residence by the applicant or by another, the owner of such property shall file an application therefor on a form designated by the City of Alvin. Such application shall include:
 - (1) The name and mailing address of the applicant;
 - (2) The legal description of the property on which such modular home is to be placed;

- (3) The street address of the property on which the modular home is to be placed;
 - (4) The size of such modular home;
 - (5) The year in which the modular home was constructed;
 - (6) A full description of such modular home, and the name of the manufacturer;
 - (7) The serial number of each modular section of the home;
 - (8) A map or drawing of the property drawn to scale showing the location where the modular home will be placed, the location of all other structures on the property, all driveways on the property, and where off-street parking will be provided.
- (b) Conditions for permit issuance. Upon the filing of a proper application pursuant to this section and the payment of the permit fee, the building official shall issue a permit for the placement of a modular home on such property unless the building official finds the placement of the modular home on such property would violate any provision of the ordinances of the City of Alvin laws of the State of Texas or finds that adequate utilities are not available for residential use of such modular home at the location set out in the application.
- (c) Applicability of permit. A permit granted pursuant to this section shall be valid only for the placement of the modular home described in the application therefor on the property designated in the application.
- (d) Certificate of compliance required prior to habitation and utility connection. No utility of any kind shall be connected to a modular home and no person shall occupy or allow or permit another to occupy a modular home as a residence unless a certificate of compliance has been issued for such modular home.
- (e) Permit fee. The fee for a permit for the placement of a modular home that is intended to be used as a residence will be that set forth in chapter 28 of this Code. This fee shall be in addition to all other applicable fees.

- (f) Information required prior to issuance of certificate of compliance. To obtain a certificate of compliance for a modular home, the applicant shall give the building official the following information:
- (1) The number of the permit issued under this section for placement of the modular home;
 - (2) The date the modular home was placed on the property; and,
 - (3) The serial number of each modular section of the home placed on the property.
- (g) Conditions for issuance of certificate. Upon receipt of a request for a certificate of compliance, inspectors of the City of Alvin shall inspect the property on which the modular home is located to determine if the modular home meets all applicable requirements of the ordinances of the City of Alvin. After such inspection a certificate of compliance shall be issued unless it is found that the requirements of this article or of other applicable ordinances have not been met.
- (h) Applicability of certificate of compliance. A certificate of compliance for a modular home shall be valid only for the occupancy of that particular home for the location set out in the application.
- (i) Seal, decal or label to be affixed to home. No modular home shall be placed on any property within the City of Alvin for use as a residence unless there is affixed thereto a seal, decal or label issued by the Texas Department of Labor and Standards pursuant to Vernon's Ann. Civ. St. art. 5221f, and also meeting HUD requirements.

Sec. 21-78. Schedule of permit fees.

- (a) Permit fees. The fees for construction, alteration or extension of any modular home subdivision shall be as set forth in chapter 28 of this Code. Such fees shall be considered to be set forth herein.

- (b) Moving of buildings or structures. For the moving of any building or structure, the fee shall be as set forth in chapter 28 of this Code.
- (c) Demolition of buildings or structures. For the demolition of any building or structure, the fee shall be as set forth in chapter 28 of this Code.
- (d) Fees for work started prior to issuance of permit. Where work for which a permit is required by this Code is started or proceeded with prior to obtaining said permit, the fees herein specified shall be doubled, but the payment of such double fee shall not relieve any persons from fully complying with the requirements of this Code in the execution of the work nor from any other penalties prescribed herein.
- (e) Plan-checking fees. When the valuation of the proposed construction exceeds one thousand dollars (\$1,000.00) and a plan is required to be submitted by the Standard Building Code, 1994 Edition, a plan-checking fee shall be paid to the Building Official at the time of submitting plans and specifications for checking. Said plan-checking fee shall be as set forth in chapter 28 of this Code.
- (f) Fees and permits not covered. Any matters not covered by paragraphs (a) through (e) above, will be in accordance with this chapter and all other pertinent ordinances of the City of Alvin, regarding fees and permits.

Sec. 21-79. Applicability of article provisions.

In any case where a provision of this article is found to be in conflict with a provision of any other ordinances or codes of the City of Alvin existing on the effective date of this article, the provision which, in the judgment of the city inspector, established the higher standard for the promotion and protection of the health and safety of the people shall prevail, and such other ordinances or codes are hereby declared to be repealed to the extent that they may be found to be in conflict with this article.

Sec. 21-80. Penalty for violation.

Any person, as defined in V.T.C.A., Penal Code § 1.07(a)(38), who shall violate any provision of this article shall be deemed to be guilty of a misdemeanor and upon conviction shall be punished by a fine as prescribed by section 1-5.

Secs. 21-81 – 21-109. Reserved.

ARTICLE VI. PLANNED UNIT DEVELOPMENTS

Sec. 21-110. Planned unit developments.

- (a) Where a developer desires to construct a project with a diversification of types of lots the planned unit development (PUD) criteria may be used.
- (b) The following will be required in order for the development to be built as a PUD:
 - (1) The minimum size of a PUD shall be ten (10) acres, and not less than seven (7) percent of the total area shall be set aside for common areas, contiguous green space or PUD park areas centrally located in each section as described below;
 - (2) Utility easements, drainage easements, or pipeline easements shall not be used in calculating the seven (7) percent requirement;
 - (3) No more than two (2) percent of the greenspace requirement shall come from the amenitization of a wet or dry stormwater detention basin;
 - (4) Each lot shall be a minimum of five thousand five hundred (5,500) square feet in size;
 - (5) Each section must maintain an average lot width of sixty (60) feet as measured at the front building setback line with no lot to be less than fifty (50) feet wide;
 - (6) Twenty-five (25) foot front building set back;
 - (7) Ten (10) foot side building set back on corner lots; and
 - (8) All streets shall have a minimum right-of-way width of sixty (60) feet.

(c) Approved amenities to satisfy the seven (7) percent common area requirements are as follows:

(1) In order for land not part of a lot, street, easement or other specific dedicated purpose not normally considered as common, accessible areas to be considered as part of the seven (7) percent common area/green space it must contain two (2) of the following amenities:

- a. Walking trails area that is only adjacent to a street or detention areas.
- b. Fountain(s), lighted or unlighted.
- c. Landscaping with benches and/or gazebos.
- d. Aesthetic lighting.

(2) A PUD park designation does not replace or contribute to the requirements for satisfying the park land dedication and development fee article. In order for a PUD park designation to be acquired and to count toward the seven (7) percent requirement, it must contain at least three (3) of the following amenities;

- a. Swimming pool with restrooms.
- b. Clubhouse.
- c. Basketball and/or tennis courts.
- d. Playground with equipment.
- e. Benches and/or gazebos.
- f. Aesthetic lighting.

(3) Other amenities will be considered on a case-by-case basis, but must be approved by the planning commission.

(4) All amenities must satisfy the intent of this criterion, which is to maintain the spirit of the conformance with this regulation.

(5) Construction details are required for each amenity provided.

- (6) All amenities are required to be constructed prior to plat recordation.
- (d) In addition to compliance with the requirements for subdivision development set forth in article III, (with the exception of lot dimension requirements, set backs and street rights-of-way set forth in subsection 21-37(b)) and the design criteria, the developer of a proposed PUD shall submit an outline development plan with the preliminary plat. This plan, at a scale of not less than one inch equaling two hundred (200) feet, shall show all the proposed surface features to be developed. This plan shall include all paving and open space areas with typical layouts.
- (e) All PUD's shall have protective covenants that require a homeowner's association (or other legal entity) to be formed and to be legally responsible for the maintenance of all common areas, easements of any kind, PUD parks, detention areas and private amenities in the PUD. The covenants shall require that sufficient funds be collected and set aside for the proper maintenance of the facilities. Sale or transfer of properties dedicated for common use shall not be permitted without the replatting of the property according to legal requirements.
- (f) A final plan for each section to be developed (with restrictive covenants attached) shall be submitted for review and approval of the planning commission and city council. The approved plan and documents shall be maintained on file by the planning and development department and all future building permits shall be reviewed for conformance with the plan and accompanying documents.

The plan at a scale of not less than one inch equaling two hundred (200) feet (fifty (50) feet or larger) shall include the following:

- (1) All proposed streets, alleys, drives, walkways and trails with a clear designation of those to be public and private.
- (2) All lots or parcels and a clear definition of areas to be retained as common areas with dimensions and bearings.

- (3) In other than single family areas, plot plans for each building site with approximate dimensions of existing and proposed structures with landscaping, amenities and improvements. Indications of the structure heights and elevational features shall be provided.
- (4) In other than single family areas, details of trash collection areas and permanent screening matching the character of the area shall be provided.

Secs. 21-111 – 21-125. Reserved.

ARTICLE VII. PARK LAND DEDICATION AND DEVELOPMENT FEE

Sec. 21-126. Short Title.

This article shall be known and cited as the “Park Land Dedication and Development Fee Article.”

Sec. 21-127. Purpose and applicability.

(a) This article is adopted to provide and ensure adequate recreational areas and amenities in the form of neighborhood parks for subdivision developments subject to this and to make the park land dedication and park development fee requirements an integral part of the review and approval of residential developments, whether the developments consist of new construction on previously vacant land or rebuilding and redeveloping existing residential areas. Property in the extraterritorial jurisdiction subdividing after the effective date of this article shall not be permitted to be utilized for residential use unless this article has been complied with.

(b) New developments or redevelopments that involve only the replacement or reconstruction of pre-existing dwelling units shall be exempt from the provisions of this article, provided that the developments do not increase the density of the pre-existing dwelling units or involve a replat of the property.

(c) Neighborhood parks are those parks that provide a variety of outdoor recreational facilities and within convenient distances from a majority of the residences to be served by such parks.

(d) The city currently has a park system; however, new residential growth adds demands for more public park space and amenities. The cost of the additional demands should be supplemented by the residential property owners who shall be the beneficiaries of such parks.

(e) The provisions of this article shall apply to the corporate limits of the city.

(f) The provisions of this article shall not apply to properties that are included in a valid preliminary or final plat application that was submitted before the effective date of this article.

Sec. 21-128. Park land dedication.

(a) When developing residential properties, the owner or developer shall be responsible for a fee simple dedication of park land at a ratio of one-one hundredth (1/100) of an acre or four hundred thirty-five and six-tenths (435.6) square feet of land for each proposed dwelling unit. A “dwelling unit” shall mean each individual residence, including each individual residential unit in a multi-family residential structure or manufactured home park, designed or intended for habitation by a single family. Hereinafter, all references to “the developer” shall mean both the owner and the developer jointly and severally, where the owner and developer are not the same party.

(b) Plat submitted to the city for approval shall show the area required to be dedicated under this section.

(c) Each corner of the park land dedication shall have an iron rod or pin set, in accordance with other lot corners in the subdivision.

(d) The City Council and the city parks and recreation board generally consider that development of neighborhood parks less than two (2) acres may be inefficient for public maintenance. Therefore, if fewer than two (2) acres are proposed as park land dedication, the City shall have the option to require the developer to pay the applicable cash in lieu of land amount as provided in Section 21-130.

(e) The city, prior to preliminary plat submittal, will define the optimum location of the required park land dedication based upon the proposed park being located adjacent to current or future park land. If there is not an opportunity for the proposed park land dedication to be adjacent to current or future park land, then the city and developer will work together to define an optimum location for the park land dedication. If an optimum location cannot be determined, then the City shall accept the cash in lieu of land option as outlined in Section 21-130.

(f) In the case of a multi-phase development, if the developer dedicates all of the park land required by this article in the first or early phase(s) of the development, no additional park land dedication will be required in later phases unless additional lots that are not shown in the original preliminary plat are included in the later phases of the development.

(g) Unless approved in writing by the city, no construction materials shall be disposed of or deposited within the dedicated park land by the developer or its contractors, subcontractors, employees, or agents, at any time while the subdivision is being built. If materials are deposited or disposed of within the park, the developer shall remove such materials within seventy-two (72) hours of written notice by the city. If the developer fails to remove the materials after notice, the city may do so at the developer's expense. The cost of removal shall be added to the subsequent request for a building permit.

Sec. 21-129. Park land dedication acceptance criteria.

(a) Land dedicated for a park or recreational area shall be of such size, dimensions, topography, and general character as is reasonably required by the city for the type of use necessary to meet the demand and need of future residents. Recreational needs for which land is dedicated may include but not be limited to multipurpose trails, equestrian trails, open space, buffer areas, swimming pools, active recreation for team or individual sports, playground, picnic area, and similar uses.

(b) Rare, unique, endangered, historic, or other significant natural areas may be given a high priority for dedication pursuant to this article. Areas that provide an opportunity for linkages between

parks or that preserve the natural character of the surrounding environment may be required by the city to be included in the park land dedication.

(c) The City shall not accept land dedication pursuant to this article if it is subject to one or more of the following disqualifications, unless individually and expressly approved:

- (1) Land within the floodplain and floodway designated areas, as defined by the FEMA, unless such land dedication contains an open area as part of the total park land dedication property that is topographically suitable for the installation of the park amenities for neighborhood parks. If floodplain and/or floodway areas are proposed by the developer, and if approved by the city, the donation ratio shall be increased to three (3) acres of land per one hundred (100) dwelling units.
- (2) Park land dedication sites which do not have ready access to public streets.
- (3) Park land dedication sites abutted by private properties on more than two-thirds (2/3) of the total boundary dimension of such site.
- (4) Areas encumbered by overhead utility lines or easements of any type which might limit the opportunity for park and recreation development.

(d) The City will not accept park land dedication sites encumbered by hazardous and or municipal waste materials or dump sites.

(e) If a developer proposes to dedicate land for park development purposes pursuant to the terms, conditions and requirements of this article, he or she shall permit the city to make an onsite inspection of the property for the purposes of determining site suitability and identification of any visual hazards or impediments to park development and use. If the property owner has any form of environmental assessment on the tract, a copy of that assessment shall be provided to the city. The city may initiate and/or require the developer, at the developer's expense to initiate specific environmental studies or assessments if the visual inspection of the site gives rise to the belief that an environmental problem may exist on the site. The city may require the employment of those consultants necessary to

evaluate any environmental issues relating to the site providing that the City makes such determination in good faith. If an environmental hazard is identified on the site, the developer at their expense must remove the hazard prior to its acceptance into the park and recreation system of the city.

(f) The intention of this article is not to discourage the creation of parks and amenities in subdivisions that will be maintained by homeowner's associations.

Sec. 21-130. Cash in lieu of land.

(a) An owner or developer responsible for park land dedication under this article may be required, at the city's option, to meet the dedication requirements in whole or in part by a cash payment in lieu of land in the amount set forth below. Such payment in lieu of land dedication shall be made prior to filing the final plat for record. All funds collected pursuant to this section shall be used solely for the acquisition of park land and/or enhancements to new or existing park land.

(b) In the event a plat is not required, the park land dedication shall be met prior to the issuance of a building permit.

(c) In instances where land is required to be dedicated, the City shall have the right to reject the park land dedication and require a cash payment in lieu of land in the amount set forth below, if the city determines that:

- (1) The park land dedication site is such a small area that it is inefficient to maintain; or
- (2) Development projects within the extraterritorial jurisdiction of the city are subject to the park land dedication requirements set forth within this article; however, the difficulty faced by the city, county, or other entity in maintaining property outside the corporate limits of the city may result in the application of a fee in lieu of the land dedication requirement.

(d) The cash payment in lieu of land dedication shall be met by the payment of a fee set from time to time by city ordinance sufficient to acquire neighborhood park land. Unless and until changed by city ordinance, the cash payment shall be computed on the basis of one hundred fifty dollars (\$150.00) per dwelling unit within the proposed subdivision. For subdivisions not receiving a final plat prior to July 1, 2007 but for which a concept plan was filed after the effective date of this article, the cash payment fee shall increase to three hundred dollars (\$300.00) effective July 1, 2007 and for all plats filed after July 1, 2007, the fee shall be three hundred dollars (\$300.00).

Sec. 21-131. Additional land donation or donations outside of the development

(a) A developer of a subdivision who dedicates more than the required park land requirements for that specific subdivision may receive credits for future park land dedication requirements for other subdivision developments that the developer may undertake within ten (10) years from the date of the dedication in the same quadrant.

(b) A developer of a subdivision may dedicate park land that is not within the boundaries of the development and receive park land dedication credits for that subdivision. The proposed park land dedication must be approved by the City prior to the filing of the preliminary plat. The proposed park land dedication must be in the same quadrant as the subdivision, within a reasonable distance of existing or developing residential neighborhoods and meet the park land dedication acceptance criteria outlined in Section 21-129.

Sec. 21-132. Park development fund and right to refund.

(a) All funds collected pursuant to Section 21-130 shall be deposited in the City of Alvin's Park Development Fund and used solely for the acquisition or leasing of park land and the development, improvement, or upgrades of new and existing parks. All expenditures shall be administered in accordance with the current purchasing requirements of the City of Alvin. Funds shall not be used for the operation and maintenance of parks.

(b) The City of Alvin shall account for all sums paid into the Park Development Fund. Any monies paid into said fund must be expended by the City within ten (10) years from the date that all the land for a neighborhood park for the subdivision has been acquired and when the subdivision(s) adjacent to that park land has been seventy-five percent (75%) built out. If not so expended within the ten (10) year period, the then current owners of the property shall, on the last day of such period, be entitled to a prorated refund within one (1) year of the date of entitlement or the right to receive the refund will be

deemed waived and the funds shall remain as property of the City and be used for the general purpose of park land acquisition, design and development as expressed in this article.

Sec. 21-133. Approval and appeal process.

The City shall be responsible for the review and approval of all park land dedication and park development fees submitted in accordance with the requirements of this article.

The City may request the comments and approval of park land dedication or park development fees from the Alvin Parks and Recreation Board for any reason prior to accepting a dedication.

Sec. 21-134 to 21-144. Reserved.

SECTION I
GENERAL REQUIREMENTS

SECTION I
GENERAL REQUIREMENTS

1.0 GENERAL

1.01 CHAPTER INCLUDES:

Graphic requirements for construction drawings.

1.02 DEFINITIONS

- A. CADD (Computer Aided Drafting Design) - the preparation of documents utilizing computer facilities for the production of drawings, plans, prints and other related documents.

1.03 DESIGN REQUIREMENTS

- A. Provide a cover sheet for all projects involving three or more design drawings (excluding standard detail sheets). Plan sheet numbers shall be shown on the cover sheet or area key map. Include a vicinity map to identify project locations. Also provide approval block for the City Engineer with a note stating that approval is valid for 1 year only from date of signatures.
- B. Drawings shall be prepared on nominal 24 inch x 36 inch overall drawings.
- C. Show service area on cover sheet or area map.
- D. Final drawings shall be India ink on vellum or produced by CADD on reproducible medium. The engineer shall also submit, at the time of plan approval, a CADD drawing on diskette of the development showing all lot lines and associated lot information, rights-of-way, easements, contours, utilities, and all drainage and paving improvements. Two identical reproducibles shall be provided with a location for an approval signature by the City Engineer on the cover and initials on all other sheets. One approved set will be returned.
- E. Details of special structures (not covered by approved standard drawings, such as stream or gully crossings, special manholes, or junction boxes, etc.) shall be drawn with vertical and horizontal scales equal to each other.
- F. Each set of construction drawings shall contain paving and utility key drawings indexing specific plan and profile sheets. Standard City drawings, where applicable, shall be included. All sheets shall have standard title blocks.
- G. Draw key overall layouts to a minimum scale of 1 inch = 100 feet.
- H. Plan 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 street.
- I. A north arrow is required on all sheets and should be oriented either toward the top or to the right. This requirement is waived under the following conditions.

1. A storm or wastewater sewer whose flow is from west to east or from south to north.
 2. A primary outfall ditch drainage facility whose flow is from west to east or from south to north.
 3. It is the intent of this requirement that all stationing should start from the cardinal points of the compass and proceed in the direction of construction.
- J. Standard scales permitted for plans and profiles of paving and utility construction drawings are as follows:
1. Major thoroughfares, streets with esplanades over 400 feet in length, or special intersections / situations.
1 inch = 20 feet horizontal, 1 inch = 2 feet vertical
 2. Minor or residential single-family streets.
1 inch = 20 feet horizontal, 1 inch = 2 feet vertical
1 inch = 40 feet horizontal, 1 inch = 4 feet vertical
1 inch = 50 feet horizontal, 1 inch = 5 feet vertical
 3. Scales of Paragraph No. 2 above are minimum; larger scales may be used to show details of construction.
 4. Deviation of specified scales can only be permitted with special approval.
- K. Bench mark information will be provided on the project layout sheet along with information pertaining to traverse points (northing and easting). The benchmark information to be provided is datum, description of physical location and elevation. In addition, information pertaining to the design baseline will be provided on project layout sheet. The provided information to be provided for the design baseline should be beginning and ending of the baseline (northing and easting) and point of intersection of any line(s) deviating from 180° along with angle turned right.
- L. The seal, date, and original signature of the Registered Professional Engineer responsible for the drawings shall be required in each sheet developed by the engineer. The engineer may use a stamped or embossed imprint for his/her seal; however, the embossed imprint must be shaded such that it will reproduce on prints.
- M. A copy of the final plat for new developments shall be included with the final drawings when submitted for final approval.
- N. If a roadway exists where drawings are being prepared to improve or construct new pavement or a utility inside the pavement, label the surface type.
- O. Show all streets and/or road alignment on drawings.
- P. Develop drawings to accurate scale showing proposed pavement, typical cross sections, details, lines and grade, and all existing topography within street right-of-way, and any easement contiguous with the right-of-way. At the intersection, the cross street details shall be shown at sufficient distance (20-foot minimum distance outside the primary roadway right-of-way) in each direction along cross street for designing adequate street crossings.
- Q. Match lines between plan and profile sheets shall not be placed or shown within cross street intersections including cross street right-of-way.

- R. Natural ground profiles shall be shown as follows:
1. For privately-funded projects, center line profiles are satisfactory except where a difference of 0.50 feet or more exists from one right-of-way or easement line to the other, in which case, dual profiles are required.
 2. For the City of Alvin projects, provide natural ground profiles for each right-of-way line and easement.
- S. Basic plan and profile sheets shall contain the following information:
1. Identify all lot lines and property lines (as appropriate for developments and authorized by the city engineer), easements, right-of-way, and drainage outfalls.
 2. Label each plan sheet as to street/easement widths, pavement widths, pavement thickness where applicable, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities (type and location), and any other pertinent feature affecting design.
 3. Show all utility lines four inch or larger within the right-of-way or construction easement in profile view. Show all utility lines, regardless of size, in the plan view including fiber optic cables.
 4. Graphically, show flow line elevations and direction of flow for all existing ditches.
 5. Label proposed top of curb grades except at railroad crossings. Centerline grades are acceptable only for paving without curb and gutters.
 6. Curb return elevations for turnouts shall show in profiles.
 7. The centerline elevation of all existing driveways shall be shown in profile.
 8. Station all esplanade noses or the centerline of all esplanade openings with esplanade width shown - both existing and proposed.
 9. The design of both roadways is required on all paving sections with an esplanade.
 10. Station all PCs, PTs, radius returns, and grade change PIs in plan view. Station all radius returns and grade change PIs in profile with their respective elevations.

1.04 Project Approval Requirements:

- A) Upon the completion of construction of the required improvements, the Design Engineer for the project shall submit a written request for a final inspection of the project. The letter shall state that he has inspected the improvement and that they conform to his design plans. One copy of the "As-Built" plans along with a copy of the test reports for all required tests shall be included with the inspection request. An electronic (CADD) file and a GIS-compatible update file (if available) of the record drawings shall be provided prior to acceptance. Once the Final Plat has been recorded, addresses assigned by the City will be posted to the GIS system.
- B) Prior to final acceptance of the project, the developer (or contractor) shall post a one-year maintenance bond in the amount of 50% of the final construction costs with the City. This bond shall allow the city to repair any portion of the project found during the one-year period should the item not be promptly repaired upon written notification to the bond holder.

SECTION II
WASTEWATER COLLECTION SYSTEM
DESIGN REQUIREMENTS

SECTION II
WASTEWATER COLLECTION SYSTEM
DESIGN REQUIREMENTS

2.0 GENERAL

2.01 CHAPTER INCLUDES: Criteria for the design of wastewater collection systems.

2.02 REFERENCES:

Texas Natural Resource Conservation Commission - "Design Criteria for Sewer Systems- Texas Administration Code - Chapter 317 (current revision).

2.03 DEFINITIONS:

This Chapter addresses the design of the wastewater collection systems within the public right-of-way or a dedicated public easement. Sanitary sewer service lines serving a single building located on private property, that are not in a dedicated easement, are under the jurisdiction of the Plumbing Code. Where used in these regulations, the following terms shall be construed to carry the meanings given below:

- A. Public Sewer - A closed conduit that conveys wastewater flow and which is located within the public right-of-way or dedicated public easement. A public sewer (or public sewer system) is intended to serve more than one (1) "owner".
- B. Private Sewer - A closed conduit that conveys wastewater flow and is constructed and maintained by a private entity. Private sewers shall be located on private property. Private sewers are subject to the design and construction requirements of the Plumbing Code.
- C. Sewer Main - A sewer that receives the flow from one or more lateral sewers.
- D. Lateral Sewer - A sewer running laterally down a street, alley, or easement that receives only the flow from the abutting property.
- E. Service Lead - A sewer that branches off a public sewer and extends to the limits of the public right-of-way. It shall be construed as having reference to a public sewer branching off from a main or lateral sewer to serve one or more houses, single-family lots, or other types of small land tracts situated in the same block with the said main or lateral sewer, but not directly adjacent thereto. Such a line shall never exceed 150 feet in length. If the sewer is designed to serve more than two houses, or the equivalent of two single-family residences along a street, a lateral sewer as defined above shall be constructed.
- F. Service Connection - A private sewer from a single source to the main or lateral sewer in the street, alley, or easement adjacent thereto. Service connections are covered by the building code. It will be owned and maintained by the owner of the property being served by said sewer.
- G. Project Area - The area within the immediate vicinity of the public sewer to be constructed. If, as an example, a public sewer is to be constructed within the public right-of-way, the project area would extend 10 feet to either side of the public right-of-way. If as an example, a public sewer is to be constructed within a dedicated easement adjacent to the public right-of-way, the project area would extend 10 feet to either side of the dedicated

easement; depending upon the existing topographical elements, unless impacted by a permanent structure (i.e. telephone pole, trees, drainage ditches, etc.) If, as an example, a public sewer is to be constructed within a side lot easement (if approved by the City), the same criteria would apply as for a dedicated easement adjacent to public right-of-way.

- H. Stack - A riser pipe constructed on main or lateral sewers which are deeper than 7 feet to facilitate construction of service leads or service connections.
- I. Force Main - A pressure-rated conduit (i.e. ductile iron pipe, pressure-rated P.V.C., etc.) that conveys wastewater from a pump station to a discharge point.
- J. Pressure sewer systems – A wastewater collection system using a pump at each residence or customer.

2.04 DESIGN REQUIREMENTS:

- A. Drawings to be furnished
Before any main or lateral sewer is constructed and before a permit will be issued for the construction of same, plans and profiles of the proposed sewer shall be prepared and submitted by a licensed professional engineer to the City for approval. On projects within the City limits or the ETJ, the tracing shall become the property of the City and shall remain on file in the City for the use of any person who may be interested in same.
- B. Details to be shown on drawings.
The detailed plan view will show the exact location of the proposed line in the street, alley or easement with respect to the edge of the particular right-of-way, the transit base line, and any nearby utilities, pavement, major landscaping, and other structures affecting construction.
- C. Main and Lateral Sewers
 - 1. Sewers must be shown both in detailed plan and profile views. Lines shall change grade or alignment only at a manhole.
 - 2. The profile should show other underground and surface utilities and facilities, both in parallel and at crossings; the size, grade of the proposed line, the elevation of same to hundredths of a foot at all manholes, changes of grade and dead-ends; and the proposed finished grade over the sewer (if improvements are requested). It should show the actual ground line as it exists prior to construction of the sewer. Where proposed fill or cut is contemplated, the proposed new ground line should be shown as a separate line from the actual ground line. Bedding shall comply with City of Alvin Standard Details. Where the lines are parallel to a ditch the flow line of the ditch shall be shown.
 - 3. Where sewers are to be placed between existing pavement and the street right-of-way (or interior easement line) or under existing pavement, show the existing ground line at both sides (or the closest side or sewers near the edge) of the right-of-way or adjacent sewer easement.
 - 4. If there is a drainage ditch or storm sewer between the line and the houses served, grade shall be shown.

D. Sewer mains-plan and profile required:

1. Sanitary sewer layouts for subdivisions should use a horizontal scale of 1" = 40 feet and vertical scale of 1" = 4 feet. In congested areas, 1" = 20 feet will be used.
 - a. All easements containing or buffering sanitary sewers are shown at points of size change; all manhole locations are shown.
 - b. The sewer alignment shall accurately reflect the relative location of the sewer as shown on the detailed plan view.
 - c. All service leads that cross street pavement or serve adjacent property are to be shown on the layout. The detail plans and profiles shall show the flow lines of all service leads at the street or easement right-of-way.
 - d. The number and size of the lots depicted on both the overall sewer layout sheet and the individual plan and profile sheets shall match the number and size of the lots depicted on the final plat after recordation.
 - e. On the overall sanitary sewer layout sheet the size and direction of flow for all existing and proposed sewers shall be shown.
 - f. The location of the proposed sewer within either the public right-of-way, a dedicated easement adjacent to the public right-of-way, or side lot easement (if allowed by the City).
 - g. The overall sanitary sewer layout sheet shall show the area, in acres, which the proposed sewer(s) is (is) designed to serve. Include a location map that references the distance to nearby major thoroughfare and boulevard streets. The scale of the location map shall be 1 inch = 2,000 feet or less.

2. The plan view shall show, at a minimum, the following information for the project area:
 - a. All topographical features;
 - b. Stationing for the proposed sewers;
 - c. All existing and proposed utilities (i.e., water, gas, power, etc.);
 - d. Any significant landscaping and/or other structures which might impact construction and/or construction related activities;
 - e. The width and type of all existing and proposed easements;
 - f. All proposed service leads;
 - g. The limits of bore and/or tunnel;
 - h. Drawings for subdivisions shall show the proposed location, by stations, of all service leads, service connections, and stacks. The distance from the sewer to the nearest existing manhole shall be shown in the plan view or on an additional sewer layout sheet with a scale no more than 1 inch = 100 feet;

3. The profile view shall show, at a minimum, the following information for the project area:
 - a. Underground and/or surface utilities/facilities, which are either parallel to the proposed sewer or cross the proposed sewers;
 - b. The proposed sewer's diameter and grade for each manhole section;
 - c. The flow line elevation for all sanitary sewers at each manhole;
 - d. The rim elevation of all existing and proposed manholes;

- The 100 year flood elevations where applicable with bolt down manhole lids and inflow prevents when below the 100 year flood elevation.
- e. The flow line elevation at each sheet "break" (i.e., from one sheet to another);
 - f. Type of pipe bedding/backfill shall be noted on each plan/profile sheet;
 - g. The finished grade for proposed and existing pavement where "fill" and/or "cut" is proposed, the proposed new ground line should be shown as a separate line from the existing ground line;
 - h. The existing ground line for the "near side" of the public right-of-way where a sewer is to be placed between the edge of existing pavement and the edge of the public right-of-way;
 - i. The existing ground line at the centerline of the proposed sanitary sewer where a sanitary sewer is to be placed within an existing easement. Show any proposed and/or existing pavement.
 - j. The flow line elevation of all service leads where same crosses the edge of the public right-of-way or the dedicated easement adjacent to the public right-of-way, stacks shall be required when over 7' deep
 - k. The limits of bore and/or tunnel;
 - l. Locations where pressure pipe to be installed for water line crossings;
 - m. The location of special backfill and/or proposed stacks shall be identified by "stations" indicated on the design plans.
 - n. Crossing utility lines and storm sewers and parallel drainage facilities.

E. Service leads:

1. Service leads shall be at the property line between two (2) adjoining lots, or as directed by the City. A single 6-inch service lead located at the property line between two (2) adjoining lots would serve two (2) single-family residences with a wye placed at the end of the service lead. Do not extend the wye clean-outs beyond the edge of either the public right-of-way or dedicated easement.
2. Any service lead extension of more than 50 feet parallel to the street right-of-way shall be treated as a lateral sewer.
3. Service leads from developments with more than 17,500 gallons-per-day flow shall discharge into a proposed or existing manhole. Where the flow 24 inches or greater above the flow line of the manhole, provide a standard drop to manhole. Service shall conform to the following:
 - a. Service leads shall be provided to serve each lot within proposed development.
 - b. Service leads shall utilize "full body" fitting (extruded or factory-fabricated) for connection to the proposed public sewer. An approved saddle-type connector for connection to an existing public sewer can be used, but not for proposed lines.
 - c. Saddle-type connectors shall be installed with the "stub" oriented between the "spring line" (3 o'clock and 9 o'clock positions) and 45 degrees from the "spring line" ("1:30" and "10:30" positions). Tees (aka, "full body fittings") shall be oriented in the same manner. These type of connections will only be allowed for new service taps on existing sanitary sewers.
 - d. The service lead shall be designated to minimize the use of bends as site conditions will permit.

- e. Stacks shall be provided where the services are over 7 feet deep.
- f. Each service end shall be marked for easy future excavations.
- g. Each service shall have a cleanout within 2 feet of the property line.

F. General Requirements:

1. Sanitary sewers within the City of Alvin jurisdiction shall allow for orderly expansion of the system and shall conform with the wastewater master plan for the City of Alvin.
2. Sewers shall be sized based on the minimum requirements set out in this standard and the standard wastewater flow rates as established by the City.
3. All sewers shall conform to the minimum requirements of the Texas Natural Resources Conservation Commission Chapter 317- "Design Criteria for Sewage Systems".
4. Sewers shall be separated from water lines by a minimum of nine (9) feet. Where the minimum separation is not maintained, refer to Section 7 for allowable clearances. Sewers crossing utilities other than water, a minimum of six (6) inches of clearance must be maintained.
5. Place stacks and wyes or tees as shown. Where no stacks are shown, it is the responsibility of the licensed plumber to place a City approved saddle for connection to the line.
6. All lines and manholes shall be tested in accordance with TNRCC regulations.
7. Unless noted otherwise, all public sewers and service leads shall be embedded in cement stabilized sand; to 6 inches below the pipe, 12 inches above the pipe and to 6 inches on each side. All such bedding shall be compacted to 95% standard proctor density. The cross-section so described herein shall be termed the "embedment zone."
8. Backfill all excavation areas/trenches under or within 1-foot of existing or proposed pavement with cement-stabilized sand from the top of the pipe "embedment zone" up to 1-foot below paving sub-grade. Cement-stabilized sand with a minimum cement content of 1.5 sacks per ton must develop 100-psi compression at 48 hours. Backfill shall be compacted to 95% standard proctor density.
9. The location of all special backfill and of proposed stacks shall be shown by stations in the drawings.
10. Construction notes shall designate the type, kind and class of pipe with exceptions to the construction notes to be shown on the plan and profile sheets.
11. Non-sanitary sewer easements or fee strips such as pipeline, power company, drainage district, railroad, etc., are in and of themselves insufficient and unacceptable to permit laying to sanitary sewers and/or force mains across or along the underlying private property or restricted non-sanitary use type of public property.
12. The final determination as to that portion of a street, alley, or easement to be occupied by a proposed sewer rests within the City. The Director will take into consideration existing, planned and proposed facilities such as manholes, pavement, pipe/conduits, along with existing trees, shrubs, or other unique surface conditions when arriving at a decision.
13. Where an easement for a public sewer ends at a public right-of-way, the last manhole shall be extended into the public right-of-way as a minimum of 2 feet beyond the property line; or as close to the public right-of-way as possible due to

- acceptable clearances required for other utilities (i.e., water line and storm sewers).
14. The drawings for the sewer shall show the location of any existing known pipe or duct that might interfere with the construction of the sewer and call to the attention of the City any known obstacles that might be encountered in constructing the sewer in any location under consideration. The Professional Engineer shall determine the existence of pipes, ducts and/or obstacles from a visual survey on the ground plus research of all public records and private records when available.
 15. All gravity sanitary sewer mains under 12 feet of depth shall be constructed utilizing, SDR 35, PVC pipe unless specifically approved by City. For gravity sanitary sewer mains over 12 feet in depth SDR 26 PVC pipe shall be used. Force mains shall be SDR 26 PVC pipe. Class 51 cement mortar lined ductile iron pipe may also be used as authorized by the city engineer.
 16. Where a sanitary sewer line could be extended to serve an adjacent development, the public sewers main shall be extended across the full length of the development or to the edge of the property where streets may be extended.

G. Line Size:

1. The minimum pipe diameter for a public sanitary sewer shall be 8 inches.
2. Four-inch service leads shall be confined to the limits of the lot, which they serve and shall serve only the equivalent of one single-family lot. No 4- inch sewer shall be laid in any street, alley, or right-of-way.
3. Six-inch service leads shall not serve more than the equivalent of two single-family lots or other types of small land tracts.
4. Four-inch and six-inch service leads for single-family residential lots shall have a minimum grade of 0.70 percent.
5. For commercial service leads such as street bores, submit a copy of the approved plumbing drawings to establish the required size of the line. The minimum size lead shall be 6 inches.
6. All main and lateral sewers will end in manholes, except for special and/or unusual situations and subject to specific approval of same.
7. All sewer lines shall be laid at a size and depth to conform to designs permitting an orderly expansion of the sewer system of the City and so as to avoid a duplication of lines in the future.
8. The City shall be the final judge as to sizes and depths required and exceptions to "lateral service leads" as previously defined.

H. Line Depth:

1. The sewer should be laid with the top of the pipe a minimum of 3 feet below finished grade or top of curb, whichever is lower. In areas with open ditches, the lines and leads shall be 2 feet below the flow line of the ditches or specific approval obtained and special protection provided.
2. Sewer laid in street rights-of-way with curb and gutter paved streets shall have a minimum cover of 4 feet from the top of the pipe to the top of the curb to anticipate future sewer extension.

3. Sewers laid in street right-of-way with crowned roads and side ditches shall have a minimum cover of 5 feet from the average ground line at the adjacent street right-of-way to the top of pipe.
4. Where the minimum cover as specified in paragraphs H, 1,2, and 3 above is not possible, the sewer shall be laid in Class 150 (150 psi) pressure pipe or rigid factory made pipe with cement stabilized sand as shown in standard detail. Ductile iron pipe shall be lined with either a polyethylene or polyurethane coating as approved by the pipe manufacturer and applied by either the pipe manufacturer or an approved application. The minimum liner thickness shall be 40 mil.

I. Line Grades.

1. The following table lists the minimum and maximum grades for 6-27 inch public sewers.

<u>Inside Dimension (I.D.) of Pipe in Inches</u>	<u>Minimum Slope</u>
6	0.50
8	0.33
10	0.25
12	0.20
15	0.15
18	0.11
21	0.09
24	0.08
27	0.06

For sewers larger than 27 inches in diameter, the Professional Engineer of record shall determine the appropriate grade utilizing the Manning Formula, $n = 0.013$ and a full pipe velocity of 2.0 fps.

J. Manholes:

1. All manholes to be pre-cast concrete, unless the Professional Engineer submits a "cast in place" manhole design for review and approved by the City. All pre-cast manholes to incorporate a "boot" type connector for sewer diameters up to 24". For sewer diameters greater than 24 inches, utilize either the "boot" type connector (if available) or an integral gasket. All pre-cast manholes to conform to the latest ASTM requirements.
2. For all public sewers, manholes shall be placed at all changes in alignment, changes in grade, junction points, and either at street, alley, or easement intersections as designs may require.
 - a. Sewers laid in easements shall have a manhole in each street crossed by the sewer.

- b. The maximum distance between manholes shall be 500 feet for 8 inch to 48-inch pipe diameters. Spacings for larger diameter mains than 48 inches shall be determined on an individual project basis.
- c. Sewers with the same, or approximate flow line elevation shall intersect each other at a 90-degree or greater angle. However, where a true perpendicular intersection cannot be obtained, and where the "entering" sewer intersects the receiving sewer at, or about, the same flow line, one or more manholes shall be utilized to maintain a minimum angle of 80 degrees at the point of intersection. Inverts shall be shaped to gentle curves and have a depth not less than 70% of the pipe diameter. Abrupt changes in alignment at pipe entrances that limit access of TV inspection will not be accepted.
 - (1) A distinct flow channel can be maintained within the manhole when the flowline elevations of the sewers are at, or within, one (1) pipe diameter of the smaller pipe; or
 - (2) Manholes shall be placed at all dead-end mains and laterals exceeding 150 feet in length. Short lines may end with a cleanout where no future extension is possible.
- d. Criteria for connections to, and utilization of, manholes.
 - (1) Where manholes are utilized to facilitate connections between public sewers, when possible the sewers shall either match the manhole's flow line, match the elevation of each other's crown or utilize an "outside" manhole drop.
 - (2) Connections between public sewers at the manhole shall adhere to the following criteria when possible:
 - (a) The elevation of the crown of the discharging sewer shall either match the elevation of the crown of the receiving sewer or be approved as special cases by the City.
 - (b) A standard drop connection is required when the difference in elevation between discharging sewer flowline and receiving flowline is greater than 24 inches.
 - (3) The routing of service connection directly to manholes will be allowed only where the flowline elevation of the existing sanitary sewer is more than 10 feet below grade is.
 - (4) When routing an approved service connection to a manhole (see Item "3"), the wall penetration shall not be greater than 10 inches in diameter and shall be cored and sealed using nonshrink grout. A pipe gasket shall be embedded in the grout.
 - (5) When routing an approved service connection to a manhole (see Item "3"), the connections shall utilize a "drop (either inside or outside) and shall adhere to the following criteria:
 - (a) The manhole wall penetration shall be a minimum of 10 feet below the manhole rim elevation and shall not be greater than 10 inches in diameter;
 - (b) The drop shall be 6 inches in diameter and shall be constructed of SDR 26 PVC pipe (ATSM D 3034-94);
 - (c) The drop shall be located 45 degrees from the upstream side of the main sewer;

- (d) An internal drop shall be affixed to the manhole wall utilizing stainless steel bands and anchor bolts.
- (e) An internal drop shall terminate with a 45-degree bend. Said 45 degree bend shall not extend below the "top of pipe" elevation of receiving sanitary sewer and;
- (f) The wall penetration (core) shall be sealed using a "grout" as approved by the City.
- (6) All public sewers shall terminate in a manhole. Clean-outs will not be utilized except at the end of each service lead or lines less than 150 feet in length.
- (7) All sewer lines shall be air tested for leakage. Lines shall have deflection. Tests conducted a minimum of 30 days after installation and all manholes shall be vacuum tested. All tests shall be in accordance with Chapter ~~247~~ **317** of TNRCC rules.

K. Lift Stations:

1. Lift station design shall comply with the City of Alvin specifications; with a storage minimum volume (pump on to pump off) in the wet well equal to design flow (in gallons per minutes) multiplied by 0.25 multiplied by 6 minutes.
2. Minimum site size shall be 25 feet by 20 feet. Odor control measures will be considered on an individual basis.
3. Pumps shall be sized to operate at optimum efficiency. Minimum acceptable efficiency at the operating point will be sixty percent (60%) unless specifically approved by the City. Only submersible pumps will be accepted.
4. Operation and maintenance should be considered in the design of the station and the location of the station.
5. Wet well working volume should be sized to allow for the maximum of 10 starts per hour with one pump out of service.
6. Controls and equipment shall be approved by the Division of Public Works.
7. Emergency operations should be considered. Provide fittings and a blind flange that will be readily accessible for emergency bypass pumping and connector for a portable generator.
8. The inlet structure shall be designed to minimize turbulence.
9. The velocity in the Force Main and riser pipes shall be less than 8 fps and greater than 2 fps.
10. The wet well shall be sized to provide adequate clearance between the pumps (refer to manufacturers recommended clearances).
11. A peak factor of four (4) shall be used for Lift Station design.
12. A minimum of two (2) feet of clearance shall be provided between pumps and between pump and wall, or as required by the pump manufacturer.
13. Low water level shall be at least six (6) inches above impeller. Higher if required by manufacturer. Complete immersion of submersible pump motor at low water level is preferred.
14. Tie steel in Lift Station bottom to wall (includes caisson construction situation) to provide watertight wet well.
15. Nuts, bolts, chains and all other metal components within wet well shall be stainless steel, not carbon steel.
16. Vent pipe shall be eight (8) inches minimum diameter.
17. The following Hazen-Williams Coefficient shall be used for various pipe types:

PVC	New	C = 140
	10-year	C = 130
DIP	New	C = 130
	10-year	C = 100

18. Provide board fence (either CCA cedar or heart redwood) with steel posts in concrete. Fence shall be at least six (6) foot high.
19. Entrance drive to be at least fourteen (14) feet wide. Drive shall terminate adjacent to the station with a parking space such that a truck-mounted hoist can remove pumps.
20. Indicate method of drainage of site on site plan. Internal drainage, sheet flow and valley gutter driveways are acceptable. Drain to street or storm sewer, never onto adjacent private property.
21. Locate control panel and wet well hatch 1 foot above 100-year flood plain minimum. Call out the 100-year flood plain elevation on the plans.
22. Dual stainless steel guide rails (or other pump removal method that avoids entering wet well) are required for submersible pumps. Size and spacing shall be approved.
23. A tee, plug valve and blind flange assembly is required on the force main on the downstream side of the discharge valves and header. This is required so truck-mounted pumps can bypass the lift station pumps and piping while work is being done.
24. Bedding for PVC force main is bank sand a minimum of 6" from all sides of pipe.
25. PVC force mains shall be SDR 26 (ASTM 2241) PVC pipe.
26. DIP bedded in bank sand and polyethylene wrapped.
27. Backfill structural excavations (wet well, etc.) with cement stabilized sand.
28. Lift station site plans shall be submitted in scales of 1-inch = 5-feet or 1-inch = 10-feet. For architectural units use 3/8" = 1'.
29. Provide a protective coating to interior walls of wet well. The Engineering Division shall approve coating or additive used.
30. Lift station shall be equipped with a telephone dialer, approved by City and a red alarm light. A float or transducer system shall be installed and connected to telemetry system to monitor status of lift station.
31. Power supply to lift station shall be 3 phase (and 480 volts where possible).
32. A system of floats or Engineering Division approved transducer system shall be provided to control pumps.

2.05 SUBMITTALS:

- A. Preliminary design - submit the following for review and comment:
 1. Copies of any documents that show approval of exceptions to the City design criteria.
 2. Design calculations for line sizes and grades
 3. Contour map for overall area.
 4. Plan and profile sheets showing proposed improvements
 5. Geotechnical soils report for the project (City projects only).
- B. Final design - submit the following for approval:
 1. Final documents of the above plus plan and profile sheets and Geotechnical soils reports for non-City projects.

2. Review prints.
 3. Original drawings.
- C. Final acceptance – submit the following for approval:
1. As – Built plans with a letter from the design engineer stating that the project was constructed in conformance with the plans.
 2. Line pressure and mandril test results.
 3. Manhole vacuum test results.
 4. Request physical inspection by city staff.
 5. One-year maintenance bond valid for 1 year from the date of acceptance by the city.

2.06 QUALITY ASSURANCE:

Prepare calculations and construction drawings under the supervision of a Professional Engineer trained and Licensed under the disciplines required by the drawings. The final construction drawings must be sealed, signed, and dated by the Professional Engineer responsible for the development of the drawings.

SECTION III
WATER LINE DISTRIBUTION SYSTEM
DESIGN REQUIREMENTS

SECTION III
WATER LINE DISTRIBUTION SYSTEM
DESIGN REQUIREMENTS

3.0 GENERAL

3.01 CHAPTER INCLUDES:

Criteria for the design of Water Lines

3.02 REFERENCES:

- A. TCEQ, Water Utilities Division "Rules and Regulations for Public Water Systems," latest revision.
- B. American Water Works Association (AWWA).
- C. National Sanitation Foundation (NSF).
- D. Texas Department of Health.
- E. Texas State Board of Insurance.

3.03 DEFINITIONS:

- A. Water Line - Closed conduits designed to distribute potable water for human consumption to various areas and provide fire protection. Line size and fire protection accessory locations are dependent on distance from primary source and quantity of demand.

3.04 DESIGN REQUIREMENTS:

- A. Obtain approval from the City of Alvin for exceptions or deviations for these requirements. Exceptions or deviations may be granted on a project-by-project basis only.
- B. Easements for water lines.
 - 1. Lines shall be located within street right-of-way, permanent access easements with overlapping public utility easements, easements adjacent to street rights-of way or recorded water line easements.
 - 2. When outside of a public street right-of-way or permanent access easement with an overlapping public utility easement, easements must be dedicated.
 - 3. When possible, easements should be contiguous with public rights-of-way.
 - 4. Except for side lot easements, water line easements shall be contiguous to a paved access.
 - 5. For water lines located adjacent to street rights-of-way, the minimum width of easement shall be 10 feet.
 - 6. For water lines 16 inches or larger located outside of street rights-of-way, the minimum width of easement shall be 15 feet.
 - 7. For water mains located less than 5 feet from the right-of-way line, the outside edge of a water line easement shall be located from the right-of-way line as follows:
 - 14 inch and smaller pipe - 5 feet.

16 inch and larger pipe - 10 feet

8. Water lines along State rights-of-way shall be installed outside of the right-of-way in a separate 10-foot minimum contiguous easement. If additional utilities are anticipated in the easement additional width shall be provided. However, if the right-of-way is sufficient for placement of utilities then the City will coordinate with TCEQ for approval of placing waterline within state right-of-way.
9. No back lot easements will be allowed for the installation of water lines, unless specifically approved by the City.
10. Commercial Developments inside the City requiring on-site fire hydrants must provide a minimum 15-foot water line easement for the water line and fire hydrant.
11. In new developments, water lines shall be centered in water line easements.
12. When using side lot easements, such easements shall be a minimum of 10 feet in width, located on one lot or centered between lots. Water line shall not be closer than 5 feet from an easement edge.
13. Location of a water main in an easement not adjoining a public right-of-way shall be prohibited, except as specifically approved by the Director. When approved, these water mains will be centered in a 15-foot wide exclusive easement.

C. Location of water lines:

1. Locate within a street right-of-way.
2. Location of waterlines within an easement - locate waterlines in the center of a 10-foot minimum width dedicated waterline easement. Obtain approval for lines to be located in wider or multi-use easements.
3. When a water line is placed parallel to another utility line, or storm sewer other than a sanitary sewer, the water line shall have a minimum of 4 feet horizontal clearance from outside wall of the water line to the outside wall of the existing utility or storm sewer.

D. Water line size:

1. 6 inch lines may be used on dead-end lines within cul-de-sacs or if the line is less than 1,500 feet in length and interconnected between two lines which are 8 inches in size or larger. The maximum number of fire hydrants or flushing valves on a dead end line is one. Two hydrants will be permitted on a looped 6-inch line.
2. 8-inch lines may be used for lines over 1,500 feet long or when 2 or more fire hydrants or flushing valves are required.
3. In areas anticipating commercial development, the minimum line sizes shall be 8 inches or larger based on anticipated required fire flows in accordance with Insurance Service Office (ISO) requirements.
4. 12 inch and larger lines - lines to be determined by the Professional Engineer (P.E.) and City of Alvin.
5. All systems shall be designed to provide a minimum of 1000 gallons per minute fire flow for a minimum of 2 hours. The minimum requirement can be lowered to 500 gallons per minute if an licensed engineer provides sealed calculations specifying structures would not be harmed using lower standard.

E. Dead-end lines:

1. Dead-end lines within a public right-of-way.

- a. On permanent dead-ends, other than cul-de-sacs, the line shall be 6 inches and shall not exceed more than 800 feet in length from the closest interconnection main line and shall terminate with a fire hydrant or flush valve.
- b. In permanent dead-end situations within cul-de-sacs, reduce pipe size successively. Carry 8 inch pipe to the next to last hydrant, then use 6 inch pipe to the line's end. Place the last service as near as possible to the end and install a fire hydrant at the end of the 6 inch line. The maximum length of this reduced line size configuration should not exceed 800 feet. Four-inch lines may be used on dead-end lines within cul-de-sacs supplying a maximum of 16 lots provided all structures are within a 500 feet radius of a fire hydrant. For this carry 6-inch pipe to the last hydrant then use 4-inch pipe to the line's end. Place the last service as near as possible to the end and install a standard 2-inch blow off and box at the end of the 4 inch line.

F. Depth of cover:

- 1. 14 inch and smaller mains shall have a minimum cover of 4 feet from top of curb. For open ditch roadway sections, 12 inch and smaller shall be installed at least 3 feet below the ultimate flowline of the ditch or 6 feet below natural ground at the right-of-way line, whichever is deeper.
- 2. 16 inch and larger mains shall have a minimum cover of 5 feet from top of curb. For open ditch roadway sections, 16 inch and longer mains shall be installed at least 4 feet below the flow line of the ditch or 7 feet below natural ground at the right-of-way line, whichever is deeper.

G. Water line crossings:

- 1. Public and private utility crossings other than sanitary sewer.
 - a. Where a water line crosses another utility other than a sanitary sewer, a minimum of 6 inches of clearance must be maintained between the outside wall of the water line and the outside wall of the utility.
- 2. Stream and Ditch Crossings
 - a. Elevated Crossings
 - (1) All water lines shall be steel or restrained joint metallic pipe and shall extend a minimum of 15 feet beyond the last bend or to the right-of-way line, whichever is greater.
 - (2) Elevated crossings are preferred to underground crossings.
 - (3) Use a separate elevated supporting structure for 16 inch and larger water lines unless otherwise approved by the City. Locate the structure a minimum of 10 feet from any existing or proposed structure.
 - (4) Support water lines on existing or proposed bridges meeting the following criteria may be used for 12 inch and smaller lines when approved in advance by the City.
 - (a) Have adequate structural capacity.
 - (b) Have sufficient clearance above the bent cap elevation for installation under the bridge.
 - (5) Design elevated crossings with the elevation of the bottom of the water line above the low chord of the nearest adjacent bridge or a minimum of 1 ½ feet above the 100 year flood plain elevation, whichever is higher.
 - (6) Extend pipe from right-of-way to right-of-way for crossings.

- (7) Provide sufficient span length to accommodate the cross section of future widening of the stream or ditch, if available.
- (8) Support the line on columns spaced to accommodate the structural capacity of the pipe considering deflection and loading.
- (9) Base column support design on soil capacity, spacing, loading, and structural requirements.
- (10) Piers are not allowed in the center of the stream.

H. Underground crossings:

1. Provide a minimum 4-foot clearance above the top of the pipe to the ultimate flow line of the ditch.
2. Provide sufficient length to exceed the ultimate future development of the stream or ditch.
3. All water lines shall be steel or restrained joint pipe and shall extend a minimum of 15 feet beyond the last bend or to the right-of-way, whichever is greater and have valves located on both sides of the crossing.

I. **State highway and county road crossings:**

1. Extend carrier pipe from flow-line to flow-line for open ditch sections and 5' behind back of curb for curb and gutter sections.
2. State highway crossings shall be constructed in conformance with the requirements of the Texas Commission Environmental Quality (TCEQ) and shall be permitted by TCEQ.
3. When additional right-of-way has been acquired or will be required for future widening, the casing, where required, should be coordinated with the appropriate agency.

J. Street crossings:

1. All water mains and sprinkler line crossings under major thoroughfare boulevards shall be encased using a minimum of P.V.C. pipe, SDR 21.
2. Crossings under existing concrete streets, other than major thoroughfares, shall be constructed by boring and jacking. P.V.C. pipe shall be jacked into place with equipment designed for that purpose. Water may be used to facilitate boring and jacking operations. Jetting the pipe main into place will not be permitted. When conditions exist that warrant open cut across and existing street, the City Engineer shall specifically approve the crossing.
3. All open cut installations under existing or proposed streets shall be backfilled as shown in the construction details.
4. All street crossings shall be constructed in accordance with construction plans approved by the City. All street crossings shall be inspected by the City Engineer or his/her designated representative. All street crossings shall meet the requirements of these standards.

K. Oil and gas pipeline crossings:

1. Do not use metallic pipe when crossing oil or gas transmission lines unless a properly designed cathodic system is implemented with City approval. Other pipe may be

used, regardless of depth, subject to approval by the City. Maintain a minimum 2 foot separation between the pipeline and waterline. All required permits and correspondence with the pipeline company is to be done by engineer, not City personnel.

- L. On-site fire loops within commercial and multi-family developments.
 - 1. For commercial and multi-family developments inside the City requiring on-site fire hydrants, comply with the following requirements to allow maintenance and future repair operations.
 - a. Do not allow placement of structures, equipment pads over the easement.
 - b. Provide 10 foot wide longitudinal pavement joint along easement lines where the water line is located under driveway or street pavement.
- M. Additional requirements: Pipe shall be C900 (SDR 18) Class 150 PVC pipe conforming to ASTM D1798 with integral bells.
- N. Auger (bore) construction:
 - 1. Use the following general criteria for establishing auger or bore sections:
 - a. Auger or bore sections shall be clearly shown on drawings.
 - b. Improved streets - use auger construction to cross the street regardless of surface. Auger length shall be computed as roadway width at proposed bore location plus 5 feet to either side of the roadway, where applicable.
 - c. Sidewalks - when the water line crosses under a sidewalk 4 feet or more in width and in good condition, the sidewalk shall either be bored and jacked or the sidewalk shall be removed and replaced to the City of Alvin criteria, whichever is cost effective. Bore and jack length shall be at least the width of the sidewalk. The proposed type of construction shall be noted on the plans.
 - d. Bore Pits - Bore pits shall be at least 3 feet from back of curb and 5 feet from the back of curb on a major thoroughfare. Bore pits and/or receiving pits to be located in street or driveway paving, shall be shown on plans.

3.05 APPURTENANCES

- A. Do not place appurtenances under pavement. Obtain approval from the Director for variances.
- B. Valves.
 - 1. Set at maximum distances along line as follows:
 - a. Six inch (6") through twelve inch (14") - 1000 feet.
 - b. Sixteen inch (16") through twenty inch (20") - 2000 feet.
 - c. Valves shall be on n-1 (where "n" is the number of lines intersecting) branches of intersecting water mains.
- C. Location.
 - 1. All mains shall be valved within the street right-of-way. Valves shall not be placed under or within 2 feet of ultimate pavement, except as specifically approved by the City Engineer.

2. Valves are normally located on the projection of intersecting street right-of-way lines or at the curb return adjoining a paved street across the main. Tapping sleeves and valves are excluded from this requirement.
3. Isolated fire hydrants and flushing valves from the service line with a valve located in the fire hydrant or flushing valve branch. This valve shall not be located in the slope or flowline of ditches on roadside ditch roadways.
4. Intermediate valves, not located on the projection line of the right-of-way line, shall be located on lot lines or 5 feet from fire hydrants but not set in driveways.
5. Locate valves a minimum of 9 feet horizontally from sanitary sewer crossings.
6. Valve Type (all valves shall open counterclockwise and have mechanical joints):
 - a. Six inch (6") through twelve inch (14") – resilient seat gate valves.
 - b. Sixteen inch (16") through twenty inch (20") - butterfly valves (gate valves may be used with approval from the Public Works Department).
7. All valves shall be provided with a 2 piece iron box labeled "water".

D. Fire hydrants and flushing valves:

1. Spacing.
 - a. Fire hydrants shall be placed at 500 foot intervals on streets in residential areas.
 - b. Commercial and Multi-Family Developments - 300 foot spacing and at all street intersections.
2. Location in or along street right-of-ways.
 - a. Fire hydrants shall be primarily located at street intersections where possible.
 - b. Locate fire hydrants at P.C.s of the intersection curb radius, 3 feet behind the curb or projected future curb.
 - c. On all State highways and roadside ditch roadways, set the fire hydrants within 3 feet of right-of-way lines. Fire hydrants lead valves shall not be located in the slopes or flow lines of ditches.
 - d. Set intermediate fire hydrants on lot lines, as extended to pavement, when located between right of way intersections. These locations may be adjusted 5 feet either way to miss driveways or other obstructions. In either case, do not locate fire hydrants closer than 3 feet from curbed driveways or 5 feet from non curbed driveways.
 - e. Fire hydrants and flushing valves shall not be installed within 9 feet of a sanitary sewer system under any condition.
3. Location of fire hydrants or flushing valves outside the street right-of-way.
 - a. The City Fire Marshal will establish and approve the location of fire hydrants and flushing valves in apartment complexes and platted private developments within the City.
 - b. Locate fire hydrants and flushing valves in protected, easily accessible areas behind curb lines.
 - c. For fire hydrants or flushing valves which are located adjacent to water lines constructed in 15 foot wide waterline easements, the fire hydrant or flushing valve shall be centered in a minimum 10'x10' separate easement.
 - d. For commercial and multi-family developments inside the City, provide isolation valves at each end of fire loops requiring on-site fire hydrants.
 - e. Fire hydrants in parking lots and near traffic shall be protected with concrete filled steel guard posts.

4. Fire hydrants shall meet the following criteria: Fire hydrants be Mueller A-423 or American Darling, conforming to AWWA C502, 3-way 5.25" main valve; 6inch inlet M.J. shoe, with two (2) 2.5 inch NST hose nozzles and one (1) 4.0-inch 4.480 thread configuration: operating nut shall be 1-3/16-inch pentagon and shall open counter clockwise (left). Fire hydrant shall be breakaway.
- E. Fittings:
1. All fittings shall be identified and described on the construction plans.
 2. Fittings are not permitted in fire hydrant leads, except as specifically approved by the City.
 3. Water main fittings shall be ductile iron mechanical joints only.
 4. All plugs shall be provided with retention clamps.
 5. Polyethylene tube encasement shall conform with the minimum requirements of "Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids", ANSI/AWWA C105, current revision. Soils within the project shall be tested in accordance with Appendix A of ANSI/AWWA C105 to adequately determine the requirements for encasement.
 6. Concrete thrust blocking shall be required on all bends, tees, plugs and combinations thereof.
 7. All fittings and fire hydrants to be tied together with 3/4-inch stainless steel all threads and I-bolts or with restrained joint fittings.
- F. Water main service:
1. In new developments, water service lines shall be provided for all lots on the opposite side of the street. Services shall normally be at lot lines with a 3/4" minimum size to serve a single lot and 1" minimum for 2 lots. Lines shall be SDR 9 polyethylene or copper. Service lines should be continuous from the tap to the meter box where possible. For long service leads that cannot be installed without a couple the couple is not to be placed under existing pavement.
 2. Water main service for lines in or along street right-of-ways.
 - a. Meters 2 inch and smaller – Meters shall be placed at the property line. Meters shall be located in areas with easy access and protection from traffic and adjacent to right-of-way whenever possible.
 - b. Meters 3 inches and larger - locate in minimum 10' x 20' separate water meter easements.
 - (1) Meters shall be located in areas with easy access and protection from traffic and adjacent to rights-of-ways whenever possible.
 - (2) Meters shall not be located in areas enclosed by fences.
 3. For proposed apartments, provide one master meter sized for the entire development. Exceptions may be granted by the City for unusual circumstances only. If an exception is approved, do not interconnect multiple meters.
- G. All water facilities shall be flushed, pressure tested and bacterial tests run and approved process to acceptance.

3.06 WATER QUALITY - OVERALL SYSTEM LAYOUT

- A. Circulation and flushing - The layout of the overall water distribution system shall provide the maximum circulation of water to prevent future problems of odor, taste, or color due to stagnant water.

1. Provide a source of fresh water at each end or at multiple points of a subdivision. Provide ways to create circulation and place valves and fire hydrants to allow simple flushing of all lines.
 2. Avoid dead-ends whenever possible, when necessary, isolate dead-ends with a line valve, keep as short as possible, and equip with a fire hydrant near the line's end.
 3. Where stubs are provided for future extensions, isolate the stubs with a valve and do not allow service connections to stubs until extended. Place one full pipe joint between isolation valve and plug.
- B. Layout and size of all water mains shall be consistent with the overall layout and phasing plan of the City's water system. The overall water system shall be designed to maintain adequate pressure throughout the system.
- C. In an unavoidable permanent dead-end situation, reduce the sizes of pipe successively. Carry an 8-inch pipe to the next to last fire hydrant, use a 6 inch to the end of the line. Provide a fire hydrant at the end of the main.

3.07 CLEARANCE OF WATER LINES FROM OTHER UTILITIES (New water lines constructed near sanitary sewers and force mains).

- A. New water lines parallel to sanitary sewers and force mains:
Locate water lines a minimum 9 feet horizontally, outside wall to outside all, when parallel to sanitary sewers or force mains. Any requests for variation from the 9 foot minimum separation shall be made in writing by the design engineer with a justification for the variance and the specific methods (conforming the TCEQ rules) that will be used to assure the integrity of the system.
- B. Where a sanitary sewer crosses the water main, and that portion of the sewer within 9 feet of the water is constructed as described in Section 290.44(e) of the TCEQ Rules and Regulations, the water line may be placed no closer than 2 feet from the sewer. The separation distance must be measured between the nearest outside pipe diameters. The water line shall be located at a higher elevation than the sewer, wherever possible and one joint, a minimum of 18 feet long, of the new pipe must be centered on the existing line.
- C. If the new water main cannot be installed 2 feet above a sewer main with an 18 foot joint centered on the water main the installation shall conform to one of the following:
1. Within nine feet horizontally of either side of the water line, the wastewater pipe and joints shall be constructed with pipe material having a minimum pressure rating of 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater line shall be located below the water line.
 2. All sections of wastewater line within nine feet horizontally of the water line shall be encased in an 18 foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at five percent deflection. The encasing pipe shall be centered on the water line and shall be at least two nominal pipe diameters larger than the water line. The space around the carrier pipe shall be supported at 5 foot (or less) intervals with polyethylene spacers or

be filled to the springline with washed sand. Each end of the casing shall be sealed with water tight non-shrink cement grout or a manufactured water tight seal.

3. When a new water line crosses under a wastewater line, the water line will be encased as described for wastewater line in section (II) above or constructed of ductile iron or steel pipe with mechanical or welded joints as appropriate. An absolute minimum separation distance of 1 foot between the water line and the wastewater line shall be provided. Both the water line and wastewater line, must pass a pressure and leakage test as specified in AWWA C600 standards.

- D. Sanitary manholes - provide a minimum 9 foot horizontal clearance from outside wall of existing or proposed manholes. If a 9 foot clearance cannot be obtained, the water line may be located closer to the manhole when prior approval has been obtained from the City of Alvin by using one of the procedures below; however, in no case shall the clearance be less than 4 feet.

1. Water line may be encased in a carrier pipe. Encasement shall be a PVC water line in a steel carrier pipe. Open cut and backfilled with cement stabilized sand compacted backfill.
2. The water line may be augered past the manhole with one 20 foot section of C-900 PVC pipe 150 psi, installed centered about the existing sanitary manhole with pressure grout using a bentonite/clay mixture.

- E. Fire hydrants. Do not install fire hydrants within 9 feet vertically or horizontally of sanitary sewer mains, service leads, manholes, and force mains regardless of construction.

3.08 SUBMITTALS

- A. General - Conform to the following submittal requirements in addition to those of general procedure of the City.
- B. Water Line Sizes - Submit justification, calculations, and locations for proposed 6-inch lines and for lines 12-inch and larger, for approval by the City, unless sizes are provided by the City.
- C. Valves - Submit information for approval by the City of Alvin with justification and locations for use of 16-inch and 20-inch gate valves proposed as substitutes for butterfly valves.
- D. Elevated stream of ditch crossings - Submit design calculations for support columns and column spacing.
- E. Master Development Plan - For multiple phase developments, submit a master development plan.
- F. Developments with individual wells and septic systems submittals and design calculations will be provided to city engineer for his/her approval.

3.09 QUALITY ASSURANCE

- A. Prepare calculations and construction drawings under the supervision of a Professional Engineer trained and licensed under the disciplines required by the drawings. The final construction drawings must be sealed, signed, and dated by the Professional Engineer responsible for the development of the drawings.
- B. Final Acceptance – For requesting acceptance of a water main by the City, the engineer of record shall submit a written request with “As-built” plans, pressure leakage test results and approved bacteriological tests. Recorded copies of all required easements.

3.0 EXECUTION

3.01 DESIGN ANALYSIS

- A. Water line sizes - Prepare narrative justification and calculations for proposed inch lines and for lines 12-inch and larger, unless sizing is provided by the City.
- B. Elevated stream or Ditch Crossings - Prepare design calculations for support columns and column spacing.

SECTION IV
STREET PAVING DESIGN
REQUIREMENTS

SECTION IV
STREET PAVING DESIGN REQUIREMENTS

4.0 GENERAL

4.01 CHAPTER INCLUDES:

Geometric design guidelines for streets, criteria for street paving, and standard paving notes for drawing call outs.

4.02 REFERENCES

- A. AASHTO - American Association of State Highway and Transportation Officials.
- B. ASTM - American Society for Testing Materials.
- C. ACI - American Concrete Institute.
- D. TxMUTCD - Texas Manual on Uniform Traffic Control Devices.

4.03 DEFINITIONS

- A. Geotechnical Engineer - An engineer certified by the American Association for Laboratory Accreditation (A2LA).
- B. HMAC - Hot Mix Asphaltic Concrete.
- C. Curb Sections - Full width concrete pavement with doweled on 6” high vertical curbs or 4-inch by 12-inch curbs. Curb and gutter sections require inlets and underground storm sewers.
- D. Roadway ditch sections - Ditch sections adjacent to either full width reinforced concrete pavement or asphaltic pavement. Roadside ditch sections do not require underground storm sewers; however, the ditch sections must be designed to accommodate the storm runoff.

4.04 DESIGN REQUIREMENTS

The following design requirements are applicable to all pavement within right-of-way limits within the City of Alvin.

- A. General
 - 1. All paving plans and construction shall be approved by the City of Alvin for all streets within the City.
 - 2. Street design should conform to all applicable planning tools, such as the Texas Manual on Uniform Traffic Control Devices, major thoroughfare plans, master plans, etc. Other considerations for design should include street function, street capacity, service levels, traffic safety, pedestrian safety, and utility locations. These additional considerations may effect the minimum requirements set forth herein. Refer to the City Thoroughfare Plan.
 - 3. Design shall conform to the City Construction Details.

- B. Minimum Width Requirements and Paving:
1. Undivided curb and Gutter sections for low-density residential developments: 28 feet back to back of curb (B/B).
 2. Pavement for open-ditch sections for low-density residential developments: 24 feet edge to edge of pavement. Use only when approved by the City in large lot residential developments.
 3. Curb and gutter sections of medium density residential, industrial, secondary and collector streets: 38 feet B/B of curb.
 4. Pavement of major arterial thoroughfares: two divided traffic lanes of 25 feet (4 lane divided) or 34 feet B/B of curb (6 lane divided).
- C. Minimum Thickness and Reinforcement Requirements for Concrete Pavement:
The following requirements are the minimum allowable. Pavement thickness and reinforcement shall be designed by the Professional Engineer responsible for the project based on a current soils analysis and recommendations by a qualified geotechnical engineer. Pavement design based on soils analysis, use, loading and life span may require greater thickness and more reinforcement than the minimums give, but City Engineer may determine that additional thickness is warranted.
1. For pavement widths less than or equal to 28 feet B/B of curb:
 - a. Minimum concrete slab thickness shall be 6 inches with $f_c = 3,000$ psi and reinforcement shall be Grade 60, $f_y = 60,000$ psi, #4 deformed reinforcing bars spaced at 18 inches center to center both ways and minimum lap lengths of 18 inches. Expansion joints shall be placed at the end of each curb return and at a maximum spacing of 50 feet - 6-inches. Expansion joints shall include a 3/4" redwood header, 3/4" smooth dowel bar (18" length) and a 26 gauge hard plastic tube. The expansion joint shall include a standard steel wing plate.
 - b. Minimum stabilized subgrade thickness shall be 6 inches.
 2. For pavement widths greater than 28 feet B/B and for major arterial thoroughfares:
 - a. Minimum concrete slab thickness shall be 7 inches with $f_c = 3,000$ psi and reinforcement shall be Grade 60, $f_y = 60,000$ psi, #4 deformed reinforcing bars spaced at 18 inches center to center both ways and minimum lap lengths of 18 inches. Expansion joints shall be placed at the end of each curb return and at a maximum spacing of 50 feet.
 - b. Minimum stabilized subgrade thickness shall be 6 inches.
 3. Joints shall use Load transfer devices.
- D. Subgrade Treatment: Geotechnical Engineer shall base depth of subgrade stabilization on structural number (SN) in conjunction with pavement thickness design. Following is a general guidance for subgrade treatment:
1. For subgrade soil conditions with a plasticity index (PI) of 20 or more, the subgrade shall be stabilized with lime. Subgrade shall be stabilized with the recommended % of lime by weight as determined by geotechnical engineer. All final soil PI's shall be less than 20.
 2. For subgrade soil conditions containing a clean sand with no clay content, the subgrade shall be stabilized with cement.
 3. For subgrade soil conditions containing silt, the subgrade shall be stabilized with lime

- fly ash.
4. All subgrade shall be compacted to a minimum of 95% standard proctor at optimum moisture plus or minus 2 percent.
- E. Requirements for Intersections, Turnouts, Transitions, and Thoroughfares:
1. At a "T" intersection with a street that has not been improved to its ultimate width, concrete pavement should be stopped either at the right-of-way line or the end of the curb return, whichever would require less concrete removal at a future date.
 2. For roadway turnouts placed at an existing street intersection, the turnout should be designed to fit the ultimate pavement width of the intersecting cross street and then transitioned to the existing roadway.
 3. The usual transition length for meeting an open-ditch street is 50 feet for streets widths less than or equal to 28 feet B/B; 75 feet for up to 38 feet B/B width; and 100 feet for 41 feet B/B width.
 - a. Streets other than concrete shall have transitions of a minimum thickness of 6 inches of lime stabilized subgrade, 8 inches of stabilized base, or approved equal, with 2 inches of hot-mix asphaltic surfacing.
 - b. Concrete streets shall have transitions of a minimum thickness of 6 inches of stabilized subgrade and 6 inches of concrete pavement.
 4. When paving only one roadway of a proposed two roadway thoroughfare (boulevard section) all left-turn lanes and esplanade crossovers shall be paved to the centerline of the street right-of-way.
- F. Requirements for Roadway Pavement with Open-Ditch Sections.
1. Minimum grade on ditches shall be 0.10 percent.
 2. Ditch capacity shall be designed to handle runoff as determined by the City Drainage Design Requirements.
 3. Maximum side slopes of ditches shall be 3:1. Sides may be sloped to 4:1 or 5:1 for easier maintenance by property owner.
 4. Culverts for roadside ditch only, shall be designed to carry ditch discharge, but not less than 15-inch diameter pipe constructed of reinforced concrete or polyethylene. The maximum length shall be 24 feet.
 5. The radius for cul-de-sac pavement shall be 45 feet.
- G. Requirements for Roadway Pavement with Curb and Gutter Sections:
1. Minimum gutter gradient shall be 0.25 percent.
 2. Maximum cut from finished grade at property line to top of curb shall be 1.25 feet. The recommended maximum slope for driveways shall be ten (10) to one (1) slope. Variations of this requirement may be allowed with specific approval of the City.
 3. Minimum grade shall be 0.50 percent fall around intersection turnout for a maximum radius of 25 feet. Grades for larger radius shall be determined on an individual basis.
 4. Vertical curves shall be installed when algebraic differences in grades exceed 1 percent. Maintain a minimum of 0.02-foot elevation change at 10-foot intervals by altering the calculated elevations. Provide length of vertical curve, PI station and elevation, high/low point station and elevation, algebraic difference and K value. The maximum desirable tangent grade to vertical curves for local streets is 3.5 percent.
 5. When a curb and gutter intersects a drainage ditch, the grade of gutter shall be above the designed water surface of the ditch.

6. Major thoroughfares shall be super elevated in accordance with AASHTO whenever the centerline radius of lanes or right-of-way are less than 2,000 feet.
7. The amount of cross slope over the pavement section should be shown on the drawings. The usual cross slope is 1/4 inch per foot.
8. A minimum gradient of 0.40 percent around the longest radius is required on an L-Type street intersection or cul de sac.
9. When the curb grades are not established below the natural ground, fill lines shall be shown on the drawings and shall be of sufficient height to insure a minimum of 1/4-inch per foot transverse slope toward the curb from the property line between a point, 2 feet outside the right-of-way and the top of curb. If this type fill is required and the pavement is adjacent to a nonparticipating property owner, fill easements from this property owner shall be obtained, filed, and a copy of the easements shall accompany the final drawings. Construction of this nature will require back-slope drainage design to prevent trapping storm runoff.
10. Grades should be labeled for all tops of curb. Centerline grades are acceptable for open-ditch sections only.

H. Requirements for Curbs and Sidewalks

1. Standard height is 6-inches or 4 inch by 12 inch wide for curb located along outside edges of residential streets. Curb height for streets other than residential shall be 6 inches. The curb height for all esplanades shall be 6-inches.
2. Sidewalk wheelchair ramps shall be required at all intersections and driveways. Ramps shall not direct pedestrians toward the center of an intersection.
3. Sidewalks shall be provided for all developments. Concrete sidewalks (4 feet wide 4 inches thick with steel reinforcement) shall be required along all street frontage.

I. Requirements for Miscellaneous Items

1. The type and amount of subgrade treatment shall be shown on the drawings.
2. Paving headers shall be placed at the end of all concrete pavements.
3. All concrete to be removed shall be removed either to an existing joint or a sawed joint.
4. Sight distance requirements based on a design speed of 30 mph shall be used for determining lengths of crest vertical curves for all pavements except boulevard sections, which shall be designed for 45 mph.
5. Standard City barricades shall be placed at the end of all dead-end streets not terminating in a cul-de-sac.
6. A letter of agreement approving the construction plan crossing is required when paving is placed over a pipeline or other easement or fee utility property.
7. When meeting existing concrete pavement, horizontal dowels shall be used if no exposed reinforcing steel for interconnection with new pavement exists. Horizontal dowels shall be Grade 60, #6 rebars, 24-inches long, drilled and embedded (with epoxy) 6 – to 8-inches into the center of the existing slab. Dowels shall be 24 inches center to center, unless otherwise specified.
8. When concrete is removed for interconnections, the pavement shall be saw cut, and existing concrete removed, to expose a minimum of 15-inches of reinforcing steel. If no reinforcing steel exists, use horizontal dowels as previously described.
9. Dead-end streets or ends of concrete slabs designed to be extended in the future shall have paving headers and 15-inches of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap or paving headers and dowel type expansion joint for future pavement tie.

10. Pavement extensions shall connect to the existing pavement with a pavement undercut and a minimum steel overlap of 18-inches.
11. Concrete pavement thickness design is required for all pavement within industrial areas and on major thoroughfares. Concrete pavement thickness design shall be based on AASHTO design procedures for rigid pavements.
12. Adjust manhole frames and covers within the limits of the pavement to meet the proposed final top of slab.
13. Adjust manhole frames and covers outside the limits of the pavement to conform to the final grading plan.

4.05 QUALITY ASSURANCE.

- A. All construction drawings and specifications shall be prepared by or under the supervision of a currently Registered Professional Engineer of the State of Texas, and all documents shall be sealed, dated, and signed by the engineer responsible for the preparation.
- B. All geotechnical work shall be performed by or under the supervision of a currently Registered Professional Engineer of the State of Texas disciplined in the science of soil analysis. All reports and documents shall be sealed, dated, and signed by the engineer responsible for the preparation.
- C. Final Acceptance – Submit the following with a written letter requesting inspection and acceptance.
 1. As – Built plans with a letter from the design engineer stating that the project has been constructed in accordance with the plans.
 2. Copies of test results for:
 - a) Concrete strength
 - b) Subgrade compaction
 - c) Subgrade PI after lime addition

A minimum one of each of the above tests per 1000 feet of pavement shall be provided.

PART 2 EXECUTION

4.01 DESIGN ANALYSIS

- A. All pavement design shall be supported by calculations to establish the required thickness and reinforcement.
- B. The current soils report with subgrade stabilizations.

SECTION V
STORM DRAINAGE DESIGN
REQUIREMENTS

SECTION V
STORM DRAINAGE DESIGN REQUIREMENTS

5.0 GENERAL

5.01 CHAPTER INCLUDES:

Criteria for the design of storm drainage improvements.

5.02 DRAINAGE POLICY

- A. Design requirements – This drainage criteria is administered by the City of Alvin and shall be effective within the City of Alvin and its extraterritorial jurisdiction. All drainage work proposed for design within these limits are to adhere to these criteria explicitly. Any questions regarding their use or function should be addressed the City Engineer. The goal is to provide protection in a 100-year storm event. This is accomplished with the application of various drainage enhancements such as storm sewers, roadside ditches, open channels, detention and overland (sheet) runoff. The combined system is intended to prevent structural flooding from extreme events up to a 100-year storm. In order to protect existing properties, water levels due to run off shall not be increased upstream or downstream of a development due to the improvement.
- B. Street Drainage - Street ponding of short duration in significant storms is anticipated and designed to contribute to the overall drainage capability of the system. Storm sewers and roadside ditch conduits are designed as a balance of capacity and economics. These conduits are designed to convey less intense, more frequent 5 year storms with the intent of allowing for traffic movement during these events. When rainfall events exceed the capacity of storm sewer system, the additional run-off is intended to be stored or conveyed overland in a manner that reduces the threat of flooding to structures.
- C. Flood Control - The City of Alvin is a participant in the National Flood Insurance Program. The intent of the flood insurance program is to make insurance available at low cost by providing for measures that reduce the likelihood of structural flooding.
- D. Relationship to the Permitting Process - Approval of storm drainage is a part of the review process for platting and permitting of new development. All plans for plats and proposed new construction shall include drainage improvements in the plans submitted to the Planning & Development Division.

5.03 REFERENCES

- A. City of Alvin Flood Damage Prevention Ordinance and subsequent revisions.
- B. Brazoria County Drainage District Criteria Manual (for development in Conservation & Reclamation District No. 3)
- C. Brazoria Drainage District No. 4 Rules, Regulations and Guidelines (For Development in Drainage District No. 4)
- D. TxDOT Bridge Division Hydraulic Manual, Third Edition, 1985.

- E. National Weather Service Documents - TP-40 Rainfall Frequency Atlas of the United States.

5.04 DEFINITIONS

- A. Conduit: any open or closed device for conveying flowing water.
- B. Drainage Area Map: Area map of watershed, which is subdivided to show each area, served by each subsystem.
- C. Hydraulic Grade Line: A line representing the pressure head available at any given point within the drainage system.
- D. Redevelopment: A change in land use that alters the impervious cover from one type of development of either the same type or another type, and takes advantage of the existing infrastructure in place as a drainage outlet.
- E. In-Fill Development: Development of open tracts of land in areas where the storm drainage infrastructure is already in place and takes advantage of the existing infrastructure as a drainage outlet.
- F. Public storm sewers: Defined as sewers and appurtenances that provide drainage for a public right-of-way, or more than one private tract, and are located in public right-of-way or easement and officially accepted by the City for maintenance. Private storm sewers provide internal drainage for a reserve or other tract. Private storm sewer connections to public storm sewers shall occur at a manhole or at the back of an inlet as approved by the City. All private storm sewers shall be constructed in conformance with these standards.
- G. Rational Formula: A method for calculating the peak run-off for a storm drain system using the following equation:

$$Q = CIAC_f$$

where:

Q = Flow rate in cfs

C = Runoff Coefficient

C_f = Frequency factor, the product of C_f and C should not exceed 1.0.

I = Rainfall intensity in inches/hour, for a given storm frequency (typically 5 year, 25 year and 100 year).

A = Area in acres

t_c = Time of Concentration in minutes, time required for peak runoff from entire upstream contributing area to reach the point of interest.

t_c = $\frac{D}{60V} + 10$ minutes initial

D = Flow Distance, feet

V = Flow Velocity, feet/sec.

Storm Frequency	Frequency Factor (C_f)
≤ 10	1.00
25	1.10
50	1.20
100	1.25

For purposes of calculating t_c , the following velocities are recommended:

- V = 1 fps for overland flow
- V = 1.5 fps for flow across paved surfaces or along gutter flow lines.
- V = 2 fps for flow in ditch or channel
- V = 3 fps for flow in storm sewer

H. Sheet Flow - Overland storm run-off that is not conveyed in a defined conduit, and is typically in excess of the capacity of the conduit.

I. Manning's Equation: $V = (1.486/n) R^{2/3} S^{1/2}$

- Where V = velocity (ft./sec)
- R = hydraulic radius (area/wetted perimeter in feet)
- S = slope of energy line in feet/feet (same as conduit bottom slopes for uniform flow)
- n = coefficient of roughness

See tables 3-1 and 3-2 for complete n values

J. Continuity Equation: $Q = VA$

- Where Q = discharge (cfs)
- V = velocity (ft/sec)
- A = cross sectional area of conduit in square feet

K. FEMA - Federal Emergency Management Agency

L. C&R3 – Brazoria County Conservation and Reclamation District No. 3

M. DD4 – Brazoria County Drainage District No. 4

N. Brazoria County Empirical Formula

Calculates the acre feet of flood control storage, S, to be provided by the detention facility for the 100-year storm event. The equation is:

$$S = I^{1/2} \times A$$

Where I = the average percent imperviousness of the area draining into the facility ($\div 100$), and

A = the drainage area of the facility (in acres)

O. WSEL - Water Surface Elevation

P. Small Watershed Hydrograph Methodology

This methodology utilizes a pattern hydrograph which peaks at the design flow rate and which contains a runoff volume consistent with the design rainfall. The pattern hydrograph is a step function approximation to the dimensionless hydrograph proposed by the Bureau of Reclamation and the Soil Conservation Service. The Small Watershed Hydrograph Method consists of the following equations:

$$T_p = V/1.39Q_p$$

$$q_i = (Q_p/2)[1 - \cos(\pi t_i/T_p)]^* \text{; for } t_i \leq 1.25 T_p$$

$$q_i = 4.34 Q_p e^{(-1.30 t_i/T_p)} \text{ for } t_i > 1.25 T_p$$

* Calculator must be in radian mode

where: T_p is the time (in seconds) to Q_p

Q_p is the peak design flow rate (in cfs) for the subject drainage area

V is the total volume of runoff (in cubic feet) for the design storm

t_i and q_i are the respective time (seconds) and flow rates (cfs), which determine the shape of the inflow hydrograph.

The peak flow rate, Q_p , is obtained from the Rational Method Formula.

Q. Triangular Hydrograph

The runoff volumes for the Triangular Hydrograph method are based on a triangle hydrograph with a runoff duration equal to twice the time of concentration (T_c) of the existing, pre-project condition. This method is limited to pre-project T_c less than 60 minutes ($T_{ce} \leq 60$ minutes)

Detention Volume, $V_s = V_i/R_d$

Where: V_s = Storage Volume (acre-feet)

V_i = Incremental Volume of runoff due to the proposed project

R_d = Rainfall Depth Ratio

Incremental Volume, $V_i = V_d - V_e$

Where V_d = Volume of developed 100-year storm runoff, in acre-feet, or

$$V_d = \frac{C_d I_d A T_{cd} (60)(2)}{42560(2)}$$

$$V_d = \frac{Q_d T_{cd}}{726}$$

And V_e = Volume of existing or pre-project conditions on 100-year storm run-off, in acre-feet,

$$V_e = \frac{C_e I_e A T_{ce} (60)(2)}{43560(2)} * (T_{cd}/T_{ce})^{1/2}$$

$$V_e = \frac{Q_e T_{cd}}{726} * (T_{cd}/T_{ce})^{1/2}$$

An alternative graphical method for V_e can be used where Q_i is obtained from the intersection of the developed triangular hydrograph versus the existing triangular hydrograph. The peak of both triangular hydrographs are its respective peak flows.

$$\text{Runoff Depth Ratio, } R_d = \frac{D@2T_{cd}}{D_{24}}$$

Where $D@2T_{cd}$ = Depth at time equal to $2T_{cd}$, or the maximum rainfall depth (in), from the depth-duration-frequency curves at the time equal to twice the developed conditions time of concentration (min) (See table in Section 1.05.2)

T_{cd} = Time of concentration for the developed watershed or subarea (min) computed,

D_{24} = 100-year 24-hour rainfall depth (13.0 inches for Alvin)

The existing and developed triangle hydrographs are the basis for the runoff volume using the rational formula to determine the peak discharge. The incremental volume of storm runoff to be mitigated is the difference between the developed and preproject hydrographs.

Substituting the appropriate relationship and reducing to simple terms, the detention requirement is:

$$V_s = \frac{13.0 (V_d - V_e)}{D@2T_{cd}}$$

R. Small Projects

On those projects where the difference in runoff coefficients for after and before development multiplied by the overall project area in acres is 0.70 or less (small project), the developer may elect to pay a mitigation detention fee in lieu of attempting to construct an on-site detention pond (if regional detention is available and the project is within the watershed of the regional detention facility).

Small Project classification is needed for those projects requiring such small outlet pipe sizes that they are too susceptible to clogging to be reliable in any way. Second, land values in some Small Project areas justify putting required mitigation detention in lower valued flood plain areas.

5.05 DESIGN REQUIREMENTS

All designs of drainage facilities should meet the requirements of the City of Alvin Standard Specifications and Standard Drawings.

Determination of Run-off:

1. Design Storm Events - All drainage improvements shall be designed for the following storm frequencies.

Road Side Ditches	5 years
Storm Sewers	5 years
Open Drainage Channels serving less than 100 acres	25 years
Secondary Arterials	25 years
Bridges	100 years
Creeks/Channels – serving more than 100 acres	100 years
Detention Facilities	5, 25 and 100 years
2. Intensity-Duration Curves
 Table 2-1 of the Brazoria County Drainage Criterion Manual provides intensity-duration values to be used for storm sewer and roadside ditch design in the City of Alvin. These intensities are derived from the formula:

$$I = \frac{b}{(d + t_c)^e}$$

Values used are listed below.

Rainfall Frequency	b	d	e
5-year	70.00	8.0	0.751
10-year	80.00	8.0	0.749
25-year	85.00	8.0	0.730
100-year	89.00	7.8	0.696

These values are to be used to compute storm sewer size. Additionally, the above formula and table will be used to compute detention requirements for developments under 250 acres.

For developments requiring a HEC I and II analysis the following tables will be used for the required fields pertaining to frequency/duration values:

Duration	5-yr	10-yr	25-yr	50-yr	100-yr
5-minute	0.64	0.69	0.78	0.84	0.91
15-minute	1.38	1.51	1.71	1.86	2.02
60-minute	2.87	3.24	3.78	4.20	4.62
2-hour	3.75	4.35	5.00	5.60	6.20
3-hour	4.10	4.90	5.60	6.30	7.15
6-hour	5.00	5.85	6.85	7.80	8.75
12-hour	6.00	7.25	8.50	9.60	10.75
24-hour	7.00	8.55	9.95	11.50	13.00

3. The Rational Method shall be used for determining the peak flow rate in the sizing of all local drainage improvements with drainage areas less than 250 acres.

4. Coefficients for the Rational Method

a. Calculation of Run-off Coefficient

The values for the run-off coefficient "C" in the Rational Method formula will vary based on the land use. Land use types and "C" values, which can be used, can be found in the attached Table 2-3, 3-1 and 3-2.

b. Determination of Time of Concentration:

Time of concentration shall be calculated based upon an analysis of the actual travel time from the most remote point in the drainage area. The travel path should be clearly denoted and a sketch included in the design calculations.

For purposes of calculating time of concentration the following velocities are recommended:

V = 1 fps for overland flow

V = 1.5 fps for flow across paved surfaces of along
along gutter flowlines

V = 2 fps for flow in ditch or channel

V = 3 fps for flow in storm sewer

TABLE 2-3
RATIONAL METHOD OF RUNOFF COEFFICIENTS
FOR 5-10 YEAR FREQUENCY STORMS

Description of Area	Runoff Coefficients For Basin Slopes		
	Less than 1%	1% - 3.5%	3.5% - 5.5%
Residential Districts			
Single Family Areas (Lots greater than ½ acre)	0.30	0.35	0.40
Single Family Areas (Lots ¼ - ½ acre)	0.40	0.45	0.50
Single Family Areas (Lots less than ¼ acre)	0.50	0.55	0.60
Multi-Family Areas	0.60	0.65	0.70
Apartment Dwelling Areas	0.75	0.80	0.85
Business Districts			
Downtown Areas	0.85	0.87	0.90
Neighborhood Areas	0.75	0.80	0.85
Industrial Districts			
Light Areas	0.50	0.65	0.80
Heavy Areas	0.60	0.75	0.90
Railroad Yard Areas	0.20	0.30	0.40
Parks, Cemeteries	0.10	0.18	0.25
Playgrounds	0.20	0.28	0.35
Streets			
Asphalt	0.80	0.80	0.80
Concrete	0.85	0.85	0.85
Drives and Walks			
(Concrete)	0.85	0.85	0.85
Roofs	0.85	0.85	0.85
Lawn Areas			
Sandy Soil	0.05	0.08	0.12
Clay Soil	0.15	0.18	0.22
Undeveloped Areas			
Sandy Soil			
Woodlands	0.15	0.18	0.25
Pasture	0.25	0.35	0.40
Cultivated	0.30	0.55	0.70
Clay Soil			
Woodlands	0.18	0.20	0.30
Pasture	0.30	0.40	0.50
Cultivated	0.35	0.60	0.80

TABLE 3-1
VALUES OF THE MANNING ROUGHNESS COEFFICIENT-“n”

Type of Channel and Description	Minimum	Normal	Maximum
A. Lined or Built-up Channels			
A1. Metal			
a. Smooth steel surface			
1. Unpainted	0.011	0.012	0.014
2. Painted	0.012	0.013	0.017
b. Corrugated	0.021	0.025	0.030
A2. Nonmetal			
a. Cement			
1. Neat, surface	0.010	0.011	0.013
2. Mortar	0.011	0.013	0.015
b. Wood			
1. Planed, untreated	0.010	0.012	0.014
2. Planed, creosoted	0.011	0.012	0.015
3. Unplaned	0.011	0.013	0.015
4. Plank with bat tens	0.012	0.015	0.018
5. Lined with roofing paper	0.010	0.014	0.017
c. Concrete			
1. Trowel Finish	0.011	0.013	0.015
2. Float Finish	0.013	0.015	0.016
3. Finished, with gravel on bottom	0.015	0.017	0.020
4. Unfinished	0.014	0.017	0.020
5. Gunite, good section	0.016	0.019	0.023
6. Gunite, wavy section	0.018	0.022	0.025
7. On good excavated rock	1.017	0.020	--
8. On irregular excavated rock	0.022	0.027	--
d. Concrete bottom float finished with sides of			
1. Dressed stone in mortar	0.015	0.017	0.020
2. Random stone in mortar	0.017	0.020	0.024
3. Cement rubble masonry, plastered	0.016	0.020	0.024
4. Cement rubble masonry	0.020	0.025	0.030
5. Dry rubble or riprap	0.020	0.030	0.035
e. Gavel bottom with sides of			
1. Formed concrete	0.017	0.020	0.025
2. Random stone in mortar	0.020	0.023	0.026
3. Dry rubble or riprap	0.023	0.033	0.036
f. Brick			
1. Glazed	0.011	0.013	0.015
2. In cement mortar	0.012	0.015	0.018
g. Masonry			
1. Cemented rubble	0.017	0.025	0.030
2. Dry Rubble	0.023	0.032	0.035
h. Dressed ashlar	0.013	0.015	0.017

i. Dressed ashlar			
1. Cemented rubble	0.013	0.013	--
2. Dry Rubble	0.016	0.016	--
j. Vegetal lining	0.030	--	0.500
B. Excavated or Dredged			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline – excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush or banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds And brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
C. Natural Streams			
C1. Minor streams (top width at flood stage <100 ft)			
a. Stream on plain			
1. Clean, straight, full stage, no rift Or deep pools	0.025	0.030	0.033
2. Same as above, but more stones And weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds And stones	0.035	0.045	0.050
5. Same as above, lower stages, more Ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, Or floodways with heavy stand Of timber and underbrush	0.075	0.100	0.0150

b. Mountain streams, no vegetation in Channel, banks usually steep, trees and Brush along banks submerged at high Stages			
1. Bottom: gravels, cobbles, and few Boulders	0.030	0.040	0.050
2. Bottom: cobbles with large boulders	0.040	0.050	0.070
C2. Floodplains			
a. Pasture, no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature fields crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.0070	0.100	0.160
d. Trees			
1. Dense willows, summer, straight	0.110	0.150	0.200
2. Cleared land with tree stumps	0.030	0.040	0.050
3. Same as above, but with heavy Growth of sprouts	0.050	0.060	0.080
4. heavy stand of timber, a few down trees, little undergrowth, flood Stage below branches	0.080	0.100	0.120
5. Same as above, but with flood stage Reaching branches	0.100	0.120	0.160
C3. Major streams (top width at flood stage >100 ft). Then value is less than that For minor streams of similar description Because banks offer less effective Resistance			
a. Regular section with no boulders Or brush	0.025	--	0.060
b. Irregular and rough section	0.035	--	0.100

Source: [Open-Channel Hydraulics by Ven Te Chow, 1959.](#)

TABLE 3-2
COMPUTATION OF COMPOSITE ROUGHNESS COEFFICIENT
FOR EXCAVATED AND NATURAL CHANNELS
 $n = (n_0 + n_1 + n_3 + n_4) m$

	Channel Conditions	Value
Material Involved n_0	Earth	0.020
	Rock	0.025
	Fine Gravel	0.024
	Coarse Gravel	0.028
Degree of Irregularity n_1	Smooth	0.000
	Minor	0.005
	Moderate	0.010
	Severe	0.020
Variation of Channel Cross-Section n_2	Gradual	0.000
	Alternating	0.005
	Occasionally	
	Alternating Frequently	0.010-0.015
Relative Effect of Obstructions n_3	Negligible	0.000
	Minor	0.010-0.015
	Appreciable	0.020-0.030
	Severe	0.040-0.060
Vegetation n_4	Low	0.005-0.010
	Medium	0.010-0.025
	High	0.025-0.050
	Very High	0.050-0.100
Degree of Meandering m	Minor	1.000
	Appreciable	1.150
	Severe	1.300

Source: [Open-Channel Hydraulics by Ven Te Chow \(1959\).](#)

A. Design of Storm Sewers:

1. Design Frequency

a. Newly Developed Areas

The design storm event for sizing storm sewers in newly developing areas will be a 5-year rainfall. Detention shall be provided and in accordance with drainage district standards. Calculations shall show that water surface elevations are not increased upstream and downstream of the development.

b. Redevelopment or In-fill Development

The existing storm drain will be evaluated using a 5-year storm, assuming no development takes place. The storm drains will be evaluated with the development in place.

(1) If the proposed redevelopment has a lower or equal impervious cover, no modifications to the existing storm drain are required.

(2) If the impervious cover is increased, detention shall be provided to prevent a change in runoff or water surface elevations. The detention required shall be based on a ratio of pre-development to post development imperviousness.

c. Private Drainage Systems

Storm sewers for private drainage systems should conform to the City of Alvin Standards for public drainage systems.

2. Velocity Considerations:

a. All storm drains shall be designed by the application of the Continuity Equation and Manning's Equation.

b. Design velocities shall be a minimum of 3 feet per second with the pipe flowing full.

c. Maximum velocities should not exceed 9 (or as approved by City Engineer) feet per second.

d. Minimum Storm Sewer Pipe Slopes

<u>Pipe Diameter</u>	<u>% Slope</u>
24	0.18
30	0.13
36	0.10
42	0.08
48	0.07
54	0.06
60	0.05

For pipe sizes not listed above, the minimum slope should be determined utilizing a design velocity of 3 fps.

3. Pipe Sizes and Placement:

a. Use the storm sewer and inlet leads with at least 18-inch inside diameter or equivalent cross section. Box culverts shall be at least 2 feet x 2 feet. Closed

- conduits; circular, elliptical, or box, shall be selected based on hydraulic principals and economy of size and shape.
- b. Larger pipes upstream should not flow into smaller pipes downstream unless construction constraints prohibit the use of a larger pipe downstream, or the improvements are out falling into an existing system, or the upstream system is intended for use in detention.
 - c. Match crowns of pipe at any size change unless severe depth constraints prohibit.
 - d. Locate public storm sewers in public street rights-of-way or in parallel and adjoining easements or in approved easements. Side and back lot easements for storm sewers will require an exception to City design standards; however, if approved, the easement must be at least 15 feet wide with the storm sewer centered in the easement. Side and back lot easements are discouraged.
 - e. Follow the alignment of the right-of-way or easement when designing cast in place concrete storm sewer easements.
 - f. A straight line shall be used for inlet leads and storm sewers.
 - g. Center culverts in side lot storm sewer easements.
 - h. Provide 4' minimum from edge of pipe to edge of easement.
4. Starting Water Surface and Hydraulic Gradient:
- a. The hydraulic gradient shall be calculated assuming the top of the outfall pipe as the starting water surface.
 - b. At drops in pipe invert, should the upstream pipe be higher than the hydraulic grade line, then the hydraulic grade line shall be recalculated assuming the starting water surface to be at the top of pipe at that point.
 - c. For the design storm, the hydraulic gradient shall at all times be below the gutter line for all newly developed areas.
5. Manhole Locations:
- Use manholes for pre-cast conduits at the following locations:
- (1) Size or cross section changes.
 - (2) Inlet lead and conduit intersections.
 - (3) Changes in pipe grade.
 - (4) A maximum spacing of 500 feet measured along the conduit run.
 - (5) Manholes shall be placed so as not to be located in the driveway area.
6. Inlets:
- a. Locate inlets at all low points in gutter.
 - b. Valley gutters across intersections are not permitted.
 - c. Inlet spacing is generally a function of gutter slope. For minimum gutter slopes, the maximum spacing of inlets shall result from a gutter run of 350 feet from high point in pavement or the adjacent inlet on a continuously graded street section, with a maximum of 700 feet of pavement draining towards any one inlet location.
 - d. Use only Standard Inlets:

Inlet	Application	Capacity
Type A	Parking Lots/Small Areas	2.5 cfs
Type B-B (single)	Residential	5.0 cfs
Type B-B (double)	Residential	9.0 cfs
Type D-1	Parking Lots	2.0 cfs
Type E	Roadside ditches	20.0 cfs
Type H (single)	Residential / Commercial	5.0 cfs
Type H-2 (double)	Residential / Commercial	9.0 cfs

- e. Do not use grate top inlets in unlined roadside ditch.
- f. Place inlets at the end of the proposed pavement, if drainage will enter or leave pavement.
- g. Do not locate inlets adjacent to esplanade openings.
- h. Place inlets on side streets intersecting major streets, unless special conditions warrant otherwise.

C. Consideration of Overland Flow:

1. Design Frequency. The design frequency for consideration of overland sheet flow will consider extreme storm events, which exceed the capacity of the underground storm sewer system resulting in ponding and overland sheet flow through the development to the primary outlet.
2. Relationship of Structure to Street. All structures will be higher than the highest level of ponding anticipated resulting from the 100 year event analysis where water will exceed six inches above the top of curb, minimum finish floor elevation with a six inch freeboard shall be shown on the final plat.
3. The development should not impede the natural flow of the site. Any fill brought in will not alter the natural flow of the site nor the adjacent sites unless alternate conduits are provided to compensate. In addition, any fill brought into the 100-year flood plain must be mitigated on a one to one basis on-site.
4. Calculation of Flow:
 - a. Streets will be designed so that consecutive high points in the street will provide for a gravity flow of drainage to the ultimate outlet.
 - b. Maximum depth of ponding shall be such as to allow vehicular traffic to proceed without hindrance. On 4-lane roads it is permissible to design the roadway for one lane to be flooded on the 5-year storm and 25-year WSEL on the outfall. On 2-lane roads the hydraulic gradeline will not exceed the gutter elevation on the 5-year storm and 25-year WSEL on the outfall.
 - c. Sheet flow between lots can be provided only through a defined drainage easement.

- d. A map shall be provided to delineate extreme event flow direction through a proposed development and how this flow is discharged to the primary drainage outlet.
- e. In areas where ponding occurs and no sheet flow path exists, then a calculation showing that run-off from the 100-year event can be conveyed and remain in compliance with the other terms of this paragraph must be provided.

D. Design of Open Channels:

- 1. Design Frequency
 - a. Open channels shall be designed according to methods described in the C&R 3 or DD4 Criteria Manuals for their respective areas.
 - b. Design standards for channel construction should follow the requirements specified in the Criteria Manuals.
- 2. Determination of Water Surface Elevation:
 - a. Water surface elevations shall be calculated using Manning's Equation and the Continuity equation.
 - b. For the design storm event, the water surface should be calculated to remain within banks.
- 3. Design of Culverts:
 - a. Head losses in culverts shall conform to TxDOT Bridge Division Hydraulics Manual, Chapter 4 - Culverts.
 - b. Culverts shall be Class III RCP conforming to ASTM C-76 or smooth interior wall corrugated polyethylene pipe conforming to AASHTO M252.
- 4. Channels shall be seeded or sodded and a grass stand obtained prior to project approval.

E. Design of Roadside Ditches:

- 1. Design Frequency
 - a. Roadside ditch design is permissible only for single-family residential lots having widths larger than, or equal to, 120 feet.
 - b. Design capacity for a roadside ditch shall be to 0.5 feet below the edge of pavement or the natural ground at the right-of-way line, whichever is lower (for the 5-year design frequency).
 - c. The design must include an extreme event analysis to indicate that structures will not be flooded. The use of FEMA FIRM maps is permissible for this analysis. Structures (i.e. manhole tops) shall be placed 18" above natural ground if located within 100-year flood plain.
- 2. Velocity Considerations
 - a. A grass lined or unimproved roadside ditch shall have side slopes no steeper than three horizontal to one vertical.
 - b. Minimum grades for roadside ditches shall be 0.1-foot per 100-foot.
 - c. Calculation of velocity will use a Manning's roughness coefficient from the tables 3-1 and 3-2.
 - d. Use erosion control methods acceptable to the City when design velocities are

expected to be greater than 9 feet per second. This requirement will be lower on a case by case basis depending upon whether the pipe discharges into a earthen ditch where soil conditions dictate smaller values (5 feet per second).

3. Culverts:
 - a. Culverts will be placed at all driveway and roadway crossings, and other locations where appropriate.
 - b. Culverts will be designed assuming outlet control unless specified as inlet control by the City Engineer.
 - c. Roadside culverts are to be sized based on drainage area. Calculations are to be provided for each block based on drainage design criteria presented in this manual.
 - d. Cross open channels with roadside culverts no smaller than 15 inches in diameter or equivalent. The size of culvert used shall not create a head loss of more than 0.20 feet greater than the normal water surface profile without the culvert. The design frequency on roadside ditch design is the 5-year.

4. Depth and Size Limitations:
 - a. All roadside ditches shall be fully contained in the right of way or a recorded drainage easement.
 - b. Ditches in adjoining and parallel easements shall have the top of bank not less than 2 feet from the outside easement line.
 - c. Roadside ditch bottoms should be at least 2 feet wide.
 - d. Roadside ditch side slopes shall not exceed 3 horizontal to 1 vertical.

F. Storm Water Detention:

1. Application of Detention
 - a. As a normal consideration, storm water detention is required. The use of on-site detention is required in order to mitigate potential damage to existing structures unless participation in regional detention facilities is available (and the project qualifies as a small project as per the definition in Section 5.04) that will provide equivalent protection to downstream property owners.

 - b. Design calculations for sizing the detention basin and related structures must be performed by the applicable method described in the following sections.

 - c. All calculations shall be sealed and signed by a registered professional engineer.

 - d. A parking lot may be used as part of the detention system, provided that the maximum depth of water over the inlet does not exceed nine (9") inches and the maximum depth in the parking stall does not exceed six (6") inches.

 - e. All detention basins shall be maintained by the property owners and/or

Homeowners Association (except regional detention facilities that are owned and operated by the City of Alvin, C&R No. 3 or DD4).

2. Calculation of Detention Volume:

a. For developments located within the City of Alvin and its ETJ, a detailed hydrologic analysis utilizing accepted engineering design methods will be required. Acceptable methods to determine detention volume requirements for developments less than 250 acres in size include the Small Watershed Method, Triangular Hydrograph, or Empirical Formula. Detention volumes resulting from this analysis along with the size of the outlet pipe required to pass the maximum allowable release rate must ensure compliance with the City and County Drainage Policy of not increasing water levels due to runoff above pre-development values during the 5-, 25-, or 100-year storm (whichever is applicable). For projects less than 2 acres in size the Modified Rational Method may be used. For projects less than 10 acres, a storage coefficient of 0.45 acre-feet per acre may be used. This coefficient multiplied by the acreage will yield the total detention volume required.

The size of the outlet pipe that is required to pass the maximum allowable release rate of pre-development conditions during the 5-, 25- or 100-year storm (whichever is applicable) is to be computed assuming outlet control by establishing a maximum ponding level in the detention facility during the 100-year storm and assuming a tailwater at the top of the downstream end of the outlet pipe or at a depth in the outlet channel associated with the maximum release flow rate, whichever is higher.

For drainage areas over 250 acres a detailed hydrologic analysis utilizing the HEC-1 Flood Hydrograph Method will be required. A preliminary engineering report will be required to detail all design assumptions and parameters.

For design requiring FEMA approval appropriate modeling must be provided. The City Engineer, as the designated flood plain administrator, will decide the appropriate technique required in flood plain situations and requiring FEMA submittal. In most cases the concept of compensating volumes will suffice.

- b. In addition to a pipe outlet, the detention basin should be provided with a gravity spillway that will protect structures from flooding should the detention basin be overtopped.
- c. The design of the detention pond depth will be contingent on an established

water table delineation showing that the bottom portion of the pond will not hold water due to water surface elevation. Wet sand areas should not be included in the volumetric calculations. A site-specific geotechnical report is required.

3. Detention Pond Structural Requirements:
 - a. Side slopes shall not exceed a slope of four (4) horizontally to one (1) vertically.
 - b. Ponds with lengths over 50 feet shall have a concrete pilot channel.
 - c. Concrete pilot channels shall have a minimum width of the inside diameter of the pipe plus 2 feet and a minimum thickness of 4 inches with #3 rebar spaced at 12 inches on center each way. The concrete channels shall be constructed of 5 sack cement concrete with a compressive strength of 2500 psi at 28 days. Provide a 2-inch minimum depression per every 1 foot of transverse slope with redwood headers spaced every 40 feet.
 - d. Appropriate covering (grass, slope paving, etc.) shall be established on side slopes and pond bottom to prevent erosion during periods of maximum water velocity
 - e. A concrete spillway, set at the maximum ponding elevation, shall be provided at the detention pond outfall structure.
 - f. A minimum of 20 feet shall be provided between the top of the berm and any adjacent property line.
 - g. Outfalls which utilize a pipe restrictor to control outflow shall use the orifice equation to compute the allowable opening as follows:

$$Q = CA(2gH)^{1/2}$$

$$D = Q^{1/2}/2.25h^{-1/4}$$

Where: Q = Allowable outflow (cfs)
C = Pipe coefficient (use 0.8)
A = Pipe cross sectional area (ft²)
g = Acceleration due to gravity (32.2 ft/s²)
H = Head differential
D = orifice diameter
h = water surface differential in feet

For head differential use 2' or 100 year water surface in the pond minus the 25 year water surface in the receiving channel, if available. If discharging to a roadside ditch or storm sewer use 1'.

Restrictor pipes shall be a minimum 4' in length and not less than 6" in diameter.

The outfall structure for ponds discharging into existing storm sewers shall be designed for the 5-year undeveloped discharge and roadside ditch discharge shall be designed for the 5-year undeveloped discharge. In each case, an overflow swale with the outfall grade set at the 100-year flood storage level will be required.

- h. Outlet structure to include "emergency conduit/spillway" to convey water to outfall in the event water exceeds 1' freeboard from top of pond. This is to

- prevent the flooding of adjacent properties.
 - i. Maximum water level in detention structure shall not exceed level of lowest point of the adjacent properties.
 - j. Detention ponds less than one acre in size shall have at least four inches minimum freeboard. All ponds over one acre in size shall have at least one foot minimum freeboard.
 - k. A geotechnical report will be required for all detention facilities greater than 5' in depth.
4. Ownership and Easements:
- a. Private Facilities
 - (1) Pump detention facilities will be considered on a case by case basis and must meet the following criteria: 1.) The proposed development shall consist of at least 20-acres for residential and 5-acres for commercial development. 2.) At least 2 pumps must be provided with each pump sized to pump the 5-year undeveloped flow rate. 3.) The system shall be designed to gravity flow to the depth of the receiving outfall. The pumps shall be activated only after the water levels have receded to below the flow line of the receiving outfall. 4.) Evidence must be provided of an ongoing maintenance provision such as a maintenance contract or an employee responsible for monitoring and long term maintenance. 5.) The pumps shall be placed in concrete wet well. The control panel shall be waterproof and control shall be provided via float switches. The pump station shall have all weather access for pump maintenance.
 - (2) Responsibility for maintenance of the detention facility must be indicated on the plat or construction plans.
 - (3) All private properties being served shall have drainage access to the pond.
 - (3) A private recorded maintenance agreement with a specific responsible party shall be provided when multiple tracts are being served.
 - b. Public Facilities:
 - (1) Facilities will only be accepted for maintenance by the City in cases where public regional drainage is being provided.
 - (2) The City will require a maintenance work area 20-foot wide surrounding the extent of the detention area. Public rights-of-way or permanent access easements may be included as a portion of this 20-foot width.
 - (3) A dedication of easement or reserve must be provided by plat.
 - (4) Proper dedication of public access to the detention pond must be shown on the plat or by separate instrument. This includes permanent access easements with overlapping public utility easements.

G. Erosion Control:

The developer shall install erosion control to prevent site from degrading streets, detention facility and drainage ways.

5.06 OFF-SITE DETENTION

Off-site detention facilities will generally be regional in nature. The facility will not be sized for one development, but will be designed to serve the entire watershed by reducing

the flood potential of a stream. Most of these facilities are envisioned to be adjacent to a channel to receive flood water from the main drainage artery through a system of multistage inlet pipes and high level weirs.

For the design of an off-site detention basin, the hydraulics of the stream and flood damage relationship of the watershed must be evaluated. This will be performed under the direction and advice of the City Engineer. This evaluation will result in flood frequency/stage-damage estimates of the stream.

Sizing of the multistage inlets will be based on a plan that will be most beneficial to the downstream community. Side flow diversions will also be developed and evaluated by iterations to evaluate the impact of the diversion on the downstream hydrographs. The arrangement of pipes/weirs shall be designed to minimize property damages due to the different storms within the entire area served by detention. The City Engineer will advise the design engineer in regards to specific design configurations.

Off-site facilities will be designed using HEC-1 modeling. The 5-, 25- and 100-year will be performed. Input from the City Engineer is recommended to determine the most appropriate level to set diversion structures for watershed-wide flood damage mitigation. These facilities will generally be located along a FEMA studied stream with adequate HEC-1 and HEC-2 models available for analysis. Diversion weirs may be sized and analyzed using the HEC-2 split flow routine. Routing of the inflow 5-, 25- and 100-year hydrographs through the detention basin may also be performed using a computer model such as ICPR or other detention reservoir models approved by the City Engineer. Set tailwater level in the receiving stream equal to the top of the outfall pipe, unless specific tailwater conditions prevail.

5.07 SUBMITTALS

- A. Preliminary Submittals- Submit for Review and Comment
 - 1. One line drawings are recommended and may be required as part of the platting process. One line drawings should include:
 - a. Approximate definition of lots and street patterns.
 - b. The approximate drainage areas for each system.
 - c. A definition of the proposed drainage system by single line.
 - d. The proposed pipe diameters.
 - e. Proposed detention areas with approximate volumes and depths
 - f. Any proposed drainage easements.
 - g. Floodplain boundary, if any.

- B. Final Design - Submit the Following for Approval.
 - 1. Copies of any documents, which show approval of exceptions to the City, design criteria.
 - 2. Design calculations for storm line sizes and grades, and for detention facilities.
 - 3. The storm water release rate for the 100-year event for proposed developments will not increase over existing conditions. Calculations detailing this will be shown. Note: The City Engineer will reserve the right to determine release rate depending on the design of the system the development is discharging into.
 - 4. Contour map of the project and drainage area map for the project and the upstream.

5. Plan and profile sheets showing storm water design
 6. Projects located within a Flood Plain boundary or within a Flood Plain Management area shall:
 - a. Show the Flood Plain boundary or Flood Plain area, as appropriate, on the one-line drawing or drainage area map.
 7. Copy of geotechnical report.
- C. Signature States - Submit the Following for Approval.
1. Review prints.
 2. Original drawings.
 3. Storm water detention maintenance agreement letters.

5.08 QUALITY ASSURANCE

- A. Prepare calculations and construction drawings under the supervision of a Professional Engineer trained and licensed under the disciplines required by the drawings. The final construction drawings and all design calculations must be sealed, signed, and dated by the Professional Engineer responsible for the development of the drawings. Drawings shall contain the following statement “Based on these plans and calculations and minimum building elevations prepared under my direction no structure will be subject to flooding in the 100-year storm and the upstream and downstream water surface elevations will not be increased.”

PART 2 EXECUTION

5.01 DESIGN ANALYSIS

- A. All projects shall be tied to National Geodetic Survey (NGS) Datum adjustment, which matches the Federal Emergency Management Agency (FEMA) rate maps or the most current NGVD, which matches the FEMA rate maps. In the event GPS surveying is used to establish bench marks, at least two references to bench marks relating to the FEMA rate maps must be identified. Equations may be used to translate other datum adjustments to the required adjustment.
- B. Plan sets will include a drainage area map, which shall contain all storm sewer drainage calculations as determined by the Rational Method.
- C. All drainage systems for curb and gutter pavements shall be underground closed conduits; individual residential lot drainage is exempt. Drainage systems for pavements without curb and gutter shall be roadside open-ditch sections.
- D. The storm water release rate for the 100-year event for proposed developments will not increase over existing conditions. Calculations detailing this will be shown (see note sheet 14).

SECTION VI
SITE PLANS AND
ADDITIONAL SUBDIVISION DESIGN
REQUIREMENTS

SECTION VI
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ADDITIONAL SUBDIVISION DESIGN REQUIREMENTS

6.0 DESIGN REQUIREMENTS

A. Site Plan Requirements

1. General Requirements
 - a. The City, prior to construction shall approve site plans for all site developments within the City of Alvin.
 - b. All site developments shall conform to the requirements of the adopted, current building codes in force at the time, and all other applicable rules and regulations of the City of Alvin.
 - c. All wastewater, drainage and paving site development improvements shall be privately owned, operated and maintained up to and including the connection to the public system. All water site development improvements shall be privately owned, operated and maintained up to, but not including, the meter and meter vault.
2. Building Slab Elevations- Minimum building slab elevations shall conform to the Federal Emergency Management Administration official Flood Plain map.
3. Water Service - Water service lines and meters shall be sized in accordance with requirements set out in the Waterline Distribution System Design Requirements.
4. Sanitary Sewer Service - Sanitary sewer service leads are normally installed during construction of the public sanitary sewer. When a sanitary sewer service lead is to be installed for a site development, refer to the Wastewater Collection System Design Requirements. All lots, tracts, or reserves shall be connected directly to a public sanitary sewer by a single lead, except as specifically approved by the City. The city shall be contacted for all sanitary sewer connections for commercial projects within the City.
5. Site Drainage Requirements - All commercial, industrial, office, recreational, and multi-family tracts shall have an internal drainage system. The internal (wholly within the confines of the property, to include both above- and/or underground), drainage system shall connect all site runoff into a storm sewer system that shall connect to the public drainage facilities in the area, except with specific approval.
 - a. The internal site storm sewer shall be connected to a public storm sewer and a manhole or at an inlet adjoining the site. The site drainage outfall shall be connected to the nearest existing drainage system with adequate capacity to serve the drainage area. Where extension of the existing drainage system is required, all costs for extension shall be the responsibility of the development.
 - b. All internal facilities shall be designed by a registered professional engineer and shall be sized to drain the site in accordance with these standards.
 - c. Drainage calculations shall be submitted with all site plans. Other supporting data may be required by the City.

- d. When the site drains directly into a facility of a public entity and/or into a highway right-of-way, the appropriate governmental entity (entities) shall approve the site development connection to public facilities.
6. Sidewalk, Driveways and Driveway Approaches Requirements -
- a. Sidewalks shall be provided for all developments. Concrete sidewalks (4 feet wide and 4 inches thick with steel reinforcement) shall be required along all street frontages.
 - b. Single family residential driveway approaches should be a minimum of 12 feet, not to exceed 24 feet, in width at the right-of-way line.
 - c. Non-residential driveway approaches shall be 25 feet to 35 feet wide. Non-residential driveway approaches shall be spaced with a minimum of 75 feet separation.
 - d. Non-residential driveway approaches on major thoroughfares/boulevard streets shall be placed no closer than 125 feet from the ultimate curb line of an intersecting major thoroughfare or boulevard street. Non-residential driveway approaches on collector/commercial/minor streets are to be placed no closer than 75 feet from the ultimate curb line of an intersecting major thoroughfare/boulevard street. Non-residential driveway approaches on major thoroughfares/boulevard streets are to be placed no closer than 75 feet from the ultimate curb line of an intersecting collector/commercial/minor street. For purposes of determining the separation distance, the back of curb or edge of street shall be used in conjunction with the edge of driveway approach which is closest and parallel to the street.
 - e. Commercial tracts with 95 feet or less of frontage on a public street shall have no more than 1 driveway and driveway approach. Commercial tracts with between 96 and 320 feet of frontage on a public street shall have no more than 2 driveways and driveway approaches. Commercial tracts with between 321 feet and 600 feet of frontage on a public street shall have no more than 3 driveways and driveway approaches. Commercial tracts with over 600 feet of frontage on a public street shall have driveways and approaches specially designed and specifically approved by the City.
 - f. Non-residential driveway connections/approaches to the public street shall be approved and inspected by the City of Alvin.
 - g. Driveway approach radii shall not extend beyond the projection of a property corner to the back of the curb.
 - h. Driveway approaches shall be evaluated with respect to signage, landscaping and structures for adequate sight distance.
 Driveways approaches shall be constructed using an all-weather surface (concrete or asphalt). Driveways shall be constructed using an all-weather surface which may include brick pavers.
 A note stating that "Access to adjacent property and common driveway may be required," when appropriate, shall be placed on the site plan.
 Driveway approaches shall be installed according to the City of Alvin Construction Details.

7. Fire Apparatus Roads

- a. Fire apparatus access roads shall be created on all multi-family and non-residential tracts. All fire apparatus access roads must have access to public roadways and shall be located so that no part of a building is further than 75 feet from either a fire apparatus access road or a public street right-of-way.
- b. Fire apparatus access roads shall be at least 20 feet wide for buildings or structures of 4,999 square feet or less, and at least 28 feet wide for buildings or structures of 5,000 square feet or greater.
- c. Width and turnaround specifications for new construction of fire apparatus access roads in excess of 150 feet in length, shall be in accordance with Alvin Code and Ordinances and approved by the Fire Marshal.
- d. Fire apparatus access roads shall be constructed using the same pavement structural requirements as a public pavement. Alternate material may be used with specific approval from the Fire Marshal.
- e. Fire apparatus access roads shall be designed to drain in compliance with the Site Development Requirements.
- f. All fire apparatus access roads shall be marked as fire lanes as specified in the Alvin Code of Ordinances.

8. Dumpster Requirements for Commercial Only

- a. Dumpsters are required for all multi-family dwellings and commercial properties,
- b. Access drive and pad for the dumpster must be concrete 6-inches thick reinforced with number 4 rebar at eighteen (18) inches center to center.
- c. The dumpster shall be screened with wood fencing at least six (6) feet tall;
- d. On major thoroughfares, the dumpster shall be placed at the rear of the property.

Reference Solid Waste Collection & Disposal Section 11-12.