

CITY OF DECATUR, TEXAS

DESIGN STANDARDS



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CHAPTER 1 DESIGN CRITERIA

SECTION 101 GENERAL

101.1 Intended Use. The following Design Criteria are primarily intended for use by the Developer's Engineer. There may be special circumstances which would dictate requirements in excess of those outlined; however, in most cases, these exceptions will be apparent to the Developer's Engineer while preparing the Construction Plans and Specifications for the subdivision.

101.2 Maintenance. These criteria and related standards shall be maintained, modified and kept current by the City Engineer and/or Planning Director.

101.3 Related Standards. The latest version of *Standard Specifications for Public Works Construction, North Central Texas* of the North Central Texas Council of Governments, with all amendments thereto, shall govern and shall constitute the technical specifications except as amended by the Decatur Construction Standards and is made a part thereof, but is not physically bound within this document.

101.4 Compliance Required. All subdivision, development and new construction shall comply with all related City Ordinances, including, but not limited to, the *Subdivision Ordinance* and *Zoning Ordinance*.

101.5 Conformance Required. The City Council and the City or its representatives shall approve no final plat, shall accept no completed improvements, shall issue no permits or rights to occupy unless and until such improvements conform to these standards herein listed and all other applicable standards as prescribed by the City of Decatur.

All improvements, including, but not limited to, streets, alleys, sidewalks, drainage ways, water and sanitary sewer lines, landscaping, buffering and green space, shall be designed, placed and constructed in accordance with the following *Design Criteria and Construction Standards*.

101.6 Flood Areas. Any land which in its natural state is subject to a 100-year flood or which cannot be properly drained shall not be subdivided, re-subdivided or developed until receipt of evidence that the construction of specific improvements proposed by the Developer can be expected to yield a usable building site. Thereafter, the Planning and Zoning Commission may recommend approval of the plat; however, construction upon such land shall be prohibited until the specific improvements have been planned and completed.

101.7 Variances. Where specific topographic or other conditions make variance from these standards necessary in

order to achieve the best overall design, the Planning Director upon recommendation from the City Engineer and Public Works Director may modify these standards.

101.8 Special Exceptions. Where the appropriate use of the neighboring property will not be substantially injured, the Planning Director, after consultation with the City Engineer, may in specific cases, and subject to appropriate conditions and safeguards, authorize special exceptions to the Design Criteria items in order to permit reasonable development and improvement of property where literal enforcement of these values would result in an unnecessary hardship.

SECTION 102 BLOCKS

102.1 Length. The length of a block shall be considered to be the distance from property corner to property corner measured along the property line of the block face (1) of greatest distance, or (2) on which the greatest number of lots face.

Where no existing subdivision controls, the block length should not be less than five hundred (500) feet in length nor greater than one thousand six hundred (1,600) feet in length. However, in cases where physical barriers, property ownership, or individual usage creates conditions where it is appropriate that these standards be varied, the length may be increased or decreased to meet existing conditions, having due regard for connecting streets, circulation of traffic and public safety.

102.2 Width. The width of a block shall be considered to be the distance from property corner to property corner measured along the property line of the block face (1) of least dimension, or (2) on which the fewest number of lots face.

102.3 Shape Criteria. The length, width and shapes of blocks shall be determined with due regard to:

1. Provision of adequate building sites suitable to the special needs of the type of use contemplated, and
2. Zoning requirements as to lot sizes and dimensions, and
3. Needs for convenient access, circulation, control and safety of street traffic, and
4. Limitations and opportunities of topography.

102.4 Streets. Intersecting streets should be provided at such intervals as to serve traffic adequately and to meet existing streets in a safe manner as determined by the City.



102.5 Walkway Required. Where long blocks in the vicinity of a school, park or shopping center are platted, the City may require a public walkway near the middle of long blocks or opposite a street that terminates between the streets at the ends of the block. If required, the concrete walkway shall not be less than four (4) feet nor more than eight (8) feet in width, through the block from sidewalk to sidewalk, or curb to curb, or if no street, to the property line adjacent to the school, park, or shopping center.

SECTION 103 LOTS

103.1 Design. Lot design shall provide adequate width, depth, and shape to provide open area, to eliminate overcrowding and to be appropriate for the location of the subdivision for the type of development and use contemplated and in accordance with the *Zoning Ordinance* of the City of Decatur.

103.2 Width. No lot shall have less width at the building line than is required by the *Zoning Ordinance*.

103.3 Building Lines. Building lines shall be shown on all lots in the subdivision but shall not be less restrictive than the *Zoning Ordinance*.

103.4 Side Lines. All side lines of lots shall be at approximately right angles to straight street lines and radial to curved street lines, except where a variation to this rule will provide a better street and lot layout.

103.5 Front Yard. The shorter dimension across a residential lot, adjacent to a street, shall designate the front yard orientation of the lot, unless otherwise specified on the face of the plat.

103.6 Adequate Size. Depth and width of properties reserved or laid out for commercial 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.

103.7 Frontage. Every lot shall have frontage on, and access to, a public street.

103.8 Double Frontage. Double frontage and reverse frontage lots should be avoided except where essential to provide separation of residential development from traffic arteries or to overcome specific disadvantages of topography and orientation.

103.9 Access Limits. Residential lots shall not have direct access onto thoroughfare streets, and direct access from residential lots shall be permitted on collector streets only where design conditions do not permit any other possibility.

103.10 Large Lots. Where the area is divided into larger lots than for normal urban building sites, and in the opinion of the City, any or all of the tracts are susceptible of being re-subdivided, the original subdivision shall be such that the alignment of future street dedications may conform to the general street layout in the surrounding area so that the larger tracts may be later subdivided in conformance with the requirements of this Ordinance and the minimum standards specified by the *Zoning Ordinance*.

103.11 Markers. Lot markers shall be iron pins not less than one half inch (1/2") in diameter and no less than eighteen inches (18") long and shall be set flush with the ground at each lot corner.

103.12 Corners. All lot corners shall be set prior to the acceptance of the public improvements and shall be marked in a way that is traceable to the responsible registrant or associated employer.

103.13 Control Monuments. A minimum of two (2) 4" x 4" x 18" concrete monuments with 1/2" x 18" reinforcing rebar may be required to be placed in easily accessible locations, such as street intersections or point of curvatures and may be required to be placed below back of curb for monument protection.

SECTION 104 EASEMENTS

104.1 Utility Easements. Utility easements shall be provided on subdivision plats when the following criteria indicate that an easement is required:

1. Where not adjacent to a public right-of-way, easements at least fifteen (15) feet wide for utility construction, service and maintenance shall be provided where necessary in locations approved by the City, and
2. Easements at least fifteen (15) feet wide for utility construction, service and maintenance shall be provided for lots which have frontage along state highways, and
3. Easements of at least ten (10) feet in width shall be provided on each side of all rear lot lines and along side lot lines, where necessary, for utilities such as electric, telephone and gas, and
4. Easements having greater width dimensions may also be required along or across lots where engineering design or special conditions make it necessary for the installation of utilities outside public right-of-ways.

The following statement of restrictions shall be placed in the dedication instrument:



UTILITY EASEMENT RESTRICTION:

Any public utility, including the City of Decatur, shall have the right to remove all or part of any building, fences, trees, shrubs, other growths or improvements which in any way endanger or interfere with the construction, maintenance, or efficiency of its respective systems on any of the easements shown on the plat; and any public utility, including the City of Decatur, shall have the right at all times of ingress and egress to and from and upon said easements for the purpose of construction, reconstruction, inspection, patrolling, maintaining and adding to or removing all or part of its respective systems without the necessity at any time of procuring the permission of anyone.

104.2 Fire Lane Easement. Emergency access and fire lane easements shall be provided in locations required by the Fire Marshal of the Decatur Fire Department. These easements shall have a minimum width of twenty (20) feet [twenty-four (24) feet when parking is located on both sides of the easement] and a minimum height clearance of fourteen (14) feet. Any emergency access and fire lane easement more than one hundred (100) feet in length shall either connect at each end to a dedicated public street or be provided with a cul-de-sac having a minimum diameter of eighty (80) feet with an additional distance of ten (10) feet on all sides clear of permanent structures. These easements shall be paved in accordance with these *Design Standards* and shall be maintained by means of a Home Owner's Association, the property owner granting the easement or other means as approved by the City.

104.3 Public Open Space Easement. A 15' x 15' triangular public "open space" easement is required on corner lots at the intersection of an alley and a street.

	Local	Collector	Thoroughfare
Local	1	1	2
Collector	1	2	2
Thoroughfare	2	2	3

A triangular public open space easement (POSE) is required on corner lots at the intersection of two streets in accordance with the table above:

1. Type 1 POSE = 20' x 20'
2. Type 2 POSE = 25' x 25'
3. Type 3 POSE = 45' x 45'

The following full statement of restrictions shall be placed in the dedication instrument or on the face of the plat:

PUBLIC OPEN SPACE EASEMENT RESTRICTION:

No structure, object or plant of any type may obstruct vision from a height of thirty (30) inches to a height of ten (10) feet above the top of the curb, including, but not limited to

buildings, fences, walks, signs, trees, shrubs, cars, trucks, etc., in the public open space easement as shown on the plat.

104.4 Drainage Easement. Drainage easement requirements are as follows:

1. Easements for storm drainage facilities shall be provided at locations containing proposed or existing drainageways.
2. Storm drainage easements of fifteen (15) feet minimum width shall be provided for existing and proposed enclosed drainage systems. Easements shall be centered on the systems. Larger easements, where necessary, shall be provided as directed by the City Engineer.
3. Storm drainage easements shall be provided for emergency overflow drainageways of sufficient width to contain within the easement storm water resulting from a 100-year frequency storm less the amount of storm water carried in an enclosed system of a capacity required by the City of Decatur.
4. No construction or filling without the written approval of the City of Decatur shall be allowed within a drainage easement, and then only after detailed engineering plans and studies show that no flooding will result, that no obstruction to the natural flow of water will result and subject to all owners of the property affected by such construction becoming a party to the request. Where construction is permitted, all finished floor elevations shall be a minimum of one (1) foot above the 100-year flood elevation.

The following statement of restriction shall be placed in the dedication instrument of the subdivision plat:

DRAINAGE EASEMENT RESTRICTION:

No construction or filling, without the written approval of the City of Decatur, shall be allowed within a drainage easement, and then only after detailed engineering plans and studies show that no flooding will result, that no obstruction to the natural flow of water will result; and subject to all owners of the property affected by such construction becoming a party to the request. Where construction is permitted, all finished floor elevations shall be a minimum of one (1) foot above the 100-year flood elevation.

104.5 Floodway Easement. Floodway easement requirements are as follows:

1. Floodway easements shall be provided along natural drainageways and lakes or reservoirs. Floodway easements shall encompass all areas beneath the water surface elevation of the base flood, plus such additional width as may be required to provide ingress and egress to allow



maintenance of the banks and for the protection of adjacent property as determined and required by the City Engineer.

2. Existing creeks, lakes, reservoirs or drainage channels traversing along or across portions of this addition will remain as an open channel at all times and will be maintained by the individual owners of the lot or lots that are traversed by or adjacent to the drainage courses along or across said lots.
3. The City of Decatur will not be responsible for the maintenance and operation of said drainageways or for the control of erosion.
4. Each property owner shall keep the natural drainage channels traversing or adjacent to his property clean and free of debris, silt or any substance which would result in unsanitary conditions, and the City shall have the right of ingress and egress for the purpose of inspection and supervision of maintenance work by the property owner to alleviate any undesirable conditions which may occur.

The natural drainage channel, as is the case of all natural drainage channels, are subject to storm water overflow and natural bank erosion to an extent that cannot be definitely defined. The City of Decatur shall not be liable for damages of any nature resulting from the occurrence of these natural phenomena, nor resulting from a failure of any structure(s) within the natural drainage channels. The natural drainage channel crossing each lot is shown by the floodway easement line as shown on the plat.

The following statement of restrictions shall be placed in the dedication instrument of the subdivision plat:

FLOODWAY EASEMENT RESTRICTION:

No construction, without the written approval of the City of Decatur, shall be allowed within a floodway easement, and then only after detailed engineering plans and studies show that no flooding will result, that no obstruction to the natural flow of water will result; and subject to all owners of the property affected by such construction becoming a party to the request. Where construction is permitted, all finished floor elevations shall be a minimum of one (1) foot above the 100-year flood elevation.

**SECTION 105
ALLEYS**

No alleys shall be allowed in any new development.

**SECTION 106
SIDEWALKS**

Sidewalks shall be required in all new subdivisions as follows:

1. Sidewalks shall be constructed for all lots adjoining dedicated streets, along major thoroughfares where lots do not adjoin the street, across power line easements and in other areas where pedestrian walkways are necessary.
2. Sidewalks shall be constructed in all parking areas to assure safe pedestrian access from parking spaces to structures.
3. Sidewalks shall be designed and constructed so as to assure uninterrupted connections between all pedestrian walkways.
4. Sidewalks shall be designed and constructed to minimize pedestrian and automobile conflicts in order to provide the safest pedestrian access possible.
5. Sidewalks shall be designed and constructed so as to connect with existing pedestrian walkways and to assure connection with future pedestrian walkways.
6. Sidewalks shall be constructed either one foot (1) from the property line within the street right-of-way or within a dedicated sidewalk easement and shall extend along the street frontage including the side of corner lots and block ends. Lots requiring landscaping shall put trees between the sidewalk and the street.
7. Sidewalks along existing thoroughfares or streets so designated by the *Master Plan* shall be no less than 4 feet in width.
8. Sidewalks abutting screening walls, parking areas or fences shall be 5 feet in width.
9. Sidewalk construction may be delayed until development of lots, but in locations not adjacent to lots and across bridges and culverts, the sidewalk shall be constructed with the other improvements to the subdivision.
10. Routing to clear poles, trees or other obstacles shall be subject to approval by City development staff.
11. The plat or construction plans shall show the location of all proposed sidewalks and shall state at what stage of the project they will be constructed.
12. All sidewalks shall conform to ADA requirements.
13. Barrier free ramps should be provided for access to the street. The following specifications shall apply:
 - i) Ramp to be 4 feet in width.
 - ii) Ramp to be constructed with minimum 3,000 psi 28-day strength concrete.



- iii) Ramp concrete thickness shall be the same as the street (6 inch normal residential).
- iv) No. 3 bars shall be used for reinforcement (24 inch on centers).
- v) Curb return shall match existing curb height of the street and taper to the connecting walk with a one (1) foot radius.
- vi) Street shall be blocked out (max 12 inches) and dowels installed.
- vii) Saw joints shall be made 1 ½ inch minimum depth and sealed with silicone joint sealant material.
- viii) Subgrade shall be prepared to a minimum depth of 6 inches.
- ix) At no time shall the walk running parallel to the street be altered.
- x) Surface of walk may be coarse and ribbed to provide extra traction.

**SECTION 107
LANDSCAPE DESIGN**

PURPOSE

The purpose of this section is to encourage low maintenance landscaping, water conservation and tree preservation while providing guidelines for minimum landscaping throughout the City.

SINGLE FAMILY RESIDENTIAL LANDSCAPING

These standards apply to new detached and attached single family residential developments. These standards may be met by saving existing trees on the site or planting new trees from the recommended list. Lot size designations apply to the zoning classification(s) of the subdivision rather than to each individual lot. In the case of PD developments, landscaping will be in accordance with lot sizes designated within the approved PD design.

- (a) One (1) shade tree (2.5" caliper minimum) provided for all single family residential lots less than 8,000 square feet.
- (b) Two (2) shade trees (2.5" caliper minimum) provided for all single family residential lots of 8,000 square feet to less than 10,000 square feet.
- (c) Three (3) shade trees (2.5" caliper minimum) provided for all single family residential lots of 10,000 square feet or more.

A tree survey shall be required with preliminary plats, final plats with construction plans, and with individual building

permit applications for single family residential development (new lots).

All required trees must be planted prior to request for final building inspection of dwelling units.

MULTI-FAMILY LANDSCAPING REQUIREMENTS

These standards apply to new multi-family zoning developments. *Those uses located on the square with no on-premise parking are exempt from this ordinance.* These standards may be met either by saving existing trees on the site, or planting new trees from the recommended list.

- (a) A 10-foot linear landscape strip is to be provided adjacent to all public and private streets, exclusive of right-of-way. The landscape strip will include one (1) shade tree (2.5" caliper minimum) for every 50 linear feet of street frontage.
- (b) Where parking lots and drives abut the landscape strip along a street right-of-way, a continuous hedge of evergreen shrubs will be provided to screen those areas from the street. The shrubs must be a minimum of a ten gallon size at planting with a minimum mature height of three feet. Shrubs will be planted according to the spacing recommended for their species. The screening will extend along the entire street frontage of the parking lot, exclusive of driveways and visibility clips. A landscape berm may be provided in lieu of the screening hedge. The berm must be a minimum of 36 inches above the average grade of the street and parking lot curbs with a slope not to exceed 3:1.
- (c) Landscaping will also be provided for the interior parking areas. Trees will be planted in each parking lot to attain a minimum average density of one (1) shade tree (2.5" inch caliper minimum) for each fifteen (15) parking spaces provided, or any fraction thereof. Interior parking lot landscaping will include an overall percentage of greenery, in addition trees, as outlined below.

<u>Total Parking Area</u>	<u>Interior Landscape Area</u>
0 - 24,999 square feet	5%
25,000 - 49,999 square feet	8%
50,000 square feet and larger	10%

- (d) To calculate the total parking area and the subsequent percentage of required interior lot landscaping, total the square footage of parking spaces, planting islands, curbed areas and all interior driveways and aisles. Landscaped areas located contiguous to the parking lot may be used to meet the interior landscaping requirement. Landscaped areas located outside and away from the parking lot may not be used to meet the interior landscaping requirement.
- (e) The required landscaping for parking lots shall be more or less evenly distributed throughout the parking lot, although adjustments may be approved by the Planning Director where the shape or size of the parking lot, the location of existing trees or other natural constraints reasonably prevent such distribution.



- (f) All landscaped areas, including the permeable areas and drip lines around trees and planting beds used for visual screening which abut any parking lot or vehicular travel area, shall be protected with curbs sufficient to protect them from vehicular intrusion.

An automatic irrigation system is required for all landscaping. Irrigation systems shall be designed and installed with rain sensors and low gallonage, low angle nozzles in such a way as to avoid water overflow into the street. A freeze sensor shall be placed in each controller to prevent the irrigation system from activating to create unsafe spillage on roads and/or sidewalks.

OFFICE, RETAIL & COMMERCIAL LANDSCAPING REQUIREMENTS

These standards apply to new office, retail and commercial developments. *Those uses located on the square with no on-premise parking are exempt from this ordinance.* These standards may be met either by saving existing trees on the site, or planting new trees from the recommended list.

- (a) A 10-foot linear landscape strip is to be provided adjacent to all public and private streets, exclusive of right-of-way. The landscape strip will include one (1) shade tree (2.5" caliper minimum) for every 50 linear feet of street frontage.
- (b) Where parking lots and drives abut the landscape strip along a street right-of-way, a continuous hedge of evergreen shrubs will be provided to screen those areas from the street. The shrubs must be a minimum of a ten gallon size at planting with a minimum mature height of three feet. Shrubs will be planted according to the spacing recommended for their species. The screening will extend along the entire street frontage of the parking lot, exclusive of driveways and visibility clips. A landscape berm may be provided in lieu of the screening hedge. The berm must be a minimum of 36 inches above the average grade of the street and parking lot curbs with a slope not to exceed 3:1.
- (c) Landscaping will also be provided for the interior parking areas. Trees will be planted in each parking lot to attain a minimum average density of one (1) shade tree (2.5" inch caliper minimum) for each fifteen (15) parking spaces provided, or any fraction thereof. Interior parking lot landscaping will include an overall percentage of greenery, in addition trees, as outlined below.

<u>Total Parking Area</u>	<u>Interior Landscape Area</u>
0 - 24,999 square feet	5%
25,000 - 49,999 square feet	8%
50,000 square feet and larger	10%

- (d) Except for customer and employee parking, parking lot landscape requirements do not apply to storage or standing parking spaces incidental to uses, such as sales and rental of motor vehicles, mobile homes, boats, trailers or other similar uses.

- (e) To calculate the total parking area and the subsequent percentage of required interior lot landscaping, total the square footage of parking spaces, planting islands, curbed areas and all interior driveways and aisles. Landscaped areas located contiguous to the parking lot may be used to meet the interior landscaping requirement. Landscaped areas located outside and away from the parking lot may not be used to meet the interior landscaping requirement.
- (f) The required landscaping for parking lots shall be more or less evenly distributed throughout the parking lot, although adjustments may be approved by the Planning Director where the shape or size of the parking lot, the location of existing trees or other natural constraints reasonably prevent such distribution.
- (g) All landscaped areas, including the permeable areas and drip lines around trees and planting beds used for visual screening which abut any parking lot or vehicular travel area, shall be protected with curbs sufficient to protect them from vehicular intrusion.

An automatic irrigation system is required for all landscaping. Irrigation systems shall be designed and installed with rain sensors and low gallonage, low angle nozzles in such a way as to avoid water overflow into the street. A freeze sensor shall be placed in each controller to prevent the irrigation system from activating to create unsafe spillage on roads and/or sidewalks.

INDUSTRIAL LANDSCAPING REQUIREMENTS

These standards apply to new industrial developments. *Those uses located on the square with no on-premise parking are exempt from this ordinance.* These standards may be met by saving existing trees on the site or planting new trees.

- (a) A 10-foot linear landscape strip is to be provided adjacent to all perimeter public streets, exclusive of right-of-way. The landscape strip will include one (1) shade tree (2.5" caliper minimum) for every 50 linear feet of street frontage.
- (b) Where parking lots and drives abut the landscape strip along a street right-of-way, a continuous hedge of evergreen shrubs will be provided to screen those areas from the street. The shrubs must be a minimum of three feet in height at maturity and planted according to the spacing shown below. The screening will extend along the entire street frontage of the parking lot, exclusive of driveways and visibility clips. A landscape berm may be provided in lieu of the screening hedge. The berm must be a minimum of 36 inches above the average grade of the street and parking lot curbs with a slope not to exceed 3:1.
- (c) Landscaping will also be provided for the interior employee and customer parking areas. Trees will be planted in each parking area to attain a minimum average density of one (1) shade tree (2.5" inch caliper minimum) for each twenty five (25) parking spaces provided, or any fraction thereof. Interior parking lot landscaping will



include an overall percentage of greenery, in addition trees, resulting in 100 square feet per provided tree.

- (d) The required landscaping for parking lots shall be more or less evenly distributed throughout the parking lot, although adjustments may be approved by the Planning Director where the shape or size of the parking lot, the location of existing trees or other natural constraints reasonably prevent such distribution.
- (e) All landscaped areas, including the permeable areas and drip lines around trees and planting beds used for visual screening which abut any parking lot or vehicular travel area, shall be protected with curbs sufficient to protect them from vehicular intrusion.

An automatic irrigation system is required for all landscaping. Irrigation systems shall be designed and installed with low gallonage and low angle nozzles in such a way as to avoid water overflow into the street. A freeze sensor shall be placed in each controller to prevent the irrigation system from activating to create unsafe spillage on roads and/or sidewalks.

GENERAL PROVISIONS

Clear cutting of trees is prohibited within the City of Decatur. Cutting of trees, grading and land clearing may be done, only for development purposes, in accordance with an approved final plat with the construction plans and/or engineering site plan. Cutting trees and land clearing for other than development purposes shall be considered on a case-by-case basis by the Director of Planning. The existing natural landscape character of the city shall be preserved to the extent reasonable and feasible. In an area of the street frontage containing a stand of recommended trees, the developer shall use best good faith efforts to preserve such trees.

It is recommended that trees from the list provided in this section be considered to meet the requirement of this ordinance, however alternate species may be presented to the Planning Director for approval. For every recommended tree in healthy, thriving condition that is preserved, the developer/owner shall be given credits as outlined below. Tree caliper shall be measured at 1’ from the base of the tree. Credit for trees saved in the required 10-foot landscape strip will only be applicable for trees required in the landscape strip area. Credit for trees saved in the parking area will only be applicable for trees required in the parking area.

Where conflict arises regarding existing trees and required parking spaces to be provided, the following applies:

1. A reduction in parking spaces may be allowed, up to a maximum of 10% of the total required parking spaces required, in order to protect qualified trees located in the parking area.
2. Reduction in the number of parking spaces allowed for each protected tree shall be determined on a case by case basis and influenced by the tree’s chances of survival.

Landscaping with irrigation is required for all development and construction as follows:

1. A landscape plan must be submitted as part of the engineering site plan process for all multi-family, commercial and industrial zoning districts and for non-residential uses allowed in single family residential districts. A tree schedule shall also accompany all final plats for single family detached and attached residential additions.
2. Where the location of existing overhead utility lines conflict with the required landscape strip, planting of trees that mature at a lesser height will be required, i.e. Chinese Pistache, Japanese Black Pine, and Aristocrat Pear. Where easements containing underground utilities conflict with the required landscaping strip, required tree planting shall be outside the easement on the property owner’s side.
3. Required landscaping must be permanently maintained in a healthy growing condition at all times. The property owner is responsible for permanent maintenance of all plantings on an as needed basis. This maintenance includes, but is not limited to, regular weeding, mowing of grass, irrigating, fertilizing, pruning, repair/replacement of damaged hardscape and replacement of sick/dying plants.
4. To maintain visibility, no fence, structure, or planting higher than three feet above the established street grades, nor any tree with foliage extending below ten feet above the established street grades, shall be planted within twenty (20) feet of any street intersection.
5. All common areas abutting an existing thoroughfare or collector street, or one so designated by the *Master Plan*, shall be landscaped and irrigated.
6. A two (2) year maintenance bond as defined in the Subdivision Ordinance shall be required covering all required landscaping and irrigation improvements before acceptance of dedicated improvements or *Certificate of Occupancy*.
7. All required landscaping and irrigation shall be adequately maintained and promptly replaced when necessary.
8. In cases where equitable landscaping can be achieved through varying means, the Planning Director may grant permission to deviate from the exact specifications of this ordinance to facilitate a better overall design but not to lessen the requirements.

Size Of Existing Trees From Recommended List	Credit
4-8” Caliper	2
9-14” Caliper	3
15-24” Caliper	4
25+” Caliper	5
Points granted for trees of greater size will be considered on a case-by-case basis by the Planning Director.	



TREE SURVEY REQUIREMENTS

This section shall apply to all new construction in single family and commercial developments. A tree survey identifying all trees, by species and size, on the subject property shall be prepared by a civil engineer, arborist, landscape architect or surveyor. A tree survey shall be required with preliminary plats, final plats with construction plans, and with individual building permit applications for single family residential development (new lots). Trees within rights-of-way and City easements do not have to be shown.

PROVISIONS FOR REMOVAL AND REPLACEMENT OF PROTECTED TREES

Protected trees (as designated on the landscape plan), if removed, injured or destroyed, shall be replanted on a 1:1 ratio per caliper inch. If protected trees are removed, injured or destroyed and not replaced, penalties for such shall be paid according to the following chart:

Size of Caliper	Cost of Removing/Removed Protected Trees*
5-9"	\$500
10-14"	\$1000
15-24"	\$1500
25"+	\$2000
* PER TREE	

Payment for tree removal shall be due prior to the issuance of the Certificate of Occupancy. Funds received for tree removal shall be designated to a general beautification fund as deemed appropriate by the City.

QUALIFICATION TO PREPARE PLANS

For all lots 1 acre or larger, Landscape Plans shall be prepared by a Registered Landscape Architect. For lots less than 1 acre, a Landscape Designer or Landscape Contractor, knowledgeable in plant materials and landscape design may also prepare the landscape plan. Irrigation plans shall be prepared by a Licensed Irrigator. The Planning Director may reject plans if deemed of insufficient quality or completeness and require that plans be prepared by a Registered Landscape Architect or other qualified professional.

LANDSCAPE PLAN REQUIREMENTS: The following items shall be provided on the required landscape plan and is to be incorporated into the set of engineered site plans.

1. Sheet size 24" x 36", or as approved.
2. Acceptable scale: 1" = 10', 1" = 20', or as approved.
3. North arrow, graphic and written scale in close proximity.
4. Appropriate title (i.e. "Landscape Plan")
5. Title block includes street address, lot and block, subdivision name, city, state, date of preparation.
6. Name and address of owner.

7. Name, address and phone of firm preparing plan.
8. Boundary shown with dimensions.
9. Any existing easements and utilities shown. (i.e. water, sewer, storm drain, gas, electric, cable, etc.)
10. Width and type of bufferyards labeled on all sides.
11. Location, caliper size and name of all existing trees which are to be preserved.
12. Location, quantity, size and name of all proposed plant materials.
13. Maintenance note provided.
14. Provide standard Interior Landscape Calculation Chart from Approved Site Plan.
15. Visibility triangles shown.
16. Landscape Architect seal signed and dated, if size of development requires such.
17. Any berms delineated with one-foot (1') contour intervals.

IRRIGATION PLAN REQUIREMENTS: The following items shall be provided on the required irrigation plan.

1. Sheet size 24" x 36", or as approved.
2. Acceptable scale: 1" = 10', 1" = 20', or as approved. (Must be same as Landscape Plan)
3. North arrow, graphic and written scale in close proximity.
4. Appropriate title (i.e. "Irrigation Plan")
5. Title block includes street address, lot and block, subdivision name, city, state, date of preparation.
6. Name and address of owner.
7. Name, address and phone of firm preparing plan.
8. Boundary shown with dimensions.
9. Location of all existing trees which are to be saved.
10. All pipes labeled as to size.
11. All heads labeled as to type. (Legend is acceptable)
12. Backflow prevention labeled with type and size.
13. Connection to water service shown after meter.
14. Second meter (with size) shown if intended.
15. Any existing easements and utilities shown. (i.e. water, sewer, storm drain, gas, electric, cable, etc.)
16. Note on plan: "All backflow installations and connections to city water lines must be permitted separately by the City inspection staff."
17. Maintenance note provided.
18. Plan sealed, signed and dated by qualified professional as authorized above.

LANDSCAPING OF DEDICATED STREETS, MEDIANS OR OTHER PUBLIC RIGHTS-OF-WAY*

All unpaved public medians and parkways shall be landscaped with a minimum of four inches of topsoil, seeded or sodded with Bermuda grass and irrigated with a properly designed and installed system. The location of trees shall be coordinated with the City to avoid conflict with any utilities within the medians and traffic movement. These landscape areas shall be maintained by the developer or owner until adequate coverage is attained at a maintenance level compatible with like areas in other parts of the City, unless other contractual arrangements are made between the developer and the City. The City will



assume responsibility after one year. This allows the landscaping materials to go through a full cycle of season change. All water usage shall be metered. Within medians, no plantings or irrigation facilities shall be permitted within areas five (5) feet in width or less. All such areas shall be covered with stamped concrete as approved by the Directors of Planning and Public Works. Upon installation, all landscape and irrigation materials within medians or right(s)-of-way shall become the property of the City.

- (a) Trees must not be planted within thirty (30) feet of intersections or utility poles.
- (b) Trees shall be spaced forty-five (45) feet apart when planted in rows and thirty (30) feet apart when planted in groups.
- (c) Only trees with a mature height of less than thirty (30) feet may be planted directly under utility lines. Trees with mature heights greater than thirty (30) feet must be planted a minimum of fifteen (15) feet from the outside edge of the last energized line.
- (d) Ornamental tree spacing will be evaluated based on the desired effect.
- (e) Trees must be planted a minimum of ten (10) feet from the edge of the curb.

Areas where median cuts are made, solid sod (Bermuda grass) will be used to repair any disturbed area. Stamped concrete will be used to cover median noses to the radius point (maximum) or as defined by the City.

*These provisions are not meant to apply to internal streets within industrial developments.

SUBMITTAL OF PLANS. Any developer desiring to install or maintain landscaping materials or irrigation facilities in any portion of a dedicated street, median or other public right-of-way shall submit to the Planning and Public Works Departments complete plans for any and all proposed improvements. The plans shall include the following:

- (1) A scale drawing (1" = 40') clearly indicating the location, type, size and description of all proposed landscape materials and existing utilities. Planting design of materials must be submitted to ensure adequate coverage.
- (2) The name of the subdivision or addition, and the name and address of the developer.
- (3) A north arrow, scale, and date of preparation.
- (4) A clear indication of the configuration, location, type and size of all irrigation, piping, heads and controllers, including the name, address and license seal of the designer.
- (5) Such other information reasonably deemed necessary by the reviewing Departments.

REVIEW AND APPROVAL BY THE CITY. The City will review and approve or deny the submitted plans, and have the right to require revisions.

Any installation of landscape material or irrigation facilities shall be in full compliance with the plans and specifications as approved by the City.

AGREEMENT. In the case where undeveloped land exists on both sides of a public street intended to have a median, the first to develop will carry the burden of submitting plans for landscaping and irrigating the median along with escrowing half the accepted estimated cost of implementation. The second to develop will adjust those accepted plans (if necessary), escrow half the cost of implementation according to the current construction cost, and complete the landscaping with irrigation using both escrowed amounts. In the event that the original escrow amount has fallen short of current construction cost, the City will make up the difference in cost, however if current construction cost have fallen and the original amount covers more than half of the cost, then the extra funds shall be placed in the City's account for maintaining and planting medians. If required by the Director Planning, developer shall also provide the City with a cash escrow to the City for ten percent (10%) of the total cost of the proposed improvements prior to approval of the plans. In order to defray future costs of landscaping and irrigation, the Director may also require such other terms and conditions in the agreement the Director deems reasonably necessary to ensure the proper installation and maintenance of all landscaping and irrigation facilities.

LANDSCAPE AND IRRIGATION CRITERIA. In areas to be maintained by the City, all landscape and irrigation materials to be used by the developer shall be designed to conserve water and be of low maintenance. All landscape and irrigation improvements shall conform to the requirements of the City governing sight distance for traffic safety and other ordinances of the City.

A list of all plant types and irrigation plans shall be submitted as part of the Engineering Site Plan for review and approval. The developer shall furnish, or cause to be furnished at its sole expense, all labor, equipment, accessories, and services necessary to install all landscaping materials and irrigation facilities in accordance with the plans as approved by the City.

All installations will be inspected by the City. All planting, if maintained by the City, must be approved by the City of Decatur. Irrigation facilities within medians or adjacent to curbs shall be designed and installed with low gallonage and low angle nozzles in such a way as to avoid water overflow into the street. A freeze sensor will be placed in each controller to prevent the irrigation system from activating to create unsafe spillage on roads and/or sidewalks.

MAINTENANCE REQUIREMENT. Developer, at its sole expense, shall furnish or cause to be furnished, all labor, materials, equipment, accessories, and services necessary to maintain all plant materials when and as they become damaged or die.



In residential developments, the developer shall maintain all landscaping and irrigation materials and equipment. If, after development, less than 90% of the lots in the residential subdivision have building permits issued for the construction and C.O. received of homes thereon, then in such event, the developer's maintenance responsibilities shall continue until such 90% issuance is realized. With approval by the City, the developer may relinquish maintenance responsibility to a viable homeowners association.

**SECTION 108
BUFFERING**

Buffering shall be required in all subdivisions and for all development and construction as follows:

1. All residential subdivisions or developments abutting collector or thoroughfare streets either existing or so designated by the *Master Plan* shall buffer the entire length of the abutted street.
2. All development having open yard storage, rear loading docks or facilities, trash dumpsters or other related activity or materials generating noise, dust or other pollutants not common to the general area or compatible with adjacent zoning designations or use shall buffer to encompass such areas.
3. All trash dumpsters shall be encompassed with a buffer which shall include a solid, decorative gated access designed to be architecturally compatible with the area.
4. All subdivisions and development adjoining property with a different zoning classification or use shall buffer the whole length of the adjoin.
5. All buffers shall be architecturally compatible with the general area.
6. Buffering, landscaping and architectural compatibility shall be approved by City Staff prior to platting or construction.
7. The proximity of the wall to the landscaping shall be such that the landscaping always fronts the street and, if not applicable, fronts the most restrictive district or use. When proven that the overall design can be improved by reorientation, this proximity can be modified by City Staff approval as long as none of the requirements are lessened.
8. All required buffers shall be a minimum of *Type C* unless otherwise specified in the *Buffer Type Table* shown below. Normal landscaping requirements specified in *Section 107* above may be counted towards the landscape buffer requirements specified in this Section. A landscape band will constitute 2" caliper overstory trees every 50 linear feet and groundcover within a 10' landscape strip.

BUFFER TYPE TABLE

	SF-1	SF-2	2F	MF	MHD	CO	C1	C1A	C2	M-1
SF-1			A	B	B	B	B	B	C	C
SF-2				B	B	B	B	B	C	C
2F	A			A	B	B	B	B	C	C
MF	B	B	A		B	B	B	B	C	C
MHD	B	B	B	B		B	B	B	C	C
CO	B	B	B	B	B				B	C
C1	B	B	B	B	B					C
C1A	B	B	B	B	B					C
C2	C	C	C	C	C	B				B
M-1	C	C	C	C	C	C	C	C	B	

- (a) *Type A* – 4' One (1) linear landscaping band.
 - (b) *Type B* – 6' Decorative fence architecturally compatible with general area with one (1) linear landscaping band.
 - (c) *Type C* – 6' Decorative fence architecturally compatible with general area with two (2) linear landscaping bands.
9. Decorative fencing shall be composed of at least fifty (50) percent masonry material with all structural elements being masonry. Decorative fencing shall be at least eighty (80) percent solid with no more than twenty (20) percent open space. Fencing may be replaced with an additional band of landscaping.
 10. Where two (2) different zoning classifications or uses are separated by right-of-way, the required buffer type may be reduced by one level to the minimum of a *Type A*.
 11. In cases where an equitable buffer can be achieved through varying means, City Staff may grant permission to deviate from the exact specifications of this ordinance to facilitate a better overall design but not to lessen the requirements.



APPROVED TREE LIST

(1) Approved Tree List For Required Landscaping on Public Right-of-way:

<i>Scientific Name</i>	<i>Common Name</i>	<i>Size at Maturity</i>
Pinus nigra	Austrian Pine	>25 ft. (30 ft.)
Pinus eldarica	Afghan Pine	>25 ft. (40 ft.)
Pyrus calleryana 'Aristocrat'	Aristocrat Pear	25 ft.
Pyrus calleryana 'Bradford'	Bradford Pear	25 ft.
Quercus macrocarpa	Bur Oak	>25 ft. (80 ft.)
Quercus virginiana	Live Oak	>25 ft. (50 ft.)
Quercus shumardii/texana	Shumard/Texas Red Oak	>25 ft. (80 ft.)
Quercus muhlenbergii	Chinquapin Oak	>25 ft. (80 ft.)
Ulmus crassifolia	Cedar Elm	>25 ft. (80 ft.)
Ulmus parvifolia	Lacebark Elm	>25 ft. (50 ft.)
Pistacia chinensis	Chinese Pistachio	>25 ft. (50-70 ft.)
Pinus thunbergii	Japanese Black Pine	>25 ft. (30 ft.)
Carya illinoensis	Pecan	>25 ft. (100 ft.)
Cercis candensis	Eastern Red Bud	<25 ft. (20 ft.)
Taxodium distichum	Bald Cypress	>25 ft. (80 ft.)

(2) Recommended Tree List For Required Landscaping on Private Property:

<i>Scientific Name</i>	<i>Common Name</i>	<i>Size at Maturity</i>
Chilopsis linearis	Desert Willow	>25 ft. (30 ft.)
Diospyrus texana	Texas Persimmon	<25 ft. (10-30 ft.)
Fraxenis texensis	Texas Ash	>25 ft. (50 ft.)
Liquidambar styraciflua	Sweetgum	>25 ft. (70 ft.)
Pinus nigra	Austrian Pine	>25 ft. (30 ft.)
Pinus eldarica	Afghan Pine	>25 ft. (40 ft.)
Pyrus calleryana 'Bradford'	Bradford Pear	25 ft.
Pyrus calleryana 'Aristocrat'	Aristocrat Pear	25 ft.
Quercus macrocarpa	Bur Oak	>25 ft. (80 ft.)
Quercus virginiana	Live Oak	>25 ft. (50 ft.)
Quercus shumardii/texana	Shumard/Texas Red Oak	>25 ft. (80 ft.)
Quercus muhlenbergii	Chinquapin Oak	>25 ft. (80 ft.)
Ulmus crassifolia	Cedar Elm	>25 ft. (80 ft.)
Ulmus parvifolia	Lacebark Elm	>25 ft. (50 ft.)
Pistacia chinensis	Chinese Pistachio	>25 ft. (50-70 ft.)
Pinus thunbergii	Japanese Black Pine	>25 ft. (30 ft.)
Carya illinoensis	Pecan	>25 ft. (100 ft.)
Magnolia grandiflora	Southern Magnolia	>25 ft. (60 ft.)
Acer saccharum "Caddo"	Caddo Maple	>25 ft. (60 ft.)
Quercus acutissima	Sawtooth Oak	>25 ft. (50 ft.)
Taxodium accendens	Pond Cypress	>25 ft. (70 ft.)
Taxodium distichum	Bald Cypress	>25 ft. (80 ft.)

(3) Recommended Shrubbery List:

<i>ScientificName</i>	<i>Common Name</i>	<i>Spacing</i>
Berberis thunbergii	Barberry, Red	2' - 3'
Ilex cornuta 'Burfordii Nana'	Dwarf Burford Holly	2' - 3'
Elaeagnus macrophylla Elaeagnus	Silverberry (Ebbenji')	3' - 4'
Myrica pusilla	Myrtle, Dwarf Wax	2' - 3'
Rhapiolepis indica	Indian Hawthorn	2' - 3'
Juniperus Sabina 'Tamariscifolia'	Tam Juniper	3'

Other varieties complying with height and spacing requirements may be acceptable when approved by the Planning Director.

Lists are based on publications of Neil Sperry and Howard Garrett.



SECTION 109 GREEN SPACE

Green space shall be required in all subdivisions and for all development and construction as follows:

1. Residential developments having four or more units on a single lot shall provide an open, green space for area residents at the ratio of 100 square feet of green space per bedroom with a 500 square foot minimum.
2. Green space should be clustered when possible and connected through pedestrian walkways with connections to pedestrian walkways on adjoining properties.
3. Green space shall be designed according to these criteria, each given in order of importance: a) to offer safe, open, common, natural space to residents, b) to serve as many residents as possible, and c) to provide safe pedestrian access to adjacent pedestrian attractors.
4. Green space shall be in addition to any other requirement resulting in open space or green space.
5. Green space shall be subject to all *Buffer* and *Landscaping* requirements when applicable.
6. At a minimum, green space shall be covered with lawn grasses and a 3" diameter canopy tree per 500 square feet of green space.
7. If found to meet the intent of the ordinance, City Staff may grant permission to deviate from the exact specifications of this ordinance to facilitate a better overall design but not to lessen the requirements.
8. Green spaces shall be identified on the plat and the following full statement of restrictions shall be placed in the dedication instrument on the face of the plat:

GREEN SPACE RESTRICTION:

Green space areas are strictly reserved as landscaped, open green spaces only and shall never allow intrusions of any kind that are not landscape related or that in any way lessen the amount of area or landscape material without the expressed, written permission of the City of Decatur.

SECTION 110 MISCELLANEOUS

110.1 Private Streets. All streets, including streets in *Planned Developments* as defined by the *Zoning Ordinance*, not dedicated to the public shall be paved in accordance with the these *Design Standards* and shall be maintained by

means of a Home Owner's Association, the property owner or other means as approved by the Commission.

Any request to dedicate a private street as a public street shall be approved only if arrangements are made to bring the street into conformity with all City standards and regulations in effect at the time of dedication at the cost of affected property owners.

All private streets that intersect with public streets shall be constructed with standard drive approaches. In such cases where an unusual condition exists, the City Engineer may approve standard intersection approaches if the approval is requested prior to the preparation of the plans. Private streets will be named and shown on the plat. Street signs for said private streets shall be erected and maintained by the Home Owner's Association or property owner.

110.2 Trench Safety. In conformance with House Bills 662 and 665 as passed by the Seventieth Legislature Regular Session of the State of Texas, all construction projects within the City of Decatur or its extraterritorial jurisdiction as provided by the Municipal Annexation Act (Article 970a, Vernon's Texas Civil Statutes) shall contain provisions for trench safety.

On construction projects in which trench excavation will exceed a depth of five (5) feet, the uniform set of general conditions must require that the bid documents and the contract include detailed plans and specifications for adequate safety systems that meet Occupational Safety and Health Administration standards and that these plans and specifications include a pay item for these same safety systems.

110.3 Underground Utilities. All distribution lines, cables, etc. for utilities shall be installed below ground within the subdivision. Transmission lines or major cables to provide utilities such as electric, telephone and cable television to the area as a whole may be located above ground on the perimeter of the subdivision being served. The installation of these utilities shall conform to commonly accepted construction standards and be subject to review by the City Engineer.

110.4 Off-Street Parking. All parking shall be off-street, meaning that all vehicle maneuvering is done on the subject parcel and not on the street or right-of-way.



PARKING SECTION 111

111.1 Off-Street Parking. All parking shall be off-street, meaning that all vehicle maneuvering is done on the subject parcel and not on the street or right-of-way.

Minimum construction standards for off-street parking shall include:

1. 3600 psi reinforced concrete with a minimum thickness of 6 inches or 4 inches of Type "B" and 2 inches of Type "D" HMAC.
2. Subgrade thickness and content shall be determined from a geotechnical report sealed by a licensed professional engineer registered in Texas provided by the developer.
3. Standard curb and gutter as shown on P-4 of the Construction Standards shall be placed around all landscaping areas and the external boundary of the parking area.
4. All off-street parking areas shall be striped in accordance with the latest additional of the Manual on Uniform Traffic Control Devices (MUTCD) published by the Texas Department of Transportation.
5. The following minimum dimensions apply for off-street parking (See Appendix A):

Parking Angle	Stall Width	Stall Length	Maneuvering Space
90 Degrees	9 feet	18 feet	24 feet
60 Degrees	9 feet	20 feet	20 feet
45 Degrees	9 feet	19 feet	18 feet

SECTION 112 DRIVEWAYS

112.1 Driveway Approaches. All driveway approaches connecting to City streets shall be composed of concrete and shall meet the construction requirements as specified in Sheet P-5 of the City's Construction Standards. (See Tables G and H in section 201.8 for driveway spacing and width details).

The normal driveway grade within the street right-of-way is set at one-quarter inch per foot rise above the top of curb at the property line. The minimum elevation of a driveway at the right-of-way is two inches (2") above the top of curb. Barrier free sidewalk construction requires a maximum driveway grade as measured from the gutter of eight percent (8%).

Where driveway construction or reconstruction must occur off the street right-of-way, the usual maximum grade is fourteen percent (14%). The maximum change in grade without vertical curve is twelve percent (12%) for any ten feet (10') in distance. Driveways should be profiled for a distance of at least twenty-five feet (25') outside the right-of-way to ensure adequate replacement design.

Due to state laws requiring barrier free construction of sidewalks, steps or other abrupt changes in sidewalk grades are prohibited at driveways.



CHAPTER 2 IMPROVEMENTS

SECTION 201 STREET IMPROVEMENTS

201.1 Street Classification Definitions. Streets shall be classified according to the following:

1. Thoroughfare (Principal, Major, Minor): The main function of a thoroughfare is to carry traffic from one urban area to another. The thoroughfare system serves the major activity centers of urbanized areas. A thoroughfare is used for longer urban trips and carries a high portion of the total traffic with a minimum of mileage.
2. Collector: Carries traffic from local streets to thoroughfare. Also may serve local facilities such as schools, churches. Uses served would include medium and high density residential, limited commercial facilities, elementary schools, some small offices and as direct access within industrial parks. Collector streets also carry heavy traffic to major commercial and industrial facilities from thoroughfare. Uses would include office parks, industrial parks, and community level commercial facilities.
3. Local: Carries traffic from residential and commercial areas to collector streets and interconnects individual sites. Local streets carry light traffic volumes and trips are of a short duration.

201.2 General Requirements. The following general requirements apply to street improvements:

1. Adequate streets shall be provided by the subdivider. The arrangement, character, extent, pavement width, right-of-way width, grade and location of each street shall conform to the *Master Plan*. Each street shall be considered in its relation to existing and planned streets, topographical conditions, significant natural features such as mature trees or water courses, public safety and convenience, and its relationship to the proposed uses of land to be served by such street.
2. Whenever a tract to be subdivided abuts any part of any street so designated on the *Master Plan*, or where a street designated on the *Master Plan* crosses any part of the tract to be subdivided, such part of the proposed public street shall be platted. The right-of-way shall be dedicated, and the street shall be constructed by the subdivider, generally consistent with the location as indicated on the *Master Plan*, and to a width consistent with the *Master Plan* and the requirements of the *Subdivision Ordinance*.
3. Whenever a subdivision, development or new construction occurs adjacent to an existing street, the street shall be

curbed and guttered according to the specifications given herein.

4. All streets shall be designed to coordinate with existing streets in adjoining subdivisions. When conditions permit, centerline offsets shall be at least one hundred thirty-five (135) feet. Greater centerline offsets may be required by the City Engineer and shall be planned where necessary for traffic safety.
5. Streets shall be named to provide continuity with existing streets. Names of new streets shall not duplicate or cause confusion with the names of existing streets. All street names are subject to approval by the Planning and Zoning Commission upon recommendation of the City Staff.
6. Where adjoining areas are not subdivided, the arrangement of streets in the subdivision shall make provision for the proper projection of streets into such un-subdivided area.
7. Streets should be platted to allow two tiers of lots between streets when possible.
8. The reservation in private ownership of strips of land at the end of proposed or existing streets and intended solely or primarily for the purpose of controlling access to property not included in the subdivision shall be prohibited.
9. Half streets shall be prohibited, except divided thoroughfare streets where essential to the reasonable development of the subdivision in conformity with the other requirements of these regulations, and where the Commission finds it will be reasonable to require the dedication of the other half when the adjoining land is subdivided. The other half of the street shall be platted within the adjacent tract at the time it is platted.
10. A median opening with an offset of less than 125 feet from the centerline of an intersecting street or alley shall be prohibited.
11. Eyebrows or partial cul-de-sacs are not permitted on thoroughfare or collector streets.

201.3 Cul-de-sacs. The following shall apply to cul-de-sacs:

1. Streets designated to be dead-ended permanently shall be platted and constructed with a paved cul-de-sac. Any dead-end street of a temporary nature, if longer than two hundred (200) feet, shall have a surfaced turning area eighty (80) feet in diameter for a cul-de-sac. Temporary dead-end streets shall have provisions for future extension

of the street and utilities and, if the temporary cul-de-sac is utilized, a reversionary right to the land abutting the turnaround for excess right-of-way shall be provided.

2. A street ending permanently in a cul-de-sac should not be longer than six hundred (600) feet and shall be provided at the closed end with a turnaround having an outside roadway diameter of at least eight (80) feet, and a street property line diameter of at least one hundred (100) feet.

201.4 Street Class Requirements. The following street class requirements shall apply:

1. Street layout shall provide for continuation of collector streets in areas between thoroughfares.
2. Those local streets designated by the Planning and Zoning Commission shall be extended through the tract to the tract boundary to provide future connection with adjoining unplatted lands. In general, these extensions should be at such intervals as necessary to facilitate internal vehicular circulation with adjoining unplatted lands.
3. Where single family or duplex uses abut an existing or proposed thoroughfare or collector street, the plat or dedication instrument will provide:
 - i) Lots to side onto the arterial with a non-access restriction on the thoroughfare or collector side, or
 - ii) Reverse frontage with screening and containing a non-access restriction along the rear property line, or
 - iii) Other treatment as may be necessary or required for adequate protection of adjoining properties, and as approved by the City Council after taking into consideration the proposed method of off-street parking and maneuvering which will prevent the necessity of backing into the thoroughfare or collector street.

201.5 Street Design General Provisions. The following general provisions shall apply:

1. All dedicated streets shall conform to the criteria set forth in the *Master Plan*. Additional right-of-way will be required at most intersections and may be required at high-volume driveways to provide for left and right turn lanes to maintain traffic volume capacities through the intersections. Additional utility easements may also be required beyond the right-of-way in some locations.
2. The dedicated streets shall conform to the minimal design parameters as shown in Table A in section 201.8.
3. Streets shall be designed in accordance with The Texas Department of Transportation's Highway Design Division Operations and Procedures Manual.

4. No street intersections of a thoroughfare (principal, major or minor) shall vary from a 90 degree angle by more than 5 degrees. Intersections of a collector or local streets shall not vary from 90 degrees by more than 15 degrees.
5. All intersections shall have:
 - i) A tangent section at least 50 feet long that meets the angle of intersection requirements, and
 - ii) A centerline curve radius of at least 400 feet.

201.6 Pavement Types. The developer shall provide a geotechnical report, sealed by a licensed professional engineer, containing recommendations for subgrade thickness and content. The minimum pavement thicknesses are provided below.

1. For Local Streets serving primarily residential areas, the developer shall construct 6 inches reinforced concrete or 4 inches of Type "B" and 2 inches of Type "D" asphalt on a minimum of 8 inches of stabilized subgrade.
2. For Collector Streets, the developer shall construct 7 inches of reinforced concrete on 8 inches of stabilized subgrade or as approved by the City Engineer.
3. For Thoroughfare Streets, the developer shall construct 8 inches of reinforced concrete on 10 inches of stabilized subgrade or as approved by the City Engineer.

201.7 Street Signs. The following requirements shall apply:

1. Street signs shall be furnished and installed by the Subdivider for all intersections within or abutting the subdivision.
2. Street signs shall be 6 inches extruded, have white lettering on a green background, be engineer grade reflectorized, and include the block numbers along with the street name.
3. Stop signs shall be 24 inch by 24 inch in size and shall conform to the standards as set forth in the Texas Manual on Uniform Traffic Control Devices.
4. All signs shall be of engineer grade reflective material and be located in accordance with the Texas Manual on Uniform Traffic Control Devices.
5. The sign pole shall be buried to a minimum depth of 2 feet and placed in 12 inches diameter concrete filled posthole. The pole shall be tall enough to accommodate all applicable signs. The bottom of the stop sign shall be located 7 feet above the finished grade of the surrounding ground.



6. The developer shall submit a list of signs to be placed and a graphical representation of the signs for review by City Staff prior to installation.

201.8 Street Design Tables. The following tables provide design information as given in the *Master Plan*.

Table A—Street Design Criteria

Street Classification	Min. Design Speed (MPH)	Max % Grade	Min % Grade	Area Free from Storm Water, Using 100-Year Frequency Storm
Thoroughfares				
Principal	70	6	0.5	One lane in each direction
Minor	60	6	0.5	
Collector	50	8	0.5	One lane or center 12'
Local	30	10	0.5	

Table B – Urban ROW Widths

Thoroughfare Planning and Design Guides, North Central Texas Council of Governments, June 1995.

Functional Class	No. Lanes	Median	Min	Recommended	Intersection
Principal	6	Yes	132'	156'	200'
	4	Yes	108'	132'	150'
Major	6	Yes	110'	132'	142'
	4	Yes	86'	102'	112'
	5	No	80'	95'	105'
Minor	3	No	58'	70'	75'
	4	Yes	80'	100'	110'
	4	No	64'	80'	90'
	3	No	56'	68'	80'
	2	No	50'	60'	72'
Collector	4	No	64'	78'	90'
	3	No	56'	68'	66'
	2	No	50'	60'	60'

Table C – Lane Widths

Location	Functional Classification	Min	Recommended
Urban	Principal	12'	12'
	Major	12'	12'
	Minor	11'	12'
	Collector	10'	12'
Rural	Principal	12'	12'
	Major	12'	12'
	Minor	12'	12'
	Collector	12'	15'

Table D – Median Widths

Thoroughfare Planning and Design Guides, North Central Texas Council of Governments, June 1995.

Design Speed	Minimum	Recommended
55+	40'	54'
45-54	22'	30'
40-44	18'	22'
<40	14'	18'

Table E – Median Lane Widths for 2-Way Left Turn Lanes

Thoroughfare Planning and Design Guides, North Central Texas Council of Governments, June 1995.

Speed Limit (mph)	Usual	Minimum
0-30	12-14'	11'
35-40	12-14'	11'
45-50	14'	12'
50+	16'	14'

Table F –Design Speeds

Thoroughfare Planning and Design Guides, North Central Texas Council of Governments, June 1995.

Location	Functional Classification	Recommended Range (mph)
Urban	Principal	45-70
	Major	45-55
	Minor	40-50
	Collector	35-40
Rural	Principal	50-70
	Major	50-70
	Minor	40-60
	Collector	40-50

Table G – Access Management Minimum Spacing

Thoroughfare Planning and Design Guides, North Central Texas Council of Governments, June 1995.

Functional Classification	Driveway Spacing	Median Openings	
		Directional	Full
Principal	440'	2640'	5280'
Principal (Svc. Rds.)	330'	N/A	N/A
Major/Minor	220'	440'	880'
Collector	100'	N/A	330'
Local	One Per Lot	N/A	N/A

Table H – Driveway Widths

Area	Minimum	Maximum
Residential	8'	24'
Commercial	10' – One Way	28'
Industrial	10' – One Way	30'



201.9 Horizontal Curves and Super Elevation

The alignment of the streets and thoroughfares is usually determined by the alignments of the existing right-of-way or structures which cannot be relocated. Changes in the direction of a street or thoroughfare are minimized by constructing a simple curve having a radius which is compatible with the speed of vehicular traffic. To increase the safety and reduce discomfort to drivers traversing a curved portion of a street or thoroughfare, the pavement may be super-elevated.

For small deflection angles, horizontal curves should be sufficiently long to avoid appearance of a kink. Curves should be at least 500 feet long for a central angle of five degrees (5°), and the minimum length should be increased to 100 feet for each one degree (1°) decrease in the central angle.

Curvature in the alignment of arterials is allowed under certain conditions, but the greater traffic volume and the higher vehicle speeds which accompany these thoroughfares tend to increase the number of accidents when curving of alignment occurs. Curves in the alignment of minor streets usually provide aesthetic value to residential neighborhoods without affecting the orderly flow of traffic or safety.

A recommended minimum radius of curvature or vehicle design speed and pavement cross-slopes is shown in Table H. These are based on traffic consisting of typical present day automobiles operating under optimum weather conditions. There are other important considerations in the design of curves on thoroughfares including the location of intersecting streets, drives, bridges and other topographic features. When super-elevation is required on collectors and arterials, the following formula will be used:

$$E=(V^2/15R)-f$$

Where:

- e= rate of roadway super-elevation, feet per foot;
- f= side friction factor (see table H);
- V= vehicle design speed, mph; and,
- R= radius of curve in feet.

Table H – Minimum Centerline Radius for Roadways

Super-Elevation	Rate of Design Speed (mph)			
In/ft	30	35	40	45
-1/2	590	790	1010	1270
-3/8	540	720	930	1170
-1/4	500	670	860	1080
-1/8	470	630	800	1010
0	440	590	750	940
+1/8	420	550	710	890
+1/4	390	520	670	840
+3/8	370	490	630	790
+1/2	360	470	600	750

Street Classification	Side Friction Factor (f)
Local/Residential	0.160
Collector	0.155
Arterials	0.145

Local or residential streets intersecting a collector street or arterial will have a tangent section of centerline at least fifty feet (50') in length measured from the right-of-way line of the collector or arterial; however, no such tangent is required when the local or residential street curve has a centerline radius greater than four hundred feet (400') with the center located on the collector street or arterial street right-of-way line. Within a reverse curve, there will be a tangent section of centerline no less than one hundred feet (100') long.

Table I – Vertical Curves

When two (2) longitudinal street grades intersect at a point of vertical intersection (PVI) and the algebraic difference in the grades is one percent (1.0%) or greater, a vertical curve is required. Vertical curves are utilized in roadway design to affect a gradual change between tangent grades and should result in a design, which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. The vertical curve will be formed by a simple parabola and may be a crest vertical curve or a sag vertical curve.

MINIMUM LENGTH OF A VERTICAL CURVE

Crest Vertical Curve	Sag Vertical Curve
L=KA Where: L= minimum length vertical curve required for safe stopping sight distance; K= horizontal distance in feet required to effect a one percent change in gradient; A= algebraic difference in grade.	L=KA Where: L= minimum length vertical curve required for comfort; K= horizontal distance in feet required to effect a one percent change in gradient; A= algebraic difference in grade.

Design Speed (mph)	Safe Stopping Sight Distance (ft)	Normal Crest Vertical Curve K (ft)	Normal Sag vertical Curve K (ft)
70	730	247	181
60	570	151	136
50	425	84	96
45	360	61	79
40	305	44	64
35	250	29	49
30	200	19	37

Based on Geometric Design of Highways and Streets 2001 by AASHTO.

SECTION 202 WATER SYSTEM IMPROVEMENTS

202.1 General. This section pertains to general design requirements for water distribution system construction in the City of Decatur.

- All water lines shall be sized and designed in accordance with the City of Decatur Water Distribution System Master Plan or as determined by the City Engineer. In the absence of specific standards, all water supply, distribution,



pumping, and storage improvements shall be designed in accordance with the most current standards of the American Water Works Association, the Standard Specifications for Public Works Construction of the North Central Texas Council of Governments, and criteria adopted by the Texas Administrative Code, Chapter 290, "Water Hygiene".

2. Water lines for multi-family, commercial and industrial fire protection lines shall be dedicated to the public, unless the system is isolated from the public system by a detector check.
3. The developer shall furnish, install, construct, or extend, at his own expense, water distribution facilities necessary for the proper development of the subdivision. The water system shall provide individual service to every lot in the subdivision. All water mains constructed within a proposed subdivision shall be extended to the perimeter of the proposed subdivision to allow for future extension of the water system into adjacent properties. The water system shall be designed and constructed in accordance with the specifications contained in these Standards. Where considered necessary by City Staff, the facilities shall be sized in excess of that dictated by these Standards to provide for the future growth and expansion of the City's water distribution system.

202.2 Water Line Sizing

1. Standard water line sizes are 6 inch, 8 inch, 12 inch, and 16 inch diameter. Other sizes must be approved by the City Engineer.
2. All water lines shall be a minimum of 8 inches in diameter. All water lines shall be looped except in cul-de-sacs. Dead end lines shall not exceed 50 feet on multi-family, commercial, or industrial sites.

202.3 Water Line Location

1. Water lines shall be located in the parkway. Along State Highways, water lines are required to be constructed on both sides of roadway. New water lines crossing existing streets shall be placed by boring. A casing shall be required under major and minor collector roadways. Open cut excavation will not be allowed to cross existing streets, unless approved by the City Engineer.
2. All public water lines located on private property shall be centered in an easement. Water lines shall not be located under paved surfaces where possible. Easements for water line construction shall meet the following requirements:

- i) The easement width shall be a minimum of 15 feet.

- ii) If the water line is less than 12 feet deep, the outside diameter of the water line shall be located a minimum distance of 6 feet from the edge of the easement, and if other utilities are located in the same easement, the outside diameter of the water line shall be located a minimum distance of 3 feet from the outside diameter of the other utilities.

- iii) If the water line is greater than 12 feet deep, the outside diameter of the water line shall be located a minimum distance of 9 feet from the edge of the easement, and if other utilities are located in the same easement, the outside diameter of the water line shall be located a minimum distance of 6 feet from the outside diameter of the other utilities.

3. All piping with mechanical couplings, push-on, or similar joints subject to internal pressure shall be designed with blocking, anchors, and restraining harnesses to preclude separation of joints.

202.4 Water Line Materials

1. Polyvinyl Chloride (PVC) Pipe

- i) PVC pipe shall be designed, manufactured, and tested in accordance with the applicable requirements of AWWA C-900 (6 inch through 12 inch water pipe) AWWA C-905 (16 inches and larger water pipe), and AWWA M-23.

- ii) All PVC water pipe shall be blue in color.

- iii) 6 inch through 12 inch water pipe shall be pressure class 150, DR 18. Pressure class 200, DR 14 pipe may be required by the City Engineer in areas of high distribution system pressure.

2. Fittings

- i) Fittings shall be ductile iron in accordance with AWWA C110 or AWWA C153.

- ii) Fittings: ANSI/AWWA C111/A21.11, except gaskets, shall be neoprene or other synthetic rubber and factory installed. Natural rubber will not be acceptable.

- iii) All buried metal shall be wrapped in polyethylene Tube Wrap: ANSI/AWWA C105/A21.5

202.5 Installation

1. General

- i) All installations shall conform to the latest NCTCOG Specifications, as amended by these standards.



- ii) All 6 inch and 8 inch water pipes shall be installed with a minimum of 42 inches of cover over top of pipe; 12 inch water pipes shall be installed with a minimum of 48 inches cover. Pipes 16 inches and larger shall be installed with a minimum of 60 inches of cover over top of pipe.
- iii) The amount of trench excavation shall not exceed two hundred (200) feet from the end of the pipe laying operations, and no more than three hundred (300) feet of total open trench will be allowed. At the end of each work day, all trench excavation shall be backfilled to the end of the pipe laying operation. Barricades and lights will be required around any open trench left overnight.
- iv) All connections to existing water mains shall be made under pressure unless dry connections will not cause any loss of service. Under special conditions connections that cause an interruption of service may be performed with approval of the City Engineer.
- v) Coated tracer wire shall be installed in the embedment material above the PVC pipe with the tracer wire terminating in the in-line gate valve boxes accessible by City Staff. Blue underground water line tape of a minimum 4-inch width shall be installed above the embedment material.
- vi) Density tests shall be taken every two hundred (200) feet. The density reports shall be submitted daily to the City's inspector.
- vii) All density reports shall be completed and delivered to the City's inspector before paving is allowed to begin.

2. PVC Water Pipe and appurtenances shall be installed as specified in AWWA Manual M-23 and in accordance with the pipe manufacturer's recommendations.

3. Fittings

- i) Fittings shall be installed in accordance with AWWA C-600.
- ii) All mechanical joint bends, tees and reducers which require blocking shall be additionally restrained with EBAA megalug retainer gland or approved equal.
- iii) All fittings that are concrete blocked must be polyethylene wrapped.

202.6. Fire Hydrants

1. Fire hydrants in commercial and industrial areas shall generally be at street intersections and so located that there

will be a fire hydrant every three hundred (300) feet. Fire hydrants in a residential area shall be generally located on street intersections and not over five hundred (500) feet apart. Fire hydrants in a multi-family complex shall be generally located on street intersections and not over three hundred (300) feet apart.

2. Materials

- i) Fire hydrants shall be manufactured in accordance with AWWA C-502, Dry-Barrel Fire Hydrants.
- ii) Hydrants shall be manufactured such that all maintenance and adjustments can be performed without excavation and such that hydrants may be faced in any direction in relation to base.
- iii) The hydrant nozzle arrangement shall be three-way, consisting of two 2½ inch hose nozzles and one 5 inch pumper nozzle. The two hose nozzles are 180 degrees apart with the pumper nozzle in between and on the same horizontal plane. Centerline of outlet nozzle shall be a minimum of 18 inches above the ground/hydrant bury line.
- iv) Threads on hose and pumper nozzles shall meet the requirements of National Fire Protection Association, NFPA 1963, "Standard for Screw Threads and Gaskets for Fire Hose Couplings" as follows:

	HOSE NOZZLE	PUMPER NOZZLE
Nominal Size of Coupling Waterway	2 1/2"	4"
Number of Threads per Inch	7 1/2	4
Thread Designation (NH = Fire Hose)	2.5 - 7.5 NH	4 - 4 NH
Approximate Outside Diameter of External Thread	3 1/16"	5"
Length of Nipple	1"	1 1/4"
Length of Pilot to Start of 2 nd Thread	1/4"	7/16"
Depth of Coupling	15/16"	1 3/16"
Diameter of Gasket Seat in Coupling	3 3/16"	5 1/8"
Length of Coupling Internal Thread	11/16"	7/8"
From Face of Coupling to Start of 2 nd Thread	3/16"	3/8"

v) Outlet nozzles shall be fastened into the nozzle section by threads or mechanical means and secured in place by a pin, a set screw or other acceptable method to prevent the nozzle from turning or backing out. Connecting the nozzle to hydrant by leading is not acceptable.



vi) Nozzle cap harnessing and gaskets shall be furnished.

vii) Shut off

- a) The hydrants shall be of the compression type, with the main valve opening against the pressure and closing with the pressure.
- b) The valve action shall provide positive shut-off at minimum closing torque.
- c) Wedge action closing gates shall not be used.
- d) All hydrants shall open by turning the operating-stem nut to the LEFT (COUNTER CLOCKWISE). A clearly visible CURVED ARROW and the word "OPEN" shall be cast in relief on the top of the hydrant to indicate the direction of opening.
- e) The fire hydrant operating nut shall be square in shape. The square nut shall measure 1 inch at the base, and 7/8 inch at the top with all faces tapered uniformly. The nut shall be so designed as to protect the working mechanism from the moisture and dirt.

viii) Bury Length – The standard fire hydrant bury length from ground to bottom of the connecting pipe shall be 3 feet 6 inches. The hydrant shall be of a design that will permit extensions without disturbing the bottom section of the hydrant.

ix) Hub Type – Inlet connection shall be mechanical joint unless otherwise specified, and shall be for 6 inch ductile iron pipe. The nominal diameter of the fire hydrant main valve opening is to be 5¼ inches.

x) Hydrant Body – The body of the hydrant between the elbow and the top cap must be made in two parts connected by a swivel flange, or breakable flange which will permit facing of the nozzles in any desired direction in increments of 45 degrees or less. The complete hydrant shall be of such design that when the hydrant barrel is broken through traffic collision or otherwise, it may be replaced without disturbing the bottom section of the hydrant. Extension sections, where required, shall include barrel extension section, extension rod with connectors provided for lengthening the complete unit. These units shall be available in increments of six (6) inches in length.

xi) The fire hydrant body shall be painted a high gloss alkyd fire hydrant red.

xii) Ballards shall be placed around fire hydrants in high traffic areas. The ballards shall be placed at 45 degree

angles to the fire hydrant with a minimum spacing of 30 inches.

3. Location Markers – A location marker shall be placed in the center of the roadway opposite the fire hydrant. If the fire hydrant is located near the intersection of at least two streets, a marker shall be placed on all streets. The installation of this reflector shall be in accordance with the manufacturer's recommendation. Location markers shall be Stemsonite 1-88-55A or approved equal.
4. Manufacturers – Approved fire hydrants manufacturers are Mueller (Super Centerion 200) and M&H (Model 129).

202.7 Valves

1. Resilient seated gate valves shall be used for 6 inch through 16 inch water lines. Butterfly valves shall be allowed for 16 inches and larger water lines when approved by the City Engineer.
2. Valves of approved design shall be installed at the intersections of all water mains so as to provide for proper maintenance and operation of the system and to provide a means of shutting off the supply to portions of the system for repairs. Valves shall be spaced such that only one fire hydrant is out of service at any one time. Three (3) valves shall be used on a four-way water line intersection and a minimum of two (2) valves shall be used on a three-way intersection.
3. Resilient Seated Gate Valves
 - i. Resilient seated gate valves 3 inches through 16 inches shall meet or exceed the latest revisions of AWWA C509 and shall meet or exceed the requirements of these standards.
 - ii. Resilient seated gate valves for buried service shall be furnished with a square 2 inch operating nut. The valve box shall be Tyler Pipe 6850 series or approved equal. The valve box lid shall be painted safety blue. The paint shall be Glidden or approved equal.
 - iii. Butterfly valves shall meet or exceed the latest revision of AWWA Standard C504 for Class 150B butterfly valves and shall meet or exceed the requirements of this specification. All valve components shall conform to Underwriters Laboratories classification in accordance with ANSI/NSF Standard 61.
4. Installation



- i) Valves shall be furnished with extensions, such that the working nut is a maximum of 48 inches below grade.
- ii) Adjustable valve boxes shall be furnished and set on each valve in accordance with these standards. Valves that are deeper than 48 inches, AWWA C900 PVC pipe shall be used for stacks, as long as the adjustable valve box is used at the top.
- iii) After the final clean-up and alignment has been complete, the contractor shall cast in place a concrete block, 24 inches by 24 inches around all valve box tops at the finish grade. See construction details.
- iv) Valves located within a right-of-way shall be indicated on the face of the curb, or where curbs do not exist, on a conspicuous location adjacent to the valve location. Markings are to be the stamping of a four (4) inch high letter "V" with the point of the "V" pointing towards the valve location.
- v) Valve markers shall be provided in rural areas.

5. Manufacturers

- i) Approved manufacturers of 3 inch through 12 inch resilient seated gate valves are Mueller and M & H.
- ii) Approved manufacturers of 16 inch resilient seated gate valves are Mueller, M & H and American Flow Control.
- iii) Approved manufacturers of 16 inch and larger butterfly valves are Dezurik, Clow and Keystone.

202.8 Air Release and Flushing Valves

1. Adequate air relief and flushing valves shall be provided for flushing, disinfection, daily operation requirements and repairs when required by the City Engineer. Air release valves shall be required on 12 inches and larger water lines. Water lines shall be designed so that each section of the water line can be flushed at its lowest and highest points.
2. All dead end lines shall have a fire hydrant installed for flushing purposes. If installation of a fire hydrant is not possible, a flushing valve is required.
3. A fire hydrant shall be required at high points on water lines smaller than 12 inches for air relief and flushing.
4. Air release valves and air/vacuum valves shall meet or exceed the latest revision of AWWA C5.

202.9 Tapping Sleeve

A tapping sleeve and valve shall be used when connecting a new water line to an existing line. A resilient seated gate valve shall be flanged to the tapping sleeve. The tapping sleeve shall be a Smith-Blair type 664-665 stainless steel tapping sleeve, or approved equal.

202.10 Water Service

1. The water meter box shall be placed a minimum of 6 inches behind the back of curb, and the water service shall be no more than 24 inches deep, covered with a meter box in place at grade. If no curb is present, the water service shall be located at the property line, no more than 24 inches deep, covered with a meter box in place at grade. Along roadways without a curb the water service line shall be constructed at a minimum of 18 inches below the ditch flow line. All water services crossing beneath streets must be encased in 4 inch diameter PVC casing.
2. Meter and service sizes will be determined by the developer prior to requesting service from the City. The minimum water service size between the water main and the meter shall be 3/4 inches and the minimum meter size shall be 5/8 inches.
3. Water services on undeveloped lots shall be located at the property line and shall be a minimum of 1 inch in diameter.
4. Materials
 - i) Service saddle shall be double strap bronze with brass body or stainless steel double bolt wide straps with stainless steel body. Minimum size tap shall be 3/4 inch diameter.
 - ii) Service lines shall be 3/4 inch minimum diameter, Type K copper as specified in ASTM B88.
 - iii) Corporation and Curb Stops.
 - a) Corporation stop shall be 2 inch ball type with compression outlet fitting, designed for a minimum working pressure of 200 psi.
 - b) Curb stop shall be set with compression inlet fitting and lock ring.
 - iv) Meter box for meters 2 inches and smaller. Meter boxes shall be provided as shown in the *Construction Details*.
5. Installation
 - i) General



- a) All water service shall be installed in accordance with these standards.
 - b) Each individual service location shall be saw cut into the face of the curb with a four (4) inch high blue "W" painted by the Contractor. If no curb exists, a similar mark should be placed in the pavement near the edge of the roadway.
- ii) Residential Meters – All residential meters shall be manufactured by Badger Meters.
 - iii) Commercial Meters (2 inches and larger) – The developer shall purchase from the manufacturer a master compound meter. The meter shall be installed by a utility contractor or plumber. All meters in this size class are required to have a strainer prior to the meter.
6. Acceptable Manufacturers for Corporation Stops, Curb Stops, and Service Saddles are Ford, Mueller and Smith-Blair.

202.11 Flushing Valves

1. Materials

- i) Corporation stop shall be 2 inch ball type with compression outlet fitting, designed for a minimum working pressure of 200 psi.
- ii) Two (2) inch curb stop shall be ball type with compression inlet fitting with tee head shut off.
- iii) Pipe shall be 2 inches diameter, Type K copper as specified in ASTM B88.

202.12 Water Line Bore

- 1. Minimum casing thickness shall be 1/4 inch. Casings shall be required under collectors and thoroughfares, highway crossings, and railroad crossings. Casings may also be required were deemed necessary by the City Engineer. The construction bore pit shall be located at a minimum distance of four (4) feet behind the back of curb or edge of pavement where no curb is present.
- 2. The design engineer shall design the water line pipe casing for the following loading conditions and applicable combinations thereof:
 - i) Cooper's E-80 Railway loading or AASHTO HS20 loading as applicable,
 - ii) Earth loading with the height of fill above the casing as shown on the plans,

- iii) Loads applied during jacking, including axial load from jacking, and
- iv) All other applicable loading conditions, including loads applied during transportation and handling.

3. Materials

- i) Steel Casing Pipe – Steel casing pipe shall be new (or used if approved by the City Engineer) and suitable for the purpose intended and shall have a minimum yield strength of 35,000 psi. Casing shall meet ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal. Pipe shall be coated with coal tar epoxy (15 mils min.) in accordance with AWWA C-210. Pipe joints shall be welded in accordance with AWWA C-206. After pipe is welded, coating shall be repaired.
- ii) Cement Mortar – Cement mortar shall consist of one (1) part cement to two (2) parts clean sand with sufficient water to make a thick, workable mix.
- iii) Pressure Grout Mix – Grout shall be comprised of 1 cubic foot of cement and 3.5 cubic feet of clean fine sand with sufficient water added to provide a free flowing thick slurry. If desired to maintain solids in the mixture in suspension, one cubic foot of commercial grade bentonite may be added to each twelve to fifteen cubic feet of the slurry.
- iv) Casing Insulators (Spacers) – Use casing insulators for any type of carrier pipe. Insulators shall be high density polyethylene. Insulators shall fit snug over the carrier pipe and position the carrier pipe approximately in the center of the casing pipe to provide adequate clearance between the carrier pipe bell and the casing pipe. Insulators shall be manufactured by "Recon" and be Racci Type or approved equal.

4. Installation

- i) Excavation and Backfill of Access Pits.
- ii) Do not allow excavation over the limits of the bore or tunnel as specified. Trench walls of access pits adjacent to the bore or tunnel face shall be truly vertical. Shore the trench walls as necessary to protect workmen, the public, structures, roadways, and other improvements.
- iii) Excavations within the right-of-way and not under surfacing shall be backfilled and consolidated by mechanical methods as specified in these standards for compaction of trenches under roadways. Surplus material shall be removed from the right-of-way and



the excavation finished to original grades. Backfill pits immediately after the installation of the carrier pipe is completed. If carrier pipe is not installed immediately after casing pipe installation, the City may require the access pits be temporarily backfilled until installation of carrier pipe.

- iv) Where seeding or sodding is disturbed by excavation or backfilling operations, such areas shall be replaced by seeding or sodding as specified elsewhere.

SECTION 203 WASTEWATER SYSTEM IMPROVEMENTS

203.1 General. This section pertains to general design requirements for wastewater collection system construction in the City of Decatur. All sewer lines shall be sized and designed in accordance with the *Master Plan* or as determined by the City Engineer. In the absence of specific standards, all collection, treatment, and disposal systems shall be designed in accordance with the most current criteria adopted by the Texas Administrative Code, Chapter 317, *Design Criteria for Sewerage Systems*.

1. All sewers shall be designed with consideration for serving the full drainage area subject to collection by the sewer in question; the drainage area may be modified with the concurrence of the City Engineer because of the projected rate of development or the financial feasibility of the proposed extension.
2. Sewers should be designed with straight alignment whenever possible. When horizontal curvatures must be used, the maximum joint deflection should be in accordance with the pipe manufacturer's recommendations.
3. The developer shall furnish, install, construct, or extend, at his own expense, wastewater collection facilities necessary for the proper development of the subdivision. The wastewater collection system shall provide individual service to every lot in the subdivision. All sewer mains constructed within a proposed subdivision shall be extended to the perimeter of the proposed subdivision to allow for future extension of the wastewater collection system into adjacent properties. The wastewater collection system shall be designed and constructed in accordance with the specifications contained in these Standards. Where considered necessary by City Staff, the facilities shall be sized in excess of that dictated by these Standards to provide for the future growth and expansion of the City's wastewater collection system.
4. All sewers shall be designed with hydraulic slopes sufficient to give mean velocities, when flowing full or half full, of no less than two (2) feet per second on Kutter's or Manning's formulas using an "n" value of 0.013. Slopes

shall also conform to TAC Chapter 317, *Sewage Collection System*.

5. When a 150 psi rated sewer line is required due to its proximity to a water line, the 150 psi rated pipe shall terminate at a manhole on each end. The pipe shall be extended to the interior wall of the manhole. No external boot connection will be allowed.

203.2 Sanitary Sewer Line Sizing

1. Standard sewer line sizes are 6 inches, 8 inches, 12 inches, 15 inches, and 18 inches in diameter; other sizes must be approved by the City Engineer.
2. Sewer lines shall be a minimum of 6 inches in diameter.

203.3 Location

1. Sewer lines shall be constructed at a minimum depth of four (4) feet. They shall be located in the parkway and are required to be constructed on both sides of a state highway. No sewer lines will be allowed to cross a state highway.
2. Easements for sewer line construction shall meet the following requirements:
 - i) The easement width shall be a minimum of fifteen (15) feet.
 - ii) If the sewer line is less than twelve (12) feet deep, the outside diameter of the sewer line shall be located a minimum distance of six (6) feet from the edge of the easement, and if other utilities are located in the same easement, the outside diameter of the sewer line shall be located a minimum distance of three (3) feet from the outside diameter of the other utilities.
 - iii) If the sewer line is greater than twelve (12) feet deep, the outside diameter of the sewer line shall be located a minimum distance of nine (9) feet from the edge of the easement, and if other utilities are located in the same easement, the outside diameter of the sewer line shall be located a minimum distance of six (6) feet from the outside diameter of the other utilities.

203.4 Materials

1. All sanitary sewer pipes shall be PVC pipe type SDR-35 for sewer lines constructed less than fifteen (15) feet deep. SDR-26 shall be provided where sewer lines exceed fifteen (15) feet. PVC pipe will not be allowed for depths greater than twenty-four (24) feet unless approved by City Engineer. If service connections are needed on sewer pipe constructed below fifteen (15) feet in depth, a parallel line



shall be constructed at a shallower depth, specifically for service connections.

2. All PVC sanitary sewer pipe shall be green in color.
3. PVC sewer pipe and fittings shall conform to the current ASTM Designation D 3034 for 4 inches through 15 inches and ASTM Designation F 679 for greater than 15 inches.

203.5 Installation

1. General

- i) All installations shall conform to ASTM Designation D2321, and the latest NCTCOG Specifications as amended by these standards.
- ii) Sewer lines shall not be installed within nine (9) feet horizontally of any water main or fire hydrant.
- iii) Construction shall begin at the downstream end of project and continue upstream with the bell facing upstream. No upstream piping shall be installed before downstream piping unless approved by the City Engineer.

2. Excavation and Backfill

- i) When PVC pipe is used, green marker tape with the wording "Buried Sanitary Sewer" shall be installed in the backfill material no more than twelve (12) inches above the top of the pipe.
- ii) The amount of trench excavation shall not exceed two hundred (200) feet from the end of the pipe laying operations, and no more than three hundred (300) feet of total open trench will be allowed. At the end of each workday, all trench excavation shall be backfilled to the end of the pipe laying operation. Barricades and lights will be required around any open trench left overnight.
- iii) Density tests shall be taken every two hundred (200) feet. The density reports shall be submitted daily to the City's inspector.
- iv) All density reports shall be completed and delivered to the City's inspector before paving is allowed to begin.

203.6 Inspection

1. All sanitary sewer lines shall be inspected using television inspection methods prior to acceptance by the City.

- i) The Contractor is responsible for cleaning the sewer pipe. If the inspection shows debris or evidence that

the line has not been properly cleaned, the review will cease and the tape will be returned to the Contractor.

- ii) A City representative shall be present during the television inspection, unless otherwise authorized in writing.
- iii) The televised inspection shall commence only after the line has passed both air and mandrel test.

2. Televised Inspection Criteria

- i) All sanitary sewer mains must be flushed with water just prior to televised inspection. Water is to be provided at the Contractor's expense. A City representative shall be present during the flushing of the main.
- ii) All television equipment used shall have a minimum of 220 lines of horizontal resolution. The picture shall be in color.
- iii) All video information on tape must have good picture quality.
- iv) As a title heading on the tape and during the televising, the operator must:
 - a) Note the project name and Contractor name.
 - b) Note the name of the company and the operator performing the video inspection.
 - c) Note line size and material, joint type and length.
 - d) Line segment to be televised including beginning and ending station numbers.
 - e) Note page of plans used and year plans were stamped.
 - f) Note date and time of inspection.
 - g) Footage counter must be displayed on the tape during the filming.
 - h) Show the above title block before and after each line segment. Show the title block at 100 foot intervals while filming the line segment.
- i) All defects should be shown on film for a minimum of 10 seconds before proceeding with the televising.
- v) The Contractor shall supply a log sheet used in conjunction with the video tape for written



documentation. All written information gathered must be legible and clearly understandable.

- a) Note the project name, Contractor name and contract number.
- b) Note the name of the company and the operator performing the video inspection.
- c) Note pipe size and material, joint type and length between joints.
- d) Note the VCR tape footage counter, start to end.
- e) Note line segment to be televised, station numbers from and station numbers to length of line segment as indicated on plans.
- f) Note page of plans used and year plans were stamped.
- g) Note date and time of inspection.
- h) Indicate by sketch the line segment to be televised in relation to surrounding road intersections and street addresses. Identify manhole station numbers. Show direction of flow with arrows and direction the camera is going. Indicate direction of north on the sketch.
- i) Note the water depth at the beginning, every 50 foot station, every change in grade, and at the end of the line segment.
- j) Identify the clock location, direction, size and type of laterals entering main. Indicate laterals as saddles, punched, or glued fittings.
- k) Indicate final footage televised at end of the log sheet.
 - a) One tape per visual televised inspection project shall be furnished to the Public Works Director.
 - b) Tapes must be VHS format, 1" wide T-120, high quality tape. Tapes are to be recorded on SP (2 hours) play.
 - c) All tapes and run sheets shall be submitted to the City. All tapes and log sheets shall become the property of the City.

3. Criteria for Repair

- i) The Contractor shall make repairs if the inspection reveals any deficiency in the sewer line. If repairs are

required, another television inspection shall be made after the repairs are complete on a new tape from manhole to manhole at the Contractor's expense.

- ii) Repairs shall be made to the satisfaction of the City Engineer and Public Works Director.

203.7 Manholes

1. Manholes shall be located at all intersections of sewer lines and at intermediate spacing along the line. Generally the maximum spacing should not exceed five hundred (500) feet. Manholes should be located at all changes in grade and at the ends of all sewer lines that will be extended.
2. A manhole is required at the junction of sewer lines with different inside pipe diameters.
3. A drop of at least 0.1 feet is required through the manhole when a change in flow direction occurs.
4. The flow line into a manhole should not be greater than 6 inches above the flow line out of the manhole. Where the flow line in is greater than two (2) feet above the flow line out, a drop manhole is required.
5. Minimum manhole inside diameter is four (4) feet.
6. Drop-connection manholes shall have a minimum inside diameter of five (5) feet, with an interior drop connection if line size is greater than eight (8) inches.
7. Minimum cast in place manhole wall thickness is eight (8) inches. For depths greater than twelve (12) feet add an extra four (4) inches of thickness for each additional six (6) feet of depth.
8. Minimum pre-cast wall thickness is five (5) inches.
9. A manhole is required where a sanitary sewer line enters and exits private property.
10. All manholes shall be constructed of concrete.
11. Installation
 - i) Use the following table to determine sanitary sewer manhole sizes:



Pipe Sizes	Depth of Cover	Maximum Diameter of Manhole	Number of Pipe Connections Allowed in Manhole
Under 12"	<12'	4'	3
	12' - 20'	5'	3
12" to 18"	<12'	5'	3
	12' - 20'	6'	4

NOTE: *If the proposed design requires the sewer line to be placed at depths greater than shown above, the design will require approval by the City Engineer.*

ii) Cast-in-place

- a) The manhole foundation shall be poured on undisturbed soil and shall have a minimum thickness of eight (8) inches.
- b) The inlet and outlet pipes shall be poured into the foundation of the manhole. The pipe shall extend one and one half (1½) inches into the manhole. When straight through flow occurs, the pipe shall not be laid continuously through the manhole.
- c) The invert shall be shaped and smoothed so that no projections will exist and the invert shall be self cleaning. The invert floor shall have a minimum slope of one (1) inch per foot.
- d) Concrete work shall conform to all requirements of ACI 301, Standard Specification for Structural Concrete, published by the American Concrete Institute, except as modified herein.
- e) Detailing of concrete reinforcement and accessories shall be in accordance with ACI Publication 315.
- f) Portland Cement shall be Type II, low-alkali and conform to ASTM Designation C-150.
- g) The manhole shall not be backfilled within twelve (12) hours after the concrete placement.
- h) The face of curb shall be sawed with an "MH" to mark the location of all manholes. The location of the stamp shall be a line that intersects the center of the manhole cover and the curb perpendicular to the centerline of the street. For manholes located in intersections, the curb shall be stamped at the closest location to the manhole. If no curb exists, a similar mark should be placed in the pavement near the edge of the roadway.

iii) Precast Manhole

- a) Precast manholes shall be constructed in accordance to ASTM Designation C-478.
- b) Manhole base shall have a spread footing and be placed on a minimum of twelve (12) inches of crushed rock.

12. Approved precast manhole manufacturers are Hydro-Conduit and Gifford Hill American.

203.8 Manhole Frame and Cover

1. Cover

- i) All manhole covers shall conform to the Standard Specifications for Grey Iron Castings, ASTM A-48, Class 30 B.
- ii) All manhole covers shall be twenty-four (24) inches in diameter.
- iii) All manhole covers shall have two (2) integrally cast pick bars.
- iv) Acceptable manufacturers include Bass and Hays and Vulcan.

2. Frames

- i) All manhole frames shall conform to the Standard Specifications for Grey Iron Castings, ASTM A-48, Class 30 B.
- ii) All manhole frames shall provide a 24 by ¼ inch opening to assure proper fit of the manhole cover.
- iii) Acceptable manufacturers include Bass and Hays and Vulcan.

3. Extension Ring

- i) All precast reinforced concrete extension rings shall conform to ASTM C-478.
- ii) The number of extension ring sections shall be kept to a minimum (i.e. use 1-12 inch extension ring instead of 2-6 inch extension rings).
- iii) A 1 inch by 3 1/2 inch bitumastic gasket shall be used to seal the extension ring at both joints.

4. Rain Pan

- i) Rain pans shall be high density polyethylene plastic.
- ii) Acceptable manufacturers include Knutson or approved equal.



203.9 Sewer Service

1. No sewer service line (lateral) shall be less than four (4) inches in nominal diameter. Commercial sewer laterals shall be six (6) inches minimum diameter.
2. Sewer laterals shall be located at the center of the lot and extended to the property line and be a minimum of ten (10) feet downstream of the water service.
3. Sewer service laterals shall have no more than six (6) feet of cover at the property line.
4. A cleanout shall be located on the service lateral at the time of connection to the building.
5. All lateral sewer service lines shall be PVC pipe type SDR-35.
6. All PVC sanitary sewer pipe used for lateral services shall be green in color.
7. All service laterals shall be installed in accordance with the sanitary sewer embedment and backfill standards.

203.10 Cleanouts

1. All cleanouts are to be constructed of PVC pipe type SDR-35.
2. All PVC sanitary sewer pipe shall be green in color.
3. PVC sewer pipe and fittings shall conform to the current ASTM Designation D 3034 for four (4) inches through fifteen (15) inches and ASTM Designation F 679 for greater than fifteen (15) inches.

203.11 Main Line Cleanouts. Main line cleanouts shall be located on dead end sewer mains at a distance no greater than 250 feet from the preceding manhole. If the distance is greater than 250 feet, a manhole shall be installed at the end of the line.

203.12 Aerial Sewer

1. The piers for the aerial crossing shall be designed in accordance with the guidelines of the Ductile Iron Pipe Research Association.
2. Aerial sewer crossings shall be located in areas where the sewer line cannot be constructed with the appropriate minimum cover. The design engineer shall design the aerial crossing in accordance with these standards and as approved by the City Engineer.
3. Pier placement and spacing shall be determined according to soils analysis performed by a geotechnical engineer.

Piers shall be placed at a maximum span distance as indicated by the design engineer's calculations.

4. Pier placement and spacing along with a soils report shall be submitted to the City Engineer.
5. All above ground sewer installations shall be ductile iron, minimum Class 150, utilizing restrained joints and shall have a wall thickness required for the size and span as designed. The pipe shall have an internal polyurethane coating.
6. The aerial pipe shall be connected to the sanitary sewer pipe by means of a manhole on each side of the aerial crossing.
7. Piers are to be constructed with a minimum of Class A 3,500 psi reinforced concrete.
8. The design engineer shall submit a pipe design for approval by the City Engineer.
9. The design engineer shall submit a pier design for approval by the City Engineer.

203.13 Sewer Line Boring

1. The design engineer shall design the sewer line pipe casing for the following loading conditions and applicable combinations thereof:
 - i) Cooper's E-80 Railway loading or AASHTO HS20 loading as applicable.
 - ii) Earth loading with the height of fill above the casing as shown on the plans.
 - iii) Loads applied during jacking, including axial load from jacking.
 - iv) All other applicable loading conditions, including loads applied during transportation and handling.
2. Steel casing pipe shall be new (or used if approved by the City Engineer) and suitable for the purpose intended and shall have a minimum yield strength of 35,000 psi. Casing shall meet ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal. Pipe shall be coated with coal tar epoxy (15 mils min.) in accordance with AWWA C-210. Pipe joints shall be welded in accordance with AWWA C-206. After pipe is welded, coating shall be repaired.
3. Cement mortar shall consist of one (1) part cement to two (2) parts clean sand with sufficient water to make a thick, workable mix.



4. Grout shall be comprised of 1 cubic foot of cement and 3.5 cubic feet of clean fine sand with sufficient water added to provide a free flowing thick slurry. If desired to maintain solids in the mixture in suspension, one cubic foot of commercial grade bentonite may be added to each twelve (12) to fifteen (15) cubic feet of the slurry.
5. Casing insulators shall be used for any type of carrier pipe. Insulators shall be high density polyethylene. Insulators shall fit snug over the carrier pipe and position the carrier pipe approximately in the center of the casing pipe to provide adequate clearance between the carrier pipe bell and the casing pipe. Insulators shall be manufactured by "Recon" and be Racci Type or approved equal.
6. All bores shall be installed at a grade no less than the minimum indicated by TAC, Chapter 317 for the desired pipe size.
7. All bores shall maintain grade enough to ensure desired clearance distances between existing utilities and bore.
8. Bore pits must be a minimum of four (4) feet from the back of curb when located for boring under roadways.
9. Do not allow excavation over the limits of the bore or tunnel as specified. Trench walls of access pits adjacent to the bore or tunnel face shall be truly vertical. Shore the trench walls as necessary to protect workmen, the public, structures, roadways, and other improvements.
10. Excavations within the right-of-way and not under surfacing shall be backfilled and consolidated by mechanical methods as specified in these standards for compaction of trenches under roadways. Surplus material shall be removed from the right-of-way and the excavation finished to original grades. Backfill pits immediately after the installation of the carrier pipe is completed. If carrier pipe is not installed immediately after casing pipe installation, the right-of-way Owner may require the access pits be temporarily backfilled until installation of carrier pipe.
11. Where seeding or sodding is disturbed by excavation or backfilling operations, such areas shall be replaced by seeding or sodding as specified elsewhere.

203.14 Lift Stations

1. Lift stations must be designed in accordance with 30 TAC, 317.3.
2. Instrumentation and Control
 - i) The voltage supplied for pump operation shall be 3 phase, 480 volts. Converting single phase power to 3

phase power using additional mechanical equipment shall not be allowed.

- ii) Wet-well level control shall be achieved through the use of an ultrasonic level indicating transmitter.
- iii) Stations with a total pumping capacity rating less than 1,000 gpm shall be equipped with an automatic telephone dialing system.
- iv) Submersible pumps shall be provided with moisture and motor over-temperature sensors.

3. Site Requirements

- i) A concrete pad will be required at the front of the control cabinet. The pad shall provide a three (3) foot working area away from the face of the cabinet and extend the width of the enclosure mounting structure. Pad depth shall be a typical four (4) inches.
- ii) A one (1) inch minimum potable water service is required. The water service may be set in a standard eighteen (18) inch galvanized water meter box with a one (1) inch brass angle stop.
- iii) The site shall be graded to drain away from the station to prevent stormwater inflow or infiltration into the wet-well.
- iv) The site shall be located outside of the 100-year flood plain.
- v) The site shall not be located within one hundred (100) feet of an existing or proposed residence, if possible.
- vi) If applicable the lift station site driveway shall include driveway area for maintenance vehicles to park off public roadway while performing maintenance. The minimum driveway length shall be fifteen (15) feet.
- vii) A concrete driveway turning area is required where access drives extend more than twenty (20) feet from main roads. The driveway area shall be "T" shaped with the applicable turning radius. The minimum driveway width shall be fifteen (15) feet.

SECTION 204

DRAINAGE AND STORM SEWER IMPROVEMENTS

204.1 General. Drainage facilities shall be provided and constructed by the developer in accordance with all City standards and the following basic requirements:



204.2 Runoff Calculations

1. The selection of which method to use for calculating runoff depends upon the size of the contributing drainage area at the most downstream point of the project. The "Rational Method" is acceptable for designing projects in which the drainage area is less than two hundred (200) acres. A unit hydrograph method is required for projects with larger drainage areas.
2. No matter which method is used to calculate runoff, a developer or builder of property greater than one (1) acre in size, or any property that was platted as a part of an overall tract which was greater than one (1) acre in size (including churches and schools), shall develop the property so that the rate of runoff created by the development as it leaves the property does not exceed the rate of runoff that would have been created if the property had developed as a single-family residential property.
3. Runoff computations shall be based upon fully developed watershed conditions in accordance with the land use projections in the latest *Master Plan*. The design engineer shall size drainage facilities by disregarding the detention effects of upstream property and calculating the runoff as if the off-site property was developed without any detention. If an approved regional detention/retention facility is in operation, the design engineer may size downstream drainage facilities based on consideration of the detention effects of the regional facility.
4. Procedure for drainage areas less than two hundred (200) acres.

- i) Computation of Storm Water Runoff for drainage areas less than two hundred (200) acres shall be by the "Rational Method," which is based on the principle that the maximum rate of runoff from a given drainage area for an assumed rainfall intensity occurs when all parts of the area are contributing to the flow at the point of discharge. The formula for calculation of runoff by the "Rational Method" is:

$$Q = CIA$$

Where: Q = the maximum rate of discharge, expressed in cubic feet per second.

C = Coefficient of Runoff.

Park areas - No developed land	0.30
Developed Park sites	0.40
Single Family Residential	0.55
Duplex	0.60
Multiple Family	0.70
Schools	0.70
Churches	0.70
Neighborhood Commercial	0.70
Office Commercial	0.70

Commercial	0.85
Industrial	0.85

I = Intensity of Runoff in inches per hour (*Use Appendix B – IDF Curve*).

A = Drainage Area in acres.

- ii) Time of concentration is the longest time, without interruption of flow by detention devices, that a drop of water takes to flow from the farthest point of the drainage area to the point of concentration (i.e. the point of design). The time of concentration is composed of the inlet time and the flow time in a conduit or channel to the point of design.
- iii) When designing inlets and laterals, the time of concentration is equal to the inlet time. The design engineer will compare the above specified inlet times to the actual calculated inlet time by computing the flow time overland and along the gutter to the first inlet. Manning's equation shall be used to determine flow time to the inlet. The design engineer may use the actual calculated or specified inlet time.
 - a) The inlet time shall be ten (10) minutes for property zoned multiple family, churches, schools, local business, central business, commercial, or industrial.
 - b) An inlet time of fifteen (15) minutes shall be used for property zoned for parks, cemeteries, agricultural, and single family residential.
5. Procedures for Drainage Areas greater than two hundred (200) acres:
 - i) For drainage areas in excess of two hundred (200) acres where the use of the "Rational Method" does not provide reliable results, the use of a unit hydrograph method shall be made. The use of a unit hydrograph calculation will be based upon standard and accepted engineering principles subject to the approval of the City Engineer. Acceptable methods include the Soil Conservation Service (SCS) Technical Release Number 55 or the Corps of Engineers HEC-1 models for drainage areas 200 acres or more.
 - ii) The unit hydrograph method shall be based upon fully developed watershed conditions assuming no effects from the small on-site detention facilities for maintaining the rate of runoff as if the property was developed as single family residential use. The detention effects of large regional detention facilities can be taken into account in unit hydrograph methods.
 - iii) Circumstances that may require the use of a unit hydrograph method include sizing open channels,



reclaiming floodplains, creating lakes, or building other types of drainage-related facilities on major drainage courses. Design engineers of these types of facilities should be aware that the requirement of designing for fully developed watershed conditions will mean that they will have to calculate these fully developed flows instead of using the flows calculated in the Federal Emergency Management Agency's (FEMA) flood insurance studies for Decatur or Wise County.

204.3 Design Storm Frequencies

The approved drainage system shall provide for positive overflow at all low points. The term "positive overflow" means that when the inlets do not function properly or when the design capacity of the conduit is exceeded, the excess flow can be conveyed overland along a grassed or paved course. Normally, this would mean along a street or alley, or shall require the dedications of special drainage easements on private property.

DRAINAGE FACILITY	DESIGN RECURRENCE INTERVAL
Closed Storm Sewer Systems	10-year with 100-year positive overflow in streets such that the depth of flow in the street does not exceed the top of curb.
Closed Storm Sewer Systems and Inlets at Street Low Point or Sag	100-year with positive overflow
Culverts and Bridges	100-year
Concrete-lined Channels	100-year
Earthen Channels	100-year

204.4 Street and Alley Capacity

1. The depth of flow in the streets shall not exceed the top of curb for the 100-year storm.
2. The flows created by the 100-year storm shall be contained within the capacity of all paved alleys.
3. The first floor elevations of all residential and other structures shall be set at a minimum elevation of one foot above the top of the street curb elevation or the alley invert, and with positive drainage provided away from the structure. Positive overflow sections shall provide a minimum of 1 foot of freeboard from the overflow invert adjacent to structures and the corresponding first floor elevation of all residential and other structures.

204.5 Inlet Placement and Capacity

1. Storm sewer inlets shall be built along paved streets at such intervals that the depth of flow, based upon the 100-

year storm, does not exceed the top of curb. Inlets shall be located as necessary to remove the flow based on a 10-year storm. If in the opinion of the City Engineer the flow in the gutters would be excessive using the above design criteria, the storm sewers or inlet locations could be altered to relieve adverse conditions.

2. Inlets shall be placed upstream from an intersection whenever possible. At any intersection, only one street shall be crossed with surface drainage and this street shall be the lower classified street. When an alley intersects a street, inlets shall be placed in the alley whenever flow down that alley would cause the capacity of the intersecting street to be exceeded.
3. The minimum inlet size shall be five (5) feet. No more than twenty (20) feet of inlet shall be placed along one gutter at any given location. Minimum sizes of laterals shall be 18 inches for use with 5 foot inlets, 21 inch laterals with 10 foot, 14 foot, and drop inlets and 24 inch laterals for 20 foot inlets. Where laterals tie into trunk lines, place the laterals on a 60 degree angle with the trunk line and connect them so that the longitudinal centers intersect.

204.6 Pipe Design Standards

1. Storm sewer conduit shall be sized to flow full. Manning's Equation shall be used to determine the conduit size.
2. Minimum and Maximum Velocities in Pipes
 - i) The minimum velocities in conduit shall be 2.5 feet per second.
 - ii) Maximum velocity in the pipe shall not exceed 12 feet per second.
 - iii) The maximum discharge velocities in the pipe shall also not exceed the permitted velocity of the receiving channel or conduit at the outfall to prevent erosive conditions. The maximum outfall velocity of a conduit in partial flow shall be computed for partial depth and shall not exceed the maximum permissible velocity of the receiving channel unless controlled by an appropriate energy dissipater (e.g. stilling basins, impact basins, riprap protection).
3. In general, storm water shall be carried in concrete pipe conduit, but other types of conduit can be used to carry stormwater. However, prior permission to use other conduit materials must be obtained from the City Engineer.
4. Hydraulic Gradient
 - i) Conduits must be sized, and slopes must be set such that runoff flows smoothly down the drainage system.



To insure this smooth passage, the hydraulic gradient must be at the proper elevations. The hydraulic grade line shall be established and shown on the plans for all storm sewer design.

- ii) The hydraulic grade line shall in no case be closer to the surface of the ground or street than one (1) foot.
- iii) Hydraulic gradient calculations shall account for all head losses that may occur in the storm sewer line. Friction head loss shall be determined by direct application of Manning's Equation. Minor losses due to turbulence at structures shall be determined using Appendix B of this section.

204.7 Culvert Design

1. One (1) foot of freeboard is required between the 100-year water surface elevation and the top of curb elevation. Exceptions must be approved in writing by the City Engineer.
2. Culverts must be designed using standard methods and engineering judgement. Culverts shall be designed in accordance with the latest edition of the Texas Department of Transportation (TxDOT) Hydraulic Design Manual. Standards of the City of Decatur will take precedence over TxDOT Manual in cases of conflict.
3. Culvert hydraulic grade line calculations shall consider both inlet and outlet control.
4. Culverts shall be skewed such that impacts due to the flood and normal flow angles of attack on the structure are minimized.
5. The maximum velocity through a culvert shall be fifteen (15) feet per second.
6. Stream stability shall be assessed when determining the number of barrels, height and width and culvert skew. Potential for scour shall be accounted for in the design.

204.8 Bridges

1. Two (2) feet of freeboard is required between the 100-year water surface elevation and the low chord of the bridge. Exceptions to this requirement must be approved by the City Engineer in writing.
2. The skew of the bridge piers and abutments shall be oriented as close to the normal or flood direction of flow resulting in an angle of attack as close to 0 degrees as possible.
3. Bridges shall be designed using standard methods.

4. Stream stability shall be assessed when designing the abutments and interior bents of the bridge. Scour shall be accounted for in the design.

204.9 Channels

1. Open channels are discouraged in urban areas. Open channels may be used instead of an enclosed system when the pipe size, necessary to carry the design storm event, exceeds the capacity of 2-60 inch RCP. Open channels shall not be permitted when 2-60 inch RCP pipes will carry the design flow, unless approved by the City Engineer.
2. Open channel design criteria:
 - i) Channels may be left in their natural state provided that the channel velocities are 6.0 feet per second or less and that one (1) foot of freeboard is available during the design storm event.
 - ii) If the natural channel is to be replaced by an improved channel, the flow from the 100-year design flood must be contained within the improved channel while allowing for one (1) foot of freeboard.
 - iii) Improved channels shall be trapezoidal shaped and include a lined section if the design velocity is greater than six (6) feet per second. Lining types such as concrete, rock walls and gabions may be used upon approval of the City Engineer. The maximum velocity allowed in concrete lined channels is fifteen (15) feet per second.
 - iv) Unless shown to be feasible in a soils report sealed by a licensed professional engineer in the State of Texas and approved by the City Engineer, improved channels shall have minimum side slopes of:
 - a) Four (4) feet horizontal to one (1) foot vertical for earthen, grassed-lined side slopes.
 - b) 1.5 feet horizontal to one (1) foot vertical for concrete-lined side slopes in rock.
 - v) Where practicable, all unpaved channels should have sufficient grade to avoid ponding during backwater flow conditions. A minimum slope of 0.40% is required for earthen channels and swales, except those used as part of a wetlands area.
 - vi) The developer or owner shall use low maintenance vegetation for vegetative cover, as approved by the City Engineer prior to planting. The selection of materials shall comply with either the current ground cover listing for North Central Texas furnished through the Texas Agricultural Extension Service.



3. Manning's equation can be used to design channels and determine water surface elevations and velocities when backwater effects are negligible. Channels where backwater effects occur must be designed using models accepted by FEMA.
 4. All channel sections must consider and account for channel stabilization in their design. This requirement pertains to all sections whether they are left in their natural condition or are modified in any manner. The design of all drainage channels and swales shall assure adequate capacity and minimum maintenance to overcome the result of erosion, silting, sloughing of bends or similar occurrences.
 5. When performing hydraulic analyses for channel or drainageway design, the starting water surface shall be based on the following criteria:
 - i) When the ratio of the drainage area of the receiving creek (at the confluence location) to the drainage area of the channel or drainageway being designed is 15 or greater, the 10-year water surface of the receiving creek shall be used as the starting water surface for hydraulic design calculations. For creeks where the 10-year water surface is not available, the slope-area method will be used for starting design calculations.
 - ii) When the ratio of the drainage area is less than 15, the 100-year elevation on the receiving creek shall be used as the starting water surface for design calculations.
- 204.10 Detention Design.** Detention/retention facilities shall be designed for the 100-year design flood according to the following criteria:
1. Dedicated detention/retention basins shall also include an additional one (1) foot of freeboard and two (2) feet of sediment storage. The volume of runoff storage for drainage areas greater than two hundred (200) acres shall be computed using unit hydrograph procedures. Acceptable unit hydrograph procedures are provided in section XI.B.5 of this document.

For drainage areas less than two hundred (200) acres, the above methods are recommended; however, an approximate routing method based on the rational formula is allowable.
 2. All detention facilities designed shall consider the timing of the flood peak in the main channel into which the detention facility drains. Delaying the peak from a site in lower portions of a watershed may result in a higher peak on the main channel.
 3. A detention facility shall have enough gradient to ensure positive drainage to the outlet structures so as to avoid nuisance conditions such as standing water, odors, insects, and weeds. A minimum slope of 0.40% towards the outlet structure is required for all detention facilities.
 4. Detention areas in parking lots shall not be:
 - i) In required parking spaces but in extra spaces.
 - ii) Behind speed bumps unless the speed bumps are made with reinforced concrete.
 - iii) Deeper than six (6) inches unless otherwise approved by the City Engineer and warning signs shall be posted.
 5. Drainage easements shall be provided for all regional detention/retention facilities and for other detention/retention facilities where two (2) or more owners are involved.
 6. Detention facilities shall be designed to empty in less than 24 hours, unless it is also serving as an erosion control facility.
 7. Detention facilities used as a sediment control device shall meet the following requirements;
 - i) The sediment control facility shall be designed with minimal velocities such that sediment is dropped and not picked up by flows at any time during the storm event.
 - ii) The basin shall be designed with adequate sediment storage area so that sediment removal is not required more than twice a year. Expected removal periods greater than twice a year must be specified in the maintenance plan and approved by the City Engineer.
 - iii) Sediment control facilities cannot be used to meet detention requirements unless the volume of sediment is included in the calculations for the detention basin design.
 8. The owner shall maintain detention/retention facilities unless the facilities are dedicated to the City of Decatur. The following measures are required to ensure the facility functions properly.
 - i) Facilities should be mowed at least twice a year to control weeds and discourage woody growth.
 - ii) Debris, litter and accumulated sediment should be removed from detention facilities at least twice a year. Particular attention should be given to removal of debris, litter and sediment around outlet structures.
 - iii) Detention basins designed for sediment removal shall be maintained as specified in the maintenance plan



and approved by the City with construction plan submittal.

204.11 Flumes. The use of flumes is not recommended for widespread use. Flumes shall not be permitted when the purpose of a permanent flume is to carry runoff down the sides of earthen channels. A flume may be used to direct overflow runoff along property lines until the runoff can be intercepted by streets or conduits. Flumes crossing sidewalks shall be covered or bridged such as to minimize danger to pedestrians.

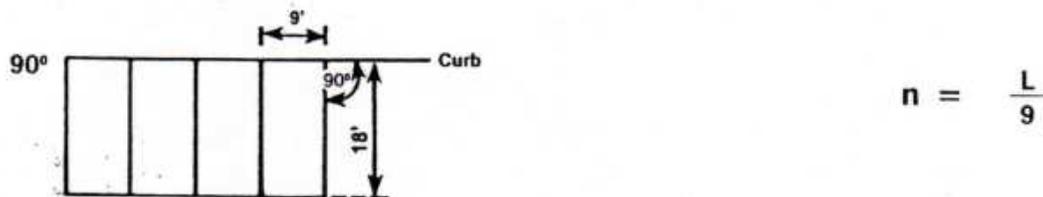
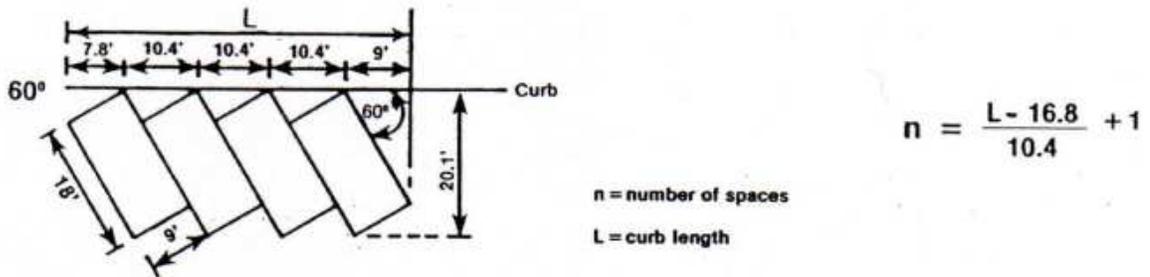
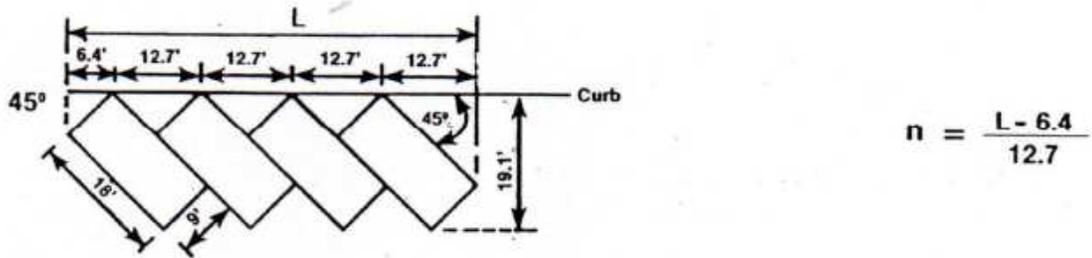
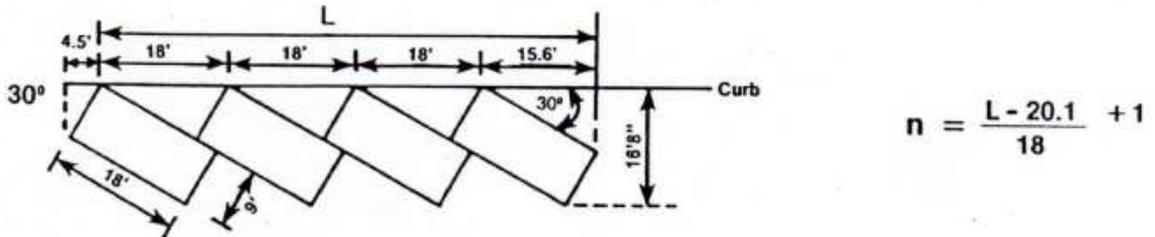
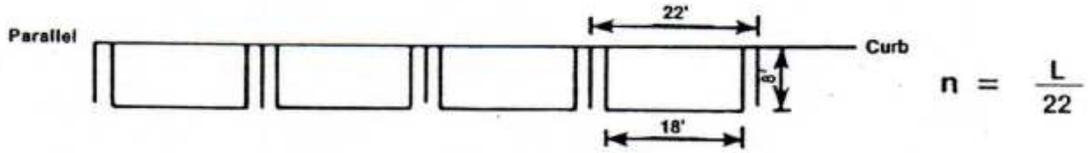
204.12 Residential Grading and Drainage

1. Surface runoff from residential lots shall cross no more than one additional lot before being directed toward the street or a dedicated drainage system. When the flow reaches the second lot, side lot swales shall be in place to direct the flows to the street or to a dedicated City drainage system within an easement in the rear yard. Furthermore, no more than one lot may drain to a second lot before the flow is directed to a street or to a dedicated city drainage system. Where lot to lot drainage occurs, the lot lines shall be aligned and a dedicated private drainage easement shall be provided.
2. Three general categories of residential lot grading and drainage plans are anticipated within the City of Decatur as shown in Figure No. 1. Specific deviations from these three plans will be considered on an individual basis.
3. When adjacent to the floodplain, the finished floor (FF) elevation of commercial buildings shall be one foot (1') above the 100-year fully developed water surface elevation (WSE) of the ultimate floodplain. The FF elevation of residential buildings shall be two feet (2') above the 100-year fully developed water surface elevation (WSE) of the ultimate floodplain.

APPENDIX A

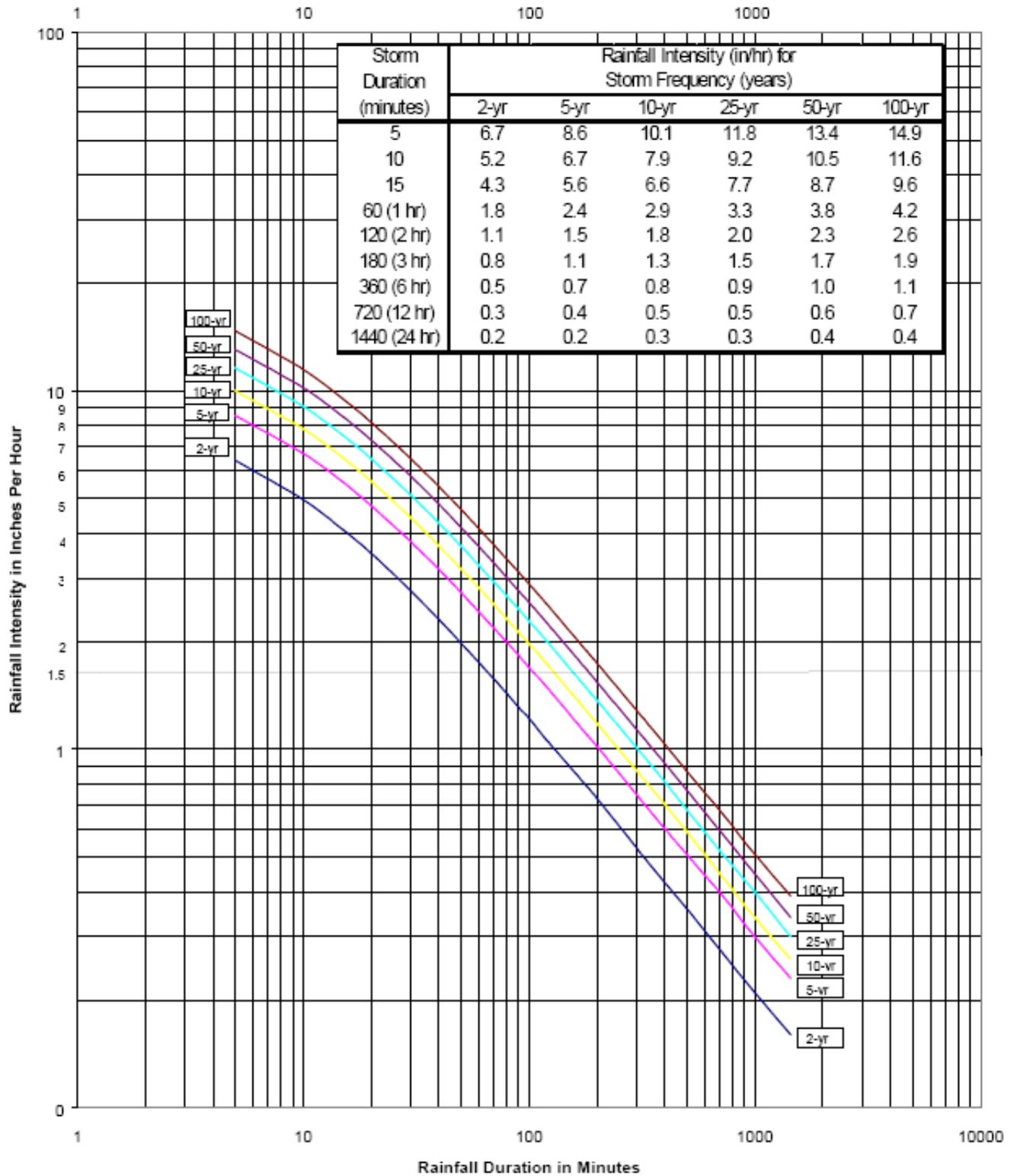
Space Requirements for Parking at Various Angles

City of Decatur



APPENDIX B

INTENSITY - DURATION - FREQUENCY CURVE



APPENDIX C

Minor Head Losses

A. Entrance Losses

1. Equation

$$HL = K_e \frac{V_2^2}{2g}$$

Where

- HL = head loss (feet)
- V₂ = velocity in downstream pipe (ft/s)
- K_e = head loss coefficient
- g = gravity constant (32.2 ft/s²)

2. Entrance Loss Coefficients (K_e)

Type of Structure and Design of Entrance	K_e
Concrete Pipe	
Projecting from fill:	
Socket end (groove-end)	0.2
Square cut end	0.5
Headwall or headwall and wingwalls:	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
End-section conforming to fill slope	0.5
Beveled edges, 33° to 45° bevels	0.2
Side- or slope-tapered inlet	0.2
 Pipe or Pipe-Arch Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edged	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
End-section conforming to fill slope	0.5
Beveled edges, 33° to 45° bevels	0.2
Side- or slope-tapered inlet	0.2
 Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls):	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension or beveled on 3 sides	0.2
Wingwalls at 30° to 75° to barrel:	
Square-edge rounded to radius of 1/12 barrel dimension or beveled on 3 sides	0.2
Wingwall at 10° to 25° to barrel:	
Square-edged at crown	0.5
Wingwall parallel (extension of sides):	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2



B. Bend Losses

1. Equation

$$HL = K_b \frac{(V_2)^2}{2g}$$

Where

- HL = Head loss (ft)
- V_2 = Velocity in downstream pipe (ft/s)
- K_b = Head loss coefficient
- g = Gravity constant (32.2 ft/s²)

2. Bend Loss Coefficient (K_b)

The following head loss coefficients for bends in storms are for pipes with diameters of 48 inches or less. For storm sewers with diameters greater than 48 inches the momentum equation should be used to determine headloss.

Conduit on Curves	K_b			
	Radius of Pipe Bend			
	90°	60°	45°	22.5°
Pipe radius = diameter	0.50	0.43	0.35	0.20
Pipe radius = 2 to 8 diameter	0.25	0.21	0.18	0.10
Pipe radius = 8 to 20 diameter	0.40	0.34	0.28	0.16

C. Junction Losses

1. Equation

$$HL = \frac{(V_2)^2}{2g} - K_j \frac{(V_1)^2}{2g}$$

Where

- HL = Head loss (ft)
- V_1 = Velocity in the upstream pipe (ft/s)
- V_2 = velocity in the downstream pipe (ft/s)
- K_j = Head loss coefficient
- g = Gravity constant (3.2 ft/s²)

2. Junction Loss Coefficient (K_j)

Description of Condition	K_j
Inlet on Main Line.....	0.50
Inlet on Main Line with Lateral.....	0.25
Manhole on Main Line with 22-1/2° Lateral.....	0.75
Manhole on Main Line with 45° Lateral.....	0.50
Manhole on Main Line with 60° Lateral.....	0.35
Manhole on Main Line with 90° Lateral.....	0.25
45° Wye Connection or Cut-in.....	0.75
60° Wye Connection or Cut-in.....	0.70
Inlet or Manhole at Beginning of Line.....	1.25