TOWN OF LITTLE ELM

ORDINANCE NO. 1746

AN ORDINANCE OF THE TOWN OF LITTLE ELM, TEXAS, AMENDING CHAPTER 107, ZONING ORDINANCE, BY AMENDING SEC. 107.02.03 – DIRECTOR OF DEVELOPMENT SERVICES, SEC. 107.03.02 APPLICATION CONTENTS, SEC. 107.03.03 – APPLICATION SUBMITTAL PROCESS, OFFICIAL FILING DATE, REQUEST FOR THIRTY-DAY REVIEW PERIOD EXTENSION, SEC. 107.08.01 – GENERAL SUBDIVISION POLICIES, SEC. 107.08.03 – STREETS AND ALLEYS, AND APPENDIX CHANGES; PROVIDING A PENALTY; PROVIDING A SEVERABILITY CLAUSE; PROVIDING A REPEALER CLAUSE; AND PROVIDING AN EFFECTIVE DATE.

WHERE AS, the Town of Little Elm ("Town") is a home rule municipal corporation organized and existing by virtue of the Constitution and laws of the State of Texas and by its Charter adopted on May 1, 2001; and

WHEREAS, Town staff has recommended proposed textual changes to the Zoning Ordinance; and

WHEREAS, the Town's Planning and Zoning Commission and the Town Council of the Town of Little Elm, Texas, in accordance with the state law and the ordinances of the Town, have given the required notices and have held the required public hearings regarding the adoption of the proposed amendments; and

WHEREAS, after due deliberations and consideration of the recommendation of the Town's Planning and Zoning Commission, and any other information and materials received at the public hearing, the Town Council of the Town of Little Elm, Texas, has determine the various amendments to the Zoning Ordinance are in the best interest of public health, safety, and welfare of the residents of the Town.

NOW, THEREFORE, BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF LITTLE ELM, TEXAS:

SECTION 1. INCORPORATION OF PREMISES. The above and foregoing premises are true and correct and are incorporated herein and made a part hereof for all purposes.

SECTION 2. AMENDMENT AND ADOPTION. From and after the effective date of this ordinance, the following sections of Chapter 107, Subdivision Ordinance, Sec.107.02.03 - Director of Development Services, Sec. 107.03.02 - Application Contents, Sec. 107.03.03 - Application Submittal Process, Official Filing Date, Request for Thirty-day Review Period Extension, Sec. 107.08.01 - General Subdivision Policies, Sec. 107.08.03 – Street and Alleys, and Appendix

Standards, of the Code of Ordinances of the Town of Little Elm, Texas, are hereby amended through the adoption of the sections attached hereto.

SECTION 3. SAVINGS. This Ordinance shall be cumulative of all other ordinances of the Town, and shall not repeal any of the provisions of those ordinances except in those instances where the provisions of those ordinances are in direct conflict with the provisions of this Ordinance; provided, however, that any complaint, notice, action, cause of action, or claim which prior to the effective date of this Ordinance has been initiated or has arisen under or pursuant to such other ordinance(s) shall continue to be governed by the provisions of that ordinance or those ordinances, and for that purpose that ordinance or those ordinances shall be deemed to remain and shall continue in full force and effect.

SECTION 5. SEVERABILITY. The sections, paragraphs, sentences, phrases, clauses and words of this Ordinance are severable, and if any section, paragraph, sentence, phrase, clause or word in this Ordinance or application thereof to any person or circumstance is held invalid or unconstitutional by a Court of competent jurisdiction, such holding shall not affect the validity of the remaining portions of this Ordinance, and the Town Council of the Town of Little Elm, Texas hereby declares that it would have passed such remaining portions of this Ordinance despite such invalidity, which remaining portions shall remain in full force and effect.

SECTION 7. EFFECTIVE DATE. This Ordinance shall take effect immediately upon its adoption in accordance with and as provided by law and the Town Charter.

PASSED AND APPROVED by the Town Council of the Town of Little Elm, Texas on the 16th day of January, 2024.

The Town of Little Elm, Texas

_____

Curtis J. Cornelious, Mayor

ATTEST:

_____

Caitlan Biggs, Town Secretary

ATTACHMENT –
AMENDED SECTIONS OF CHAPTER 107 – SUBDIVISION ORDINANCE

Amended Sections

Section.107.02.03 - Director of Development Services

Selection.107.03.02 - Application Contents

Section.107.03.03 - Application Submittal Process Official Filing Date, Request for Thirty-day Review Period Extension

Section.107.08.01 - General Subdivision Policies

Section.107.08.03 – Street and Alleys

Appendix

Sec. 107.02.03 Director of development services.

(a) *Responsible official.* The director of development services is the responsible official for the following types of applications, approval of requests for review time extensions, variances, and petitions:

(1) Review and staff report, including a staff recommendation for approval/approval with conditions/disapproval with conditions, for any type of plat;

(2) Approval of requests for an extension of the 30-days review period;

(3) Appeal of a decision on any application for which the town engineer is the responsible official;

(4) Vested rights petition for any application when the director of development services is the responsible official.

(5) Review recommendations by the community development corporation (CDC), and carry out the CDC's decisions, on the following types of applications:

a. Acceptance of fees in lieu of parkland dedication;

b. The portion of an application showing where park land, including trails, is to be dedicated, and whether such dedication is acceptable;

c. Any other portions of applications showing items required by article 107.09, parks and open space.

(b) *Final decision-maker.* The director of development services is the final decision-maker for the following types of applications (subject to any appeal):

(1) Minor plat, as outlined in section 107.04.05, minor plats;

(2) Amending plat, as outlined in section 107.04.08, amending plats;

(3) Extension for a preliminary plat approval, as outlined in section 107.04.03, preliminary plats; and

(4) Certain types of vested rights petitions, as outlined in section 107.10.02, vested rights.

(c) *Additional Authority*. In the event there is not sufficient time for the Planning and Zoning Commission and/or the Town Council to approve or deny any plat based upon the filing date of such plat, the Director of Development Services may approve or deny such plat, pursuant to Section 212.0065 of the Texas Local Government Code, as amended. The disapproval of any plat by the Director of Development Services may be appealed to the Planning and Zoning Commission and/or the City Council.

(Ord. No. 1444, § 2(Att. A), 3-6-2018; Ord. No. 1531, § 2, 11-19-2019)

Sec. 107.03.02 Application contents.

(a) *Application contents generally.* All applications shall be submitted on a form supplied by the development services staff with the required information and exhibits as stated on the application form. Incomplete applications shall not be accepted. Neither the submission or acceptance of an application, however, shall be considered a filing of a plat application for purposes of triggering the Town's statutorily mandated 30-days review period of plat applications. *See*107.03.03 for determining the filing date for the 30-days review period.

(1) *Application timing.*

a. As authorized by Texas Local Government Code Section 212.0015, Development services staff shall establish submittal deadlines for all applications decided by the director of development services and by the commission. Such submittal schedule will be posted on the town website.

b. An application must be considered officially complete in accordance with section 107.03.03(c), determination of completeness, of this subdivision ordinance prior to being processed for review and consideration.

(2) *Fees required.* Every application shall be accompanied by the prescribed fees set forth in the town's fee schedule, as approved by town council and as may be amended from time to time. Fees are not refundable and are not a guarantee of approval. Review of the application will not begin until the appropriate fees have been processed by the town.

(3) *Proof of paid taxes on property.* An application shall not be deemed complete, nor shall it be approved, if there are delinquent town taxes on the subject property.

(b) *Modification of applications prior to approval.* The applicant may modify any submitted application prior to the expiration of the period during which the town is required to act on the application.

(1) *Modifications requested by the town.* Town requested revisions or modifications to any plat are required to be resubmitted to the department services department a minimum of five calendar days prior to the scheduled date for the planning and zoning commission hearing to allow staff adequate time to review the revisions and modifications for completeness and accuracy. Resubmittals for residential replats that require public noticing must be submitted a minimum of 20 calendar days prior to the scheduled date for the planning and zoning commission hearing to allow staff adequate time to review the revisions and modifications for completeness and accuracy and to publicize the public hearing in the official newspaper of the town, as required by state law.

(2) *Additional revisions.* Should certain requested revisions not be completed to the satisfaction of the town staff, additional revisions may be required from the applicant. The additional comments to be addressed may affect the tentatively scheduled planning and zoning commission hearing date (see section 107.04.04).

(3) *Applicant initiated revisions.* In all other instances (e.g., when the applicant chooses to submit a revised application on his own accord because of a change in development decisions), submittal of a modified application shall be subject to additional town staff review.

(Ord. No. 1444, § 2(Att. A), 3-6-2018; Ord. No. 1531, § 2, 11-19-2019)

Sec. 107.03.03 Application submittal process, official filing date, request for thirty-day review period extension.

(a) *Initiation by owner.* An application required under this subdivision ordinance may be initiated only by the owner of the land subject to the application, or by the owner's duly authorized representative. If the applicant is a representative of the property owner, the application shall include a written and notarized statement from the property owner, such as a duly executed power of attorney, authorizing the representative to file the application on the owner's behalf.

(b) *Applicability.* The procedures within this chapter shall apply to all applications that are required by the town and submitted in accordance with this subdivision ordinance.

(c) *Official filing date.* The 30-day time period established by state law, and by this subdivision ordinance, for approving, approving with conditions, or disapproving with conditions, shall begin on the official filing date. The official filing date is defined as the date the applicant submits the plat, along with a completed plat application and the application fees and other requirements prescribed by Texas Local Government Code Section 212, which date shall also be considered the date when the application for a plat is determined to be administratively complete. An application is considered administratively complete , and thus filed, upon the occurrence of all of the following: (1) when all necessary forms, supplemental documents, and copies are submitted and accepted by staff; (2) when staff has determined that the application for a plat meet all requirements of applicable town ordinances so that it may be reviewed by the Planning and Zoning Commission; and (3) all fees associated with the application have been paid and the issuance of a fee receipt by staff has occurred; and

(d) *Request for extension 30-day review period.* Pursuant to Texas Local Government Code, § 212.009(b-2), upon application in writing by the applicant, the Planning and Zoning Commission or, if applicable, the Town Council may approve one or more extensions of right to 30-day action, each such extension not to exceed 30 additional days. The director of development services shall be the responsible official for accepting a request for an extension of the 30-day review period.

(e) *Owners dedication language.* Refer to the plat checklist for the appropriate owner dedication language to include on the plat.

(Ord. No. 1444, § 2(Att. A), 3-6-2018; Ord. No. 1531, § 2, 11-19-2019)

Sec. 107.08.01 General subdivision policies.

(a) *Conformance to plans.*

(1) *Public improvements.* Proposed public improvements serving new development shall conform to and be properly related to the public facility elements of the comprehensive plan, other adopted master plans for public facilities and services, and applicable capital improvements plans, and shall at a minimum meet the service levels specified in such plans.

(2) *Conformance with master thoroughfare plan.* All plats within the town and its ETJ, and corresponding construction plans, shall provide for thoroughfares as shown in the master thoroughfare plan. Minor adjustments to thoroughfare alignments may be allowed without amending the master thoroughfare plan if the town engineer determines the new alignment meets the spirit and intent of the master thoroughfare plan and will not compromise public safety or traffic efficiency. The design and construction of all proposed thoroughfares shall be in conformance with the town's engineering design standards, and is subject to approval by the town engineer. Such approvals shall be required prior to any plat approval.

(3) *Master thoroughfare plan amendment.* If a significantly different roadway alignment or a road type from what is shown on the master thoroughfare plan is proposed, then the master thoroughfare plan shall be amended prior to any plat approval. Submission of a traffic impact analysis (TIA) of the proposed amendment by the developer may be required if the director of development services and the town engineer determine that such an analysis is necessary to fully assess the impact of the proposal upon the town's overall thoroughfare network.

(4) *Water and wastewater plans.* The design and construction of the water system and wastewater system to serve the development shall be in conformance with the town's master plans for water and wastewater facilities and with the engineering design standards. The design is subject to approval by the town engineer prior to approval of the construction plans and the final plat.

(5) *Storm drainage standards.* The design and construction of the storm drainage system to serve the development shall be in conformance with, but not limited to, the town's master plans for stormwater drainage, with the town's storm drainage policies (water reuse master plan), and with the engineering design standards. The design is subject to approval by the town engineer prior to approval of the construction plans and the final plat.

(b) *Adequate public facilities.*

(1) *Adequate services for areas proposed for development.* Land proposed for development in the town and in the town's ETJ shall be served adequately by essential public facilities and services, including, but not limited to, water distribution, wastewater collection and treatment, roadways, pedestrian circulation, storm drainage conveyance, and park and recreational facilities. Land shall not be approved for platting or development until adequate public facilities necessary to serve the development exist or provisions have been made for the facilities, whether the facilities are to be located within the property being developed or offsite. All street and road dedication requirements for land within a subdivision shall comply with Texas Local Government Code Section 212.010(c).

a. *Street access.* A plat will not be approved unless all of the proposed lots have safe and reliable street access for daily use and emergency purposes.

1. A plat will not be approved unless all of the proposed lots have access to an improved public street (or a public street that will be improved during construction of the proposed development) that meets the town's minimum design and paving standards, or to an

approved public way or mutual access easement that is connected to an improved public street.

2. Except for lots that are provided access from an approved cul-de-sac, all lots within a development shall have at least two means of access or approach. Where development phasing or constraints of the land prevent the provision of a second, separate means of access, the town may accept a temporary, paved street connection provided that a second permanent access point can be reasonably anticipated with future development of adjacent properties.

3. In certain circumstances where providing two means of access to a site is not feasible, the planning and zoning commission may waive this requirement if staff can demonstrate that the site can be adequately served by emergency vehicles and that life and safety issues have not been compromised.

4. For properties situated adjacent to an existing or planned median-divided thoroughfare, at least one of the required access points shall occur at, or through access easement connection to, a median opening (see diagram 107.13.01, median and cross access).

b. *Water.* A plat will not be approved unless all of the proposed lots are connected to a public water system which is capable of providing adequate water for health and emergency purposes.

1. Except for lots along an approved cul-de-sac, all lots shall be provided service connections from a looped water main providing water flow from two directions or sources.

2. Water service shall be sufficient to meet the fire flow requirements of the proposed development, except where a suitable alternative means of fire protection is approved by the fire chief.

3. The town may require the phasing of development and/or improvements to the water system to ensure adequate fire protection.

4. Plats for residential lots greater than one acre in size may use private well water, at the discretion of the town engineer.

c. *Wastewater.* A plat will not be approved unless all of the proposed lots are served by an approved means of wastewater collection and treatment.

1. The projected wastewater discharge of a proposed development shall not exceed the proposed capacity of the wastewater system.

2. The town may require the phasing of development and/or improvements to the sanitary sewer system so as to maintain adequate wastewater capacity.

3. Plats for residential lots greater than one acre in size may use private septic systems, at the discretion of the town engineer.

d. *Storm drainage.* Increased stormwater runoff attributable to new development shall not cause impacts to adjoining, upstream or downstream properties. Impacts are defined as an increase in runoff between pre- and post-development. Where the projected runoff from a new development exceeds runoff from pre-development conditions, the town may require the phasing of development, the use of control methods such as retention or detention, obtaining off-site drainage easements, and/or the construction of off-site drainage improvements as means of mitigation. All designs shall comply with the engineering design standards, as it exists or may be amended.

(2) *Town's cost of review.* Should the town deem that adequate review of the roadway, water, wastewater, or drainage submittal should be outsourced to a third party, the cost of such review shall be passed through to the developer or applicant.

(3) *Property owner's responsibilities.* The property owner shall be responsible for, but not limited to, the following:

a. *Dedication and construction of improvements.* The property owner shall dedicate all rights-of-way and easements for, and shall construct and extend, all necessary on-site and off-site public improvements for water distribution, wastewater collection and treatment, streets, storm drainage conveyance, and other improvements that are necessary to adequately serve each phase of a proposed development at service levels that are consistent with the town's applicable master facilities plans and engineering design standards. All street and road dedication requirements for land within a subdivision shall comply with Texas Local Government Code Section 212.010(c).

b. *Abutting substandard streets.* Where a substandard street abuts or traverses a proposed development, the town may require the property owner to dedicate additional right-of-way and to improve the street to the current town design and construction standards as set forth in the engineering design standards. Such requirements to improve the substandard street to the town's current standards shall only be imposed following careful review of factors including, but not limited to:

1. The impact of the new development on the street;
2. The timing of the development in relation to need for the street; and
3. The likelihood that adjoining property will develop in a timely manner.

c. In the case of frontage or service roads for state or federally designated highways, the entire abutting right-of-way shall be dedicated to the town and improved to the county, state or federal agency's applicable construction design standards if such improvement is approved by the agency.

d. *Right-turn lanes mandatory.* The town reserves the right to require free right turn lanes into any development from a roadway whose posted speed limit is 40 miles per hour or greater. Should the applicant request a waiver from this requirement, the applicant must provide to the town a study by an acceptable third party that justifies the elimination of the required free right turn lane.

e. *Facilities impact studies.* The town may require that a developer prepare a comprehensive traffic impact analysis (TIA), flood or drainage study or downstream assessment, or other facilities impact studies in order to assist the town in determining whether a proposed development will be supported with adequate levels of public facilities and services concurrent with the demand for the facilities created by the development. The cost of such study or studies shall be borne by the applicant.

f. *Timing and approval of studies.* Any outside study shall be subject to approval by the town engineer prior to approval of the preliminary plat and the construction plans. The town also may require, at the time of approval of a subsequent applications (e.g., final plat), an update of a facilities impact studies that were approved in conjunction with a prior application (e.g., preliminary plat).

g. *Future extension of public facilities.* The property owner shall make provisions for future expansion of the public facilities as needed to serve future developments, subject to the town's oversize participation policies, if applicable.

h. *Operations and maintenance of the public facilities.* The property owner shall provide for all operations and maintenance of the public facilities, or shall provide proof that a separate entity will be responsible for the operations and maintenance of the facilities.

i. *Fiscal security.* The property owner shall provide all fiscal security required for the construction of the public facilities.

j. *Approvals from utility providers.* The property owner shall obtain all necessary approvals from the applicable utility providers other than the town, and shall submit written verification of such approvals to the town with the construction plans.

k. *Compliance with utility providers.* The property owner shall comply with all requirements of the utility providers, including the town and applicable utility districts.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 107.08.03 Streets and alleys.

(a) *Streets basic policy.*

(1) *Street improvements.* In platting a new development, the property owner shall provide additional right-of-way needed for existing or future streets as required by the engineering design standards and as shown on the thoroughfare plan (see table B, thoroughfare types and standards). All street and road dedication requirements for land within a subdivision shall comply with Texas Local Government Code Section 212.010(c).

(2) *Existing substandard streets.*

a. When a proposed residential or nonresidential development abuts one or both sides of an existing substandard street, the developer shall be required to improve the substandard street and its appurtenances (such as curbs and gutters, sidewalks, barrier-free ramps, street trees, etc.) to bring the same to town standards, or to replace it with a standard town street, at no cost to the town other than as may be provided in the town's cost-sharing policies, including any ordinances that are in effect at the time of final plat approval.

b. If the proposed development is located along only one side of a substandard street, and if the town makes a determination that it is not feasible to improve the full width of said substandard street at that time the town may require the developer to pay into escrow, in accordance with section 107.05.04, development agreements, funds for the future improvement of the street as a condition of final plat approval for the development.

c. When a traffic impact analysis (TIA) is required or voluntarily submitted, the findings determined shall not be imposed on the requirements, alignment, rights-of-way, and number of lanes shown on the master thoroughfare plan, as it exists or may be amended. The TIA may be used to justify amendments to the thoroughfare plan, but in no case shall dictate such amendments.

(3) *New perimeter streets.*

a. When a proposed residential or nonresidential development is developed abutting an existing or planned major thoroughfare, minor thoroughfare or collector street as shown on the master thoroughfare plan, the developer shall construct a portion of the abutting street and its appurtenances (such as curbs and gutters, sidewalks, barrier-free ramps, street trees, etc.) to the town's standards for that type of street (per the engineering design standards). If the town engineer determines that it is not feasible to construct the abutting street and its appurtenances at the time of development, the town may require the developer to pay into escrow, in accordance with section 107.05.04, development agreements, funds for the future construction of the street as a condition of final plat approval for the development. The funds placed in escrow or the value of the lanes constructed shall be roughly proportional to the amount of traffic estimated to be generated by the development itself.

b. When a proposed residential or nonresidential development is constructed and has designed an unplanned perimeter street in order to provide access to the site and/or adjacent land, the developer shall construct a portion of the abutting street as described in section 107.08.03(a)(4), new internal streets, below, and under the same conditions.

(4) *New internal streets.*

a. All new streets and their appurtenances internal to a proposed residential or nonresidential development shall, at a minimum, be built to a width and design that will adequately serve the

development, and shall conform to the town's standards as described in the engineering design standards. If oversizing of an internal street is deemed necessary by the town engineer for traffic safety or efficiency (such as adjacent to a school or park site), then the town and/or the applicable entity may participate in such oversizing costs as part of a development agreement/facilities agreement with the developer.

b. Streets which temporarily dead-end at power lines, railroads or similar rights-of-way shall be constructed for at least one-half the distance across these rights-of-way, or provision shall be made to place the construction cost for said improvements in escrow with the town in accordance with section 107.05.04, development agreements.

c. When, in the judgment of the town engineer, it is not feasible to construct an internal street or appurtenances at the time of development of the subdivision, the town may require the developer to pay into escrow funds for the future construction of the street or its appurtenances as a condition of final plat approval for the development, in accordance with section 107.05.04, development agreements.

(5) *Impact fees.* All fees due on the project shall be paid in accordance with the town's impact fee ordinance and/or executed development agreement/facilities agreement.

(b) *Street design and appurtenances.*

(1) *Application of requirements.* Street design requirements are subject to the provisions included in the engineering design standards, development agreements and planned development ordinance (if applicable to the subject property) as well as the regulations contained within this subdivision ordinance.

(2) *Conformity to the master thoroughfare plan.* The general location of streets shall conform to the master thoroughfare plan. For streets that are not shown on the master thoroughfare plan, such as local residential streets, the arrangement of such streets shall:

a. Provide for the continuation or appropriate continuation of existing streets or street stubs from or into surrounding areas - refer to street stub requirements outlined in section 107.08.03(b)(8), stub streets, and connectivity requirements in section 107.08.03(b)(9), street connectivity;

b. Conform to any plan for the neighborhood approved or adopted by the town to address a particular situation where topographical or other conditions make continuance or conformity to existing streets impractical; and

c. Not conflict with existing or proposed streets or driveway openings, including those on the opposite side of an existing or planned thoroughfare, as described within the engineering design standards.

d. New streets that cross divided arterials shall align to the greatest extent possible with opposite streets such that median openings can be shared.

(3) *Relation to adjoining street system.* The proposed street system shall extend all existing major and minor arterials and such existing collector and local streets as may be necessary for convenience of traffic circulation and emergency ingress and egress.

(4) *Maximum cul-de-sac street length.* No cul-de-sac street shall be longer than 600 feet.

(5) *Maximum street length.* No street shall be more than 1,000 feet in length without an intersection with another street which will provide some degree of flexibility in traffic patterns and public convenience.

a. See the engineering design standards for specific design requirements.

b. In certain circumstances, the town may consider minor exemptions to the maximum street lengths if sought by the applicant. These circumstances include, but are not limited to:

1. Rerouting of streets;

2. Increasing the lot count by five percent or more from the previously approved preliminary plat or final plat; or

3. Approval by the planning and zoning commission through a subdivision ordinance variance. Any variance approved by the planning and zoning commission shall include the curvilinear requirement and street calming methods, described below.

(6) *Curvilinear requirement.* When a residential street length exceeds 500 feet but is less than 1,000 feet in length, the design of the street shall include a curve of between 100 to 200 feet radius for a length equal to the curve radius.

(7) *Street calming methods.* When a residential street length exceeds 500 feet but is less than 1,000 feet in length, one or more of the following street calming methods shall be incorporated into the design in addition to the curvilinear requirement (above) in order to reduce traffic velocity and increase safety to pedestrians and cyclists, subject to the review and approval of the town engineer:

a. Street width narrowing with landscaped islands placed approximately every 400 feet;

b. Roundabouts placed approximately in the center of the street length; and/or

c. Landscaped medians that include pedestrian crossing oases included for a minimum of one-third of the street length.

(8) *Street widths and rights-of-way.* Street widths and related rights-of-way shall be designed in accordance with the following:

a. Master thoroughfare plan (adopted on March 24, 2016, and as amended);

b. Planned development ordinance (if applicable to the subject property); and

c. All streets shall be paved with a permanent type of pavement in accordance with the engineering design standards.

TABLE B - THOROUGHFARE TYPES AND STANDARDS								
Criteria	Primary Arterial-1	Primary Arterial-2	Primary Arterial-3	Minor Arterial-1	Minor Arterial-2	Minor Arterial-3	Collector	Urban Mix Residential
Designation	P6D-1	P6D-2	P6D-3	M4D-1	M5U-2	M4U-3	C2U	R
Limited to:	(US 380)	(FM 423, 720 and 2931)	Town and ETJ roadways					
Right-of-way	160'	140'	124'	100'	100'	100'	60'	50'
ROW at intersections	Per Texas DOT		134'	110'	100'	100'	60'	50'
Lanes/division			6LD	4LD	5LU	4LU	2LU	2LU
Roadway width (B-B)			37'	37'	63'	49'	37'	31'
Median width			20'	20'	-	-	-	-
Parkway width			15'	15'	9'	25'	11.5'	9.5'
Parking			No	No	No	No	Yes	Yes

(9) *Street names, street name signs, and traffic control signs.*

a. *Street names.* New streets shall be named so as to provide naming continuity with existing streets, and so as to prevent conflict or "sound-alike" confusion with similar street names. All street names shall be approved by the director of development services prior to any plat approval, and prior to approval of the construction plans and should comply with the town's approved street name policy, as it exists or may be amended.

b. *Cost of signs.* The cost of street name signs and traffic control signs shall be paid for and installed by the developer.

c. *Town standards.* All street name signs and traffic control signs shall conform to the town's details for street name sign design and the latest edition of the Texas "Manual of Uniform Traffic Control Devices" (TMUTCD).

(10) *Traffic studies.* The town engineer may require a traffic impact analysis (TIA) or other type of engineering study from the developer prior to any approval for plats or construction plans to ascertain technical data pertaining to the potential traffic impact of the proposed development on the town's street system. For any study required by the town that is outsourced to a third party, the cost of such study shall be passed through to the developer or applicant.

(11) *Stub streets.*

a. See the engineering design standards for all design requirements.

b. Future connections are required to adjacent vacant properties at locations as approved by the director of development services and the town engineer.

c. When a residential development is constructed in phases requiring a temporary stubbed street, a paved temporary turn-around shall be provided for maneuvering by emergency equipment.

d. A note shall be clearly placed on the final plat indicating that the stub street will be extended with future development (see requirements for temporary turn-arounds in the engineering design standards).

e. All stub streets shall have barricades that meet TMUTCD standards.

f. All stub streets shall have a sign prominently posted at the terminus of the street to indicate no through traffic and that the street will be extended in the future.

1. The sign shall comply with standards established by the town engineer, and

2. Installation and cost of the signs shall be the responsibility of the developer.

(12) *Connectivity.*

a. New residential developments shall provide street connections to adjacent developments, as determined by the director of development services, allowing access between developments for neighborhood traffic and to enhance pedestrian and bicycle connectivity as recommended in the comprehensive plan.

b. Residential developments shall not have direct vehicular access to adjacent commercial or retail developments. Pedestrian and/or bicycle access may be provided, as approved by the director of development services.

(13) *Street lighting required.* Street lighting shall be provided by the developer along all streets and thoroughfares in accordance with the engineering design standards. The developer is responsible for the installation of street lighting and they shall be installed to town standards prior to the town accepting responsibility for the future provision of electricity to the street lights. The town engineer

shall be the responsible official for decisions related to street lighting, and may authorize a minor variance to these regulations, in accordance with section 107.10.01, variances, for a street lighting requirement if such variance will not compromise public health, safety, security and convenience.

(14) *Street lighting placement.*

a. Street lights shall be placed at every street intersection.

b. In addition to intersection placement, street lights shall be spaced no greater than 500 feet apart.

c. Street lighting shall be placed within the right-of-way, either the median or the parkway, or if not practical, within a utility easement.

d. Street lighting shall be placed in such a manner to avoid interference of nearby trees or signs with the intended illumination field.

e. Street lighting shall be chosen and installed according to the engineering design standards and shall conform to the Dark Sky Ordinance (Ordinance No. 703 adopted June 7, 2005), and as amended.

(c) *Private streets.*

(1) *Private streets.* Private streets within the town and/or the ETJ may be allowed in accordance with the zoning ordinance. Private streets shall be designed and constructed to the same standards as for public streets, in accordance with the engineering design standards.

(2) *Town council action required.* Dedicated streets and rights-of-way shall not be designated or used as private streets and such use is prohibited, except where specific approval is given by action of the town council for properties within the town's extraterritorial jurisdiction and upon approval of a specific use permit for properties within the town limits. The town council may add any conditions as deemed appropriate as part of the approval of a private street development.

(3) *Private street development generally.* Private street developments are subject to provisions of the master thoroughfare plan and the subdivision ordinance, as it exists or may be amended. Private street developments shall only be permitted by the approval of a specific use permit or through a planned development district. Private street developments shall be restricted to an area that is surrounded on at least three sides, and in any event no less than approximately 75 percent of the perimeter, by natural barriers or similar physical barriers created by man. Examples of natural barriers would be creeks and floodplains. Examples of similar barriers created by man would be a golf course, school location, park, railroad tracks or a limited access roadway. Non-qualifying man-made barriers include screening walls, local roadways, man-made drainage ditches, detention ponds, landscape buffers, earthen berms, utility easements and rights-of-way. Private street developments may not cross an existing or proposed thoroughfare as shown on the town's adopted master thoroughfare plan nor shall a private street development disrupt an existing or proposed hike and bike route.

(4) *Connectivity.* The comprehensive plan calls for all plans for development in the town to include a high degree of connectivity within developments and between one development and another. Any proposed private street development adjacent to an existing public street subdivision that can be reasonable connected, including by constructing a bridge or culvert, for example, should not be approved as a private street development. The two adjacent subdivisions should allow cross-connectivity using public streets. This is especially important when one of the two adjacent subdivisions has a school site within the development that will be accessed by both developments.

(5) *Criteria for approval for private streets in new developments.* Private street developments within the town may be considered through the specific use permit (SUP) process or through a planned development district. The planning and zoning commission and town council shall use any of the following criteria:

a. Non-disruption of planned public roadways or facilities/projects (thoroughfares, parks, park trails, public pedestrian pathways, etc.);

b. Non-disruption to and from properties of future developments either on-site or off-site to the proposed subdivision;

c. No negative effect on traffic circulation on nearby public streets;

d. Not less than 100 feet of street frontage on which to locate the main entrance gate;

e. No more than two gated street entrances, subject to approval by the town engineer, may face the same thoroughfare;

f. No impairment of access to and from public facilities including schools or public parks;

g. No impairment of the adequate and timely provision of essential municipal services (emergency services, water/sewer improvements or maintenance, etc.);

h. The main entrance to the private street development shall have adequate throat depth to provide for residents, their guests and any accidental access and have an escape aisle for those vehicles not admitted into the subdivision, as determined by the town engineer;

i. Existence of natural and/or qualifying manmade boundaries around 75 percent of the development; and/or

j. Absence of a concentration of private street developments in the vicinity of the requested private street development.

(6) *Conversion of public streets to private streets.* The criteria for converting existing public streets to private streets includes all the criteria, issues and procedures involved with new developments, listed above, plus:

a. Submittal of a petition signed by 100 percent of the owners in the existing subdivision requesting conversion to private streets;

b. Existence of a property owners association that would be responsible for owning and maintaining the converted streets and rights-of-way;

c. Applicants must agree to contract with the town for the purchase of the installed infrastructure and rights-of-way from the Town of Little Elm at fair market appraised value for cash in full payment, and agree to maintain the infrastructure and rights-of-way at town standards thereafter prior to the approval of the specific use permit;

d. All documents are subject to the review and approval of the town attorney; and/or

e. Subsequent to the approval of the private street designation, the entire subdivision affected shall be re-platted to reflect the right-of-way ownership changes.

(7) *Conversion of private streets to public streets.* The town may, but is in no way obligated to, accept private streets for public access and maintenance. Requests to convert private streets to public streets shall be subject to all of the following provisions:

a. The homeowners' association (HOA) shall submit a petition signed by at least 67 percent of its members/lot owners (or a greater number of signatures, if required by the HOA documents or declarations).

b. All of the infrastructure shall be in a condition that is acceptable to the town engineer.

c. All security stations and other structures not consistent with a public street development shall be removed by the HOA, at its cost, prior to acceptance of the streets and appurtenances by the town.

d. All monies in the reserve fund for private street maintenance shall be delivered to the town. Money in the reserve fund in excess of what is needed to bring the streets and appurtenances up to town standards will be refunded to the HOA. Private street developments that exist as of the adoption of this ordinance are not required to deliver a reserve fund balance to the town.

e. The HOA shall prepare and submit a replat to development services for review. Upon approval, the HOA shall file the replat to dedicate the streets and appurtenances to the town.

f. The HOA shall modify and re-file, at its cost, the HOA documents to remove requirements specific to private street developments. The town attorney shall review the modified HOA documents prior to their filing. The HOA shall be responsible for the cost of review by the town attorney.

(8) *HOA requirements.* Private street developments and the related HOA shall meet all requirements of section 107.08.09, HOA requirements, of this ordinance.

(d) *Alleys.*

(1) *Alleys optional.* Alleys are optional for all single-family and two-family residential lots that are greater than 40 feet in width at the front building line.

(2) *Alleys required.* Alleys are required for residential lots that are equal to or less than 40 feet in width at the front building line. When so utilized, alleys shall be constructed according to design criteria in the engineering design standards.

(3) *Alley design.* Permanent dead-end and "hammerhead" alleys are prohibited. All alleys shall have adequate turnouts and street entrances such that vehicular traffic flow is continuous and efficient. Where a temporary dead-end alley situation is unavoidable (such as due to project phasing), a temporary, paved turn-around bulb or turnout onto a street, either of which will require a temporary alley easement, shall be shown on the plat.

(4) *Street access when alleys are present.* No driveway shall access a street when an alley is available unless specifically allowed in writing by the town engineer.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

[Appendix.] Engineering Design Standards

Sec. 1.0 General requirement.

Purpose.

The design criteria and standards section of the subdivision regulations for the Town of Little Elm is intended primarily for use by the developer's engineer. These criteria and standards should enable the engineer to design the required community facilities in a manner acceptable to the town. There may be special circumstances which would call for requirements in excess of those outlined. In most cases, additional requirements will be apparent to the developer's engineer while preparing the plans for the subdivision.

Compliance Required.

Prior to the commission's approval of the final plat, the subdivider shall comply or provide for compliance with the policies and procedures set forth in these regulations for construction of street improvements and utilities. No building, sewer, electrical or plumbing permit shall be issued by the town as to any property in the subdivision until:

1. The preliminary plan has been approved; and
2. The working drawings, specifications and agreements required herein have been reviewed and approved by the affected agencies and, as required, by the town attorney.

Town Design Criteria and Standards.

There are hereby adopted by reference and made a part of these regulations design criteria and standards which shall be controlling in design, construction and installation of street paving, curbs and gutters, sidewalks, utilities and other public improvements required herein. All references to town design criteria and standards shall mean and include those standards and specifications, together with all exhibits, charts, drawings and diagrams appertaining thereto, which have been approved by the town's engineer, adopted by the town council, and placed on file in the office of the town secretary.

Installation and Financing.

The subdivider shall arrange with the town and with utility companies franchised to serve the area in which the subdivision is located for the construction costs of streets and alleys, utility lines and other public improvements. The subdivider shall also arrange for the sequence of work so that underground utilities shall be installed in those portions of streets intended for vehicular traffic before such streets shall be surfaced. If the several improvements required herein have not been installed or constructed prior to submission of the final plat then the final plat shall bear a restriction that no lot shall be occupied and that no municipal services shall be extended thereto until the specified utilities and improvements have been constructed as required.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 2.0 Street standards.

Thoroughfare Design Requirements

A. *Street Widths*

1. Street widths for all subdivisions shall be 31 feet from back of curb to back of curb on residential sections. All streets which are not governed by one of the following conditions shall be considered residential for width design:

2. Designated as a collector (which shall be 37 feet from back of curb to back of curb) or thoroughfare (which shall be 46 feet from back of curb to back of curb) by the town's comprehensive plan.

3. Adjacent to commercial or multifamily land-use where, in the opinion of the town's engineer or the town's planner, additional street width is indicated for proper access and circulation.

4. Where, in the opinion of the town administration or in the opinion of the developer with the concurrence of the town administration, the esthetic value achieved from extra width is dictated by special conditions.

5. In the case of [subsection] (1) above, the section to be constructed shall be in accordance with the comprehensive plan or a revision thereof based on updated conditions. In the case of [subsections] (2) and (3), each condition will be studied individually and approved by the town prior to approval of the subdivision in question.

B. *Street Sections.*

1. Street sections shall be as shown on the following pages for residential, collector and thoroughfare type streets. These sections shall govern except in conditions of [subsections] (2) and (3) above. In those instances, each condition shall be studied by the town's staff individually and designed for the specific situation. Such design must be approved by the town prior to approval of the subdivision in question.

Sidewalk Policy.

Statement of policy on sidewalks.

a. Sidewalks shall be required in those locations where travel by foot is of such a volume as to warrant special protection for pedestrians using the public right-of-way.

b. In general, this requirement shall be considered to have been met when sidewalks are installed along such thoroughfares, arterial streets and other streets that provide major pedestrian access to schools, places of public assembly and commercial centers. Further, sidewalks may be installed by order of the town council upon receipt of a petition signed by more than 60 percent of property owners and 60 percent of properties in any one block face.

c. Sidewalks adjacent to arterials and collectors shall be a minimum of six feet.

d. Sidewalks adjacent to residential streets shall be a minimum of five feet in width.

e. The cost of constructing sidewalks shall be assessed against the abutting property where such property is especially benefited.

f. Developed area criteria.

a. Town initiated. In cases where the town initiates construction of sidewalks, a public hearing shall be held upon the necessity for such construction and the special benefits, if any, that accrue to the property being assessed.

b. Property owner initiated. In cases where sidewalk construction improvements are initiated by a petition of 60 percent or more of the abutting property owners and properties in any one block face, the cost of the improvements shall be assessed against the abutting property owners, following a public hearing upon the necessity for such construction and the special benefits if any, that accrue to the property being assessed.

Criteria for Property Being Developed.

At the option of the developer, required sidewalks shall be installed either with the construction of abutting street improvements or at the building site prior to occupancy. The town may require the construction of the sidewalk improvement in advance of the issuance of a building permit where such sidewalk construction is necessary to protect the public safety.

Street Name Signs.

The subdivider shall install or shall arrange for the installation of street name signs satisfying the specifications of the town.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 3.0 Drainage design requirements

Section 3.1. Introduction

3.1.1 Stormwater Goals and Objectives

The purpose of this manual is to provide *adequate stormwater management* within the Town of Little Elm (Town) and its extraterritorial jurisdiction (ETJ). *Adequate stormwater management* is achieved by the development, adoption, and enforcement of policies and standards for drainage design that achieve the following goals:

1. Protect public health and safety
2. Prevent property damage due to flooding
3. Preserve and enhance water quality and minimize water pollution in Lewisville Lake and other natural waterbodies
4. Stabilize or decrease streambank and channel erosion on creeks, channels, and streams
5. Fully comply with all state, federal, and local regulatory and permitting requirements relating to stormwater and land development
6. Proportionally distribute the cost of necessary drainage improvements
7. Minimize the maintenance cost of drainage facilities constructed
8. Promote sustainable and productive development and redevelopment

This manual is intended to supplement the Town *Code of Ordinances* with procedures and technical criteria to meet the Town's adopted policies. If any policies and requirements set forth herein conflict with, or are inconsistent with, criteria outlined elsewhere, the more stringent criteria shall apply.

3.1.2 Applicability of Stormwater Criteria

The stormwater criteria outlined in this manual applies to development and redevelopment activity within the limits of the Town of Little Elm and its ETJ to the extent legally authorized. Development and redevelopment activities meeting the requirements outlined in **Section 3.1.3.1** require the submittal of a drainage plan for Town review and approval prior to commencement of land disturbing activities.

It is recognized that there will be specific situations not completely addressed by this manual. Unusual circumstances or special designs requiring variance from standards within this manual require the express written approval of the Town Engineer. All requests for variance from the Town's drainage criteria shall be considered based on the standards, procedures, and criteria outlined in **Section 107.10.01** of the Town's *Subdivision Ordinance*.

3.1.3 Stormwater Submittal Requirements

The design of stormwater infrastructure must be performed in accordance with this manual and other applicable Town criteria. All plans and studies with stormwater elements shall be prepared and sealed by a Licensed Professional Engineer with a valid license and a valid registered firm number from the State of Texas.

All applicable calculations, plans, and other documentation necessary to evaluate the design must be provided for review. Upon receiving a stormwater submittal for review, the submittal package will receive a cursory review for completeness of submittal requirements. Incomplete submittals shall be rejected by the City without further review. The Town's review period conforming to State regulations governing subdivision application begins on the date the application is accepted for review.

3.1.3.1 *Stormwater Submittal Elements*

The Town of Little Elm has developed a *Development Application Handbook* to assist developers with the preparation of applications for various types of planning and development activities. Developers shall utilize the applicable forms and checklists in the preparation and submittal of storm drainage plans for development review.

Storm drainage plans shall be prepared for subdivision applications and civil plan submittals that include the following activities:

1. Land disturbing activity or platting of 1.0 acre or more; or
2. Land disturbing activity of less than 1.0 acre where the activity is part of a common plan of development that is 1.0 acre or more.

A common plan of development consists of construction activity that is completed in separate stages, separate phases, or in combination with other construction activities. For the purposes of this policy, this classification may include, but is not limited to, a tract that:

1. Is included in a single concept plan submitted to the Town
2. Is included in a single preliminary plat submitted to the Town
3. Is comprised of contiguous land (or land separated only by roadway and/or drainage rights-of-way or easements) under the same root ownership
4. Is encumbered by a single Master Drainage Study or Plan
5. Is encumbered by a single Developer Agreement, TIF, 380 Agreement or other public/private partnership agreement
6. Is overlaid by a common Homeowner's or Property Owner's Association (HOA or POA), or
7. Is owned or managed by a common Master Developer.

Site developments that do not meet the applicability requirements outlined above will not require a drainage plan submittal. However, all developments with the Town limits and ETJ shall comply with the Town Subdivision Ordinance and development permitting requirements, including but not limited to: building permits, floodplain development permits, SWPPP, and grading permits.

3.1.3.2 *Permitting Requirements*

The engineer must provide proof of compliance with applicable federal, state, and local environmental regulations upon request by the Town. Potential applicable regulations and permits may include, but are not limited to:

1. Section 404 of the Clean Water Act (33 USC 1344)
2. Section 106 of the National Historic Preservation Act
3. Water Rights
4. Section 303(d) Impaired Waters
5. Migratory Bird Treaty Act
6. Water Well Drilling
7. Threatened and Endangered Species Act

8. The Texas Archeological and Research Laboratory Requirements
9. The Antiquities Code of Texas
10. Air Quality
11. TCEQ Dam Requirements

The engineer is responsible for providing documentation of the relevant United States Army Corps of Engineers (USACE)-approved permits prior to beginning modification to the floodplain, or for providing a signed and sealed statement detailing why such permits are unnecessary. A preliminary Section 404 permitting evaluation shall be included as part of the downstream assessment report for the development. Should mitigation be required under Section 404 of the Clean Water Act, the areas shall be identified on the engineering construction plans.

Additional permitting requirements may apply for design of stormwater storage facilities and projects that impact regulatory floodplains. Further guidance is provided in **Sections 3.6.3**, **3.7.3**, and **3.7.4**.

3.1.3.3 *Acceptable Modeling Software*

The design of storm drainage facilities can be aided by and sometimes requires the use of hydrologic and hydraulic modeling programs. **Table 1** lists several widely used modeling software which are acceptable to the Town. The use of a program that is not included in the list requires prior approval by the Town Engineer.

Table 1: Acceptable Hydrologic and Hydraulic Modeling Programs

Software	Hydrologic Calculations	Hydraulic Calculations	FEMA Approved	Water Quality Features
HEC-HMS	X		X	
HEC-RAS		X	X	
Autodesk Suite – Hydraflow, Storm and Sanitary Analysis	X	X		(X)
Bentley Suite – CulvertMaster, FlowMaster, PondPack, StormCAD	X	X	(X)	
Innovyze Suite – ICM, InfoWorks	X	X		X
SWMM (EPA)	X	X		X
XPSWMM	X	X	X	X

The most recent version of the program should be used unless the Town provides an approved effective model developed using a previous version, and in other instances as approved by the Town Engineer. Only Federal Emergency Management Agency (FEMA) approved software can be used for design within the Regulatory Floodplain. Refer to **Chapter 7** for additional guidance on software requirements for floodplain development applications.

Section 3.2. Stormwater Design Standards

3.2.1 Design Frequency for Drainage Features

The design of drainage facilities relies on evaluation of performance during theoretical rainfall events. A rainfall event is classified by its annual exceedance probability (AEP), which describes how likely an event is to occur in a given year. This probability has classically been presented inversely as a return period, giving the estimated time interval between events of a similar size or intensity. For example, the “100-year storm” return period has an AEP of 1%. This does not mean that a storm of this duration or intensity occurs every 100 years—instead, it means that, in any given year, there is a 1% chance of such an event occurring.

Table 2 lists the storm events to be used in the design of drainage facilities.

Table 2: Design Storm Events

Storm Event Name	Storm Event Description	Design Standard
Water Quality	Criteria based on volume of 1.5 inches of rainfall; not a storm frequency.	• Onsite water quality controls
Streambank Protection	2-year return period (50% AEP)	• Low flow channels and velocity check
Conveyance	25-year return period (4% AEP)	• Secondary check for street inundation and open travel lanes
Flood Mitigation	100-year return period (1% AEP)	• Open channels • Primary standard for street and storm drain design

3.2.2 Drainage Impacts

The design of a storm drainage system must account for offsite flows, flows generated by the development, and the impacts on the downstream drainage system. All stormwater discharges from the development shall be conveyed to an adequate outfall. An adequate outfall is a structure or location that is adequately designed as to not cause adverse impacts to adjacent or downstream properties or facilities. An adequate outfall shall have capacity to convey any increased stormwater runoff from the site.

In order to determine the adequate outfall, the engineer must establish the zone of influence for the development. The zone of influence is the point downstream where the discharge from a proposed development no longer has a significant impact upon the receiving stream or storm drainage system. The hydrologic and hydraulic analysis to establish the zone of influence from a proposed development and to demonstrate an adequate outfall for site drainage is called a downstream assessment.

Generally, the zone of influence will be defined by a detailed hydrologic and hydraulic analysis. For watersheds of 100 acres or less at any proposed outfall, the 10% rule of thumb may be used in order to determine the zone of influence. The 10% rule states the zone of influence is considered to be the point where the drainage area controlled by the drainage facility comprises 10% of the total drainage area. If a portion of a larger property is being developed, the zone of influence shall be determined based on the entire property. A detailed study may be required for any drainage area regardless of size at the discretion of the Town Engineer.

It shall be the responsibility of the engineer to contact the Town and inquire about other proposed or approved developments within the zone of influence. At the direction of the Town Engineer, these developments shall be accounted for in the downstream assessment.

Table 3: Zone of Influence (Adequate Outfall) Determination

Item	Parameter	Adverse Impact Determination
1	**Inhabitable Structures**	• No new or increased flooding (0.00 feet) of existing insurable (FEMA) structures (inhabitable buildings).

Item	Parameter	Adverse Impact Determination
2	**Flood Elevations**	• No increase (0.00 feet) in the 2-, 25-, and 100-year water surface elevations unless contained within the owner's property or within an existing channel, roadway, drainage easement, and ROW. • Dry lane and gutter capacity requirements set forth in **Table 10** shall also be met.
3	**Floodplain Ordinance**	• Where provisions of the Town's floodplain ordinance may be more restrictive, the floodplain ordinance shall have authority over the above provisions.
4	**Channel Velocities**	• Proposed channel velocities for 2-, 25-, and 100-year storms cannot exceed the applicable maximum permissible velocity shown in **Table 9**. • If existing channel velocities exceed maximum permissible velocities shown in **Table 9**, no more than a 5% increase in velocities will be allowed. • Exceptions to these criteria will require certified geotechnical/ geomorphologic studies that provide documentation that the higher velocities will not create additional erosion.
5	**Downstream Discharges**	• No increase in downstream discharges caused by the proposed development that, in combination with existing discharges, exceeds the existing capacity of the downstream storm drainage system or existing right-of-way.
6	**Water Quality**	• Compliance with water quality standards and requirements outlined in **Chapter 3**.

3.2.3 Drainage Considerations for Site Grading

3.2.3.1 *Grading Plans*

Grading plans shall be submitted for any land disturbance activities. Existing (pre-project) and proposed (post-project) contours shall be shown. The natural flow of surface waters shall not be diverted or impounded in a manner that damages adjacent property.

Residential development shall be type A, B, or C drainage for each lot within the subdivision as described in Housing and Urban Development (HUD) Federal Housing Administration (FHA) Data Sheet 72, as amended. Type 1 or 2 block grading as shown in the HUD information is preferred. Type 3 and 4 block grading are allowed only if:

1. A flume or channel is constructed at the rear of the lot to intercept runoff; or
2. Runoff from no more than 3 lots is accumulated prior to constructing a drainage system to intercept the runoff.

To ensure adequate drainage between lots after final construction of residential structures, the minimum slope between lot lines is required to be at least 50% steeper than the HUD minimums. Alternatively, the builder may provide a written certification that site grading is as prescribed in the grading plan and may be held responsible for drainage complaints by residents.

The engineer may utilize swales to redirect flows. In such cases, the engineer shall provide more detailed information in addition to the lot grading type (A, B, or C) by indicating spot elevations on each lot. If the site is complex and an overall site grading plan cannot be developed in accordance with the HUD standards, an individual grading plan for each lot shall be submitted by the engineer prior to the issuance of building permits. The individual grading plans shall be coordinated with surrounding lots. For these complex plans, an as-built letter shall be submitted by the engineer prior to final inspection.

3.2.3.2 *Minimum Lot and Floor Elevations*

The minimum elevation for the buildable area (including parking areas) of the lot shall be set at or above the 100-year water surface elevation, or as directed by the Town Engineer. Any inhabitable structure shall have a finished floor elevation 2 feet above the 100-year water surface elevation.

For developments outside of the floodplain, minimum floor elevations shall be at or above the street curb, edge of alley, or rear property line, whichever is lower, unless otherwise approved by the Town Engineer. For lots adjacent to or in the influence of a sump area and a positive overflow, the lot elevation will be at or above the sump area top of curb or the possible maximum pool elevation when the positive overflow is functioning, whichever elevation is higher. Refer to **Section 3.5.2.5** for additional information on positive overflow requirements.

3.2.3.3 *Concentrated Runoff from Development*

Site runoff due to development shall not cause adverse impacts as outlined in **Table 3**. When offsite grading is required or when the development discharges concentrated flow on an adjacent property, off-site conveyance to reach an adequate outfall shall be contained within a drainage easement obtained from the affected property owner(s). Drainage easement requirements are further discussed in **Section 3.3.2.1**.

Section 3.3. Stormwater Quality

The Town of Little Elm is one of the fastest growing cities in North Texas, with almost 70 miles of the town limits along the shoreline of Lewisville Lake. New development in the Town has contributed to increased stormwater runoff. Urban stormwater runoff has had detrimental impacts on the Town's receiving waters, including increased flooding potential, stream channel erosion, and reduced stormwater quality. As undeveloped areas of the Town are developed and older areas are redeveloped, it is imperative that a robust stormwater quality program be implemented to protect the Lewisville Lake and the Town's other natural resources and improve the benefits to human health, fish and wildlife habitat, and recreational opportunities.

Additionally, the Town is subject to Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) permit regulations governing discharges of stormwater from municipal separate storm sewer systems (MS4s) to surface waters of the state (TXR040000). The Town is required to develop, implement, and enforce a Stormwater Management Program (SWMP) to reduce the discharge of pollutants and protect water quality. This program requires oversight of the design, construction, and maintenance of stormwater controls in the Town to protect and enhance stormwater quality.

The following sections outline the Town's commitment to stormwater quality and water quality provisions that apply to the design of storm drainage facilities.

3.3.1 Post-Construction Stormwater Quality

3.3.1.1 *Post-Construction Stormwater Quality Objectives*

This section will establish criteria for the design, operation, and maintenance of post-construction stormwater controls and the preparation of a Stormwater Quality Plan (SWQP). Specific objectives of the Town's post-construction stormwater policies include:

1. Protect the integrity of watersheds and preserve the health of water resources, including Lewisville Lake;
2. Minimize changes to the site hydrology for land disturbance and redevelopment to reduce flooding, streambank erosion, and pollution;
3. Implement beneficial site design practices;
4. Promote the preservation of green space and other conservation areas;
5. Establish administrative procedures for the submission, review, approval, and disapproval of stormwater best management practices, and for the inspection of approved projects;

6. Establish provisions for the long-term responsibility for and maintenance of structural and nonstructural stormwater management to ensure that they continue to function as designed, are maintained appropriately, and pose minimum risk to public safety; and
7. Meet the provisions of the Town's MS4 permit and SWMP.

3.3.1.2 *Stormwater Quality Plan*

A Stormwater Quality Plan (SWQP) shall be prepared for all land disturbing activities of 1 acre or more as part of a subdivision application or civil plan submittal. For land disturbance activities between 1 and 5 acres, the Site Plan can be considered the SWQP. The grading or drainage plans may also be used as the SWQP for capital improvement projects. The SWQP shall be sealed by a Professional Engineer in the State of Texas.

The SWQP shall identify permanent site features and controls that will be included in the design and constructed with the project to minimize and mitigate the project's long-term effects on stormwater quality and quantity. All new development designs shall evaluate site layout to minimize impervious area and impacts to existing natural resources to promote sustainable development.

3.3.1.2.1 Preparation of a SWQP

A preliminary SWQP shall be prepared with the preliminary plat. The final SWQP shall be submitted with the site plan or construction plans. This plan must be accepted by the Town prior to any site activity, including grading. The SWQP shall be developed and coordinated with all portions of the plans, but specifically, the grading plan, the drainage plans, and the landscape plan.

3.3.1.2.2 Post-Construction BMP Selection

Table 4 shows the minimum number of permanent BMPs required based on acreage of post-project impervious area:

Table 4: Minimum Number of Permanent BMPs Required

Impervious Area	Minimum Number of Permanent BMPs
< 5 acres	1
5 acres ≤ Impervious Area ≤ 20 acres	2
> 20 acres	3

The BMPs shall be designed to achieve the water quality design requirements as set forth in **Section 3.3.1.3**. The *iSWM Technical Manual for Site Development Controls* provides guidance on the design and selection of permanent BMPs. It is the responsibility of the engineer to design BMPs that are appropriate address specific site conditions and meet the water quality standards.

Final stabilization of disturbed areas is required for all sites, regardless of size, and shall not be considered a permanent BMP. Final stabilization is defined as 80% coverage with no large bare areas on all portions of the site that are the responsibility of the developer.

3.3.1.3 *Water Quality Design Requirements*

3.3.1.3.1 Floatable Capture Requirements

All storm sewer outfalls to Lewisville Lake shall include a debris separator conforming to the Standard Details. Other applications of debris separators may be approved or required at the discretion of the Town Engineer.

For developments subject to SWQP requirements, debris separators may be considered a permanent BMP to meet the requirements of **Section 3.3.1.2.2**. Where multiple debris separators are installed for a single development, they shall be considered as a single BMP.

3.3.1.3.2 Water Quality Volume Requirements

Studies have shown the 85th percentile storm event (i.e., the storm event that is greater than 85% of the storms that occur) is a reasonable target event to address the vast majority of smaller, pollutant-loaded storms. Based on a rainfall analysis, 1.5 inches of rainfall has been identified as the average depth corresponding to the 85th percentile storm for North Texas. The runoff from these 1.5 inches of rainfall is referred to as the Water Quality Protection Volume (WQ_v).

Developments subject to SWQP requirements are required to demonstrate treatment of the WQ_v by the installation of permanent BMPs. Calculation of the WQ_v shall adhere to procedures outlined in the *iSWM Technical Manual for Water Quality*. Methods to reduce the required WQ_v as outlined in the iSWM manual may also be implemented.

The WQ_v shall not be discharged in a period less than 24 hours. The water quality treatment requirement can be met by providing extended detention in stormwater storage facilities designed for mitigation of peak events. In such instances, these facilities shall be allowed to have a total drawdown time greater than 24 hours but no greater than 48 hours. Refer to **Chapter 6** for additional guidance and requirements concerning the design of stormwater storage facilities.

3.3.1.4 *Permanent Erosion Control*

Adequate control for the erosion is imperative to minimize Total Suspended Solids (TSS) and to protect stormwater quality in natural drainageways. Energy dissipation, channel stabilization and/or permanent erosion control mechanisms are required in instances where the design channel velocities or discharge velocities of pipes, culverts, and flumes exceeds the maximum permissible velocities outlined in **Table 9** and in other instances as determined by the Town Engineer. The *iSWM Technical Manual for Hydraulics* and the *Federal Highway Administration Hydraulic Engineering Circular No. 14* (*FHWA HEC-14*) provide additional guidance on the design of energy dissipators.

3.3.2 Maintenance of Permanent Stormwater Facilities

3.3.2.1 *Drainage Easements*

Easements are required for all public drainage systems that convey stormwater runoff across a development and shall be required for both on-site and off-site public stormwater drainage improvements, including standard engineering channels, storm drain systems, detention and retention facilities, and other stormwater controls. All drainage easements shall be recorded on the plat. The drainage easement must include sufficient area for operation and maintenance of the drainage system, and the developer shall obtain downstream drainage easements until adequate outfall is determined.

Minimum easement requirements are discussed in the following sections. Special circumstances may require additional easement allocation at the discretion of the Town Engineer.

3.3.2.1.1 Open Channels

Drainage easements shall be provided for all open channels. Easements shall encompass all areas lower than a ground elevation defined as being the highest of the following:

1. Two (2) foot above the calculated water surface elevation based on the fully developed 100-year water surface elevation or the 100-year base flood elevation (BFE), whichever is higher.
2. The top of the high bank, if higher than (1) above.

An additional easement of 15 feet on each side of a channel is required by the Town for maintenance and access purposes. For the purposes of this manual, bank slope is measured in a straight line from the toe of the slope to the top of the bank. The slope within the easement shall be no greater than 6:1 (horizontal to vertical) to allow for safe access of crews and equipment. Easements shall be kept free and clear of encroachments, but the

maintenance and access portion of the easement may contain designated fire lanes and parking areas as approved by the Town Engineer.

Engineered channels shall have drainage easements dedicated to meet the requirements of the width of the channel, the 1 foot of freeboard, and access easement.

3.3.2.1.2 Storm Sewer Easements

Easement widths will be rounded up to the nearest 5-foot increment. The minimum width of the storm sewer easement shall be the outside diameter of the storm sewer pipe or horizontal dimension of the storm sewer box plus 10 feet. For pipes or boxes in parallel, the minimum easement shall be equal to the width of the parallel storm drain system plus 10 feet. The minimum storm sewer easement that shall be provided in any case is 15 feet.

3.3.2.1.3 Other Stormwater Facilities

Drainage easements for structural overflows, swales, and berms shall be of sufficient width to encompass the structure or graded area. The proposed centerline of overflow swales shall normally coincide with the centerline of the easement. Drainage easements will generally extend at least 25 feet past an outfall headwall to provide an area for maintenance operations.

Easements for stormwater controls, including detention basins, sediment traps, and retention ponds, shall be negotiated between the Town and the developer but will normally include essential access to all embankment areas and inlet and outlet controls. Essential access is defined as access in at least one location. The entire reach or each section of any drainage facility must be readily accessible to maintenance equipment. Additional easement(s) shall be required at the access point(s), and the access points shall be appropriately designed to restrict access by the public.

3.3.2.2 *Operations and Maintenance Agreements*

All drainage improvements constructed within a development and any existing or natural drainage systems to remain in use shall require a maintenance agreement that identifies responsible parties for maintenance. Both private and public maintenance responsibility shall be negotiated between the municipality and the owner and documented in the agreement. The maintenance agreement shall be written such that it remains in force upon sale of transfer of the property.

The Town will provide for perpetual maintenance, in accordance with adopted Town maintenance standards, of all public drainage facilities located within dedicated easements and constructed to the Town standards. In addition, limited perpetual maintenance may be provided by the Town for riparian areas placed in a drainage easement preserved in their natural state, subject to Town approval. Access shall be provided and dedicated by the developer to all public stormwater facilities in developments for maintenance and inspection by the Town.

A *Stormwater Facility Maintenance Agreement* (SFMA) must be prepared by the engineer for each stormwater control that will not be wholly maintained by the Town. This agreement must outline both preventive maintenance tasks as well as major repairs, identify the schedule for each task, assign clear roles to affected parties, and provide a maintenance checklist to guide future owners. Multiple stormwater controls may be contained within a single SFMA. When areas are identified for detention that also serve other purposes for the development (e.g. parking lots, loading docks) the requirement for a SFMA may be waived.

3.3.2.3 *Inspections*

An annual self-inspection report shall be provided to the Town for all permanent stormwater controls with an active SFMA. The inspection report shall document the condition of the stormwater control and maintenance provisions undertaken to ensure the continued functionality of the stormwater control as designed. Generally, this inspection can be conducted and documented by the owner of the facility unless otherwise stated in the SFMA. An inspection report signed and sealed by a Professional Engineer in the State of Texas shall be submitted to the Town at a minimum of every 5 years, unless otherwise stated in the SFMA. The Town maintains the right, as outlined in

the Town ordinances, to inspect permanent stormwater controls and enforce provisions of the SFMA and this manual.

3.3.3 Temporary Construction Controls

Construction activities shall comply with all applicable federal (EPA), state (TCEQ), and local (Town) stormwater pollution prevention regulations. When the ordinance and applicable regulations are in conflict, the most stringent requirements shall apply.

3.3.3.1 *Stormwater Pollution Prevention Plan*

For all construction projects that will disturb 1 acre or more of land area, the TCEQ requires operators to obtain Texas Pollutant Discharge Elimination System (TPDES) General Permit (TXR150000) coverage for the project. This requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP). A SWPPP shall be provided to the Town and approved prior to the start of any construction. The contractor is responsible for implementing and maintaining the SWPPP, as well as posting and submitting construction site notifications, the Notice of Intent, and the Notice of Termination.

3.3.3.2 *Best Management Practices During Construction*

The SWPPP shall provide a series of best management practices (BMPs) that are appropriate for each phase of construction. The SWPPP shall also identify which owner/operator is responsible for installing, inspecting, and maintaining each BMP during the different phases of construction. All temporary BMPs must be removed after final stabilization is achieved.

Structural BMPs shall comply with the *Town of Little Elm Standard Details*, this manual, and the latest edition of the North Central Texas Council of Governments (NCTCOG) integrated Stormwater Management *(iSWM) Criteria Manual for Site Development and Construction* and *Technical Manual for Construction Controls*. When the iSWM manual, Town Standard Details, or this manual are in conflict, the Standard Details and then this manual shall govern.

Section 3.4. Hydrology

Prior to hydraulic design of drainage facilities, the rate and volume of stormwater runoff at the design point must be determined. The amount of stormwater runoff from a given site is a factor of the intensity and duration of the rainfall event and the size and hydrologic characteristics of the contributing drainage area. The following sections describe the approved hydrologic criteria and procedures to be used in the calculation of design runoff values.

Several sections of this chapter are adapted from the *iSWM Technical Manual for Hydrology*. Please reference the latest edition of the iSWM manual for additional guidance as needed.

3.4.1 Peak Discharges Prepared by Town

Peak discharge data from an appropriate flood study or Town-approved drainage studies shall be used as the design discharges, if such data is available. When no flow rates are available, peak discharges shall be determined by the engineer. All discharge values shall be based on full development of the drainage basin as outlined in the most recently adopted versions of the Town's *Comprehensive Plan*, *Zoning Map*, and *Future Land Use Map*.

3.4.2 Rainfall Intensity

The National Oceanic and Atmospheric Administration (NOAA) *Atlas 14, Volume 11 Precipitation-Frequency Atlas of the United States, Texas (2018)* is recognized as the best available set of rainfall data for the State of Texas. *Atlas 14* provides point precipitation frequency values, with rainfall intensity values varying slightly across the Town. A single coordinate (33.1870, -96.8897) has been selected to define standard rainfall intensity values throughout the Town. The standard rainfall intensities are listed in **Table 5**.

Table 5: Design Rainfall Intensities

Duration		Rainfall Intensity (in/hr) by Return Period and AEP (%)		
Min	**Hr**	**2-Year (50%)**	**25-Year (4%)**	**100-Year (1%)**
5	**0.083**	5.89	9.77	11.92
10	**0.167**	4.69	7.78	9.52
15	**0.25**	3.90	6.44	7.84
30	**0.5**	2.70	4.44	5.40
60	**1**	1.76	2.92	3.56
120	**2**	1.09	1.87	2.33
180	**3**	0.81	1.42	1.79
360	**6**	0.48	0.86	1.11
720	**12**	0.29	0.51	0.66
1440	**24**	0.17	0.30	0.39

3.4.3 Drainage Areas

Drainage area maps and runoff calculations shall include all drainage areas contributing to the site. Separate drainage area maps and runoff calculations shall be prepared for both the existing (pre-project) drainage area and the fully developed (post-project) drainage area. Drainage areas shall follow natural drainage features if future land disturbance is unknown or existing areas will not be changing under fully developed conditions.

Drainage area determinations shall be based on site survey and proposed grading plans, supplemented by recent aerial imagery and topographic maps. Delineations shall be performed utilizing a maximum 2-foot contour interval for existing drainage areas and a maximum 1-foot contour interval for proposed drainage areas. The performance of topographic survey used to delineate drainage areas is the responsibility of the engineer designing the drainage facility.

3.4.4 Time of Concentration

The time of concentration (T_c) is defined as the longest time, without interruption of flow by detention devices, that will be required for water to flow from the upper limit of a drainage area to the point of concentration. Times of concentration can often be assumed based on the typical inlet times shown in **Table 7**.

Alternatively or where no typical inlet time is provided, T_c may be calculated using the National Resource Conservation Service (NRCS, formerly known as the Soil Conservation Service, SCS) methodology. The use of NRCS methodology in lieu of standard inlet times may be at the discretion of the Town Engineer. This method separates the flow through the drainage area into sheet flow, shallow concentrated flow, and open channel flow. The T_c is the sum of travel times for sheet flow, shallow flow and open channel flow. Time of concentration calculations shall be provided by the engineer along with flow path delineations.

Computations for travel time (T_t) for sheet flow, shallow flow, and open channel flow shall adhere to the following methodology.

1. **Sheet Flow:** Sheet flow is the initial flow over the ground surface. The maximum allowable length for sheet flow is 300 feet for undeveloped drainage areas and 100 feet for developed areas. The travel time (T_t) in hours for sheet flow is determined using the following equation:

$$\boldsymbol{T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}}$$

T_t = travel time (hr)

n = Manning's roughness coefficient (**Table 9**)

L = flow length (ft)

P_2 = 2-year, 24-hour rainfall, 4.1 in.

S = longitudinal slope (ft/ft)

2. **Shallow Concentrated Flow:** Shallow concentrated flow begins where sheet flow ends. A projected average slope should be established along the flowline for the shallow concentrated flow length. The travel time (T_t) in hours for shallow concentrated flow is determined by the following equation:

$$\boldsymbol{T_t = \frac{L}{3600V}}$$

V = average velocity (fps), calculated as follows:

Unpaved Surfaces = $16.1345 \times S^{0.5}$

Paved Surfaces = $20.3282 \times S^{0.5}$

3. **Open Channel Flow:** Open channel flow is where the runoff is located within a defined channel or in some cases, closed storm systems. The travel time (T_t) for open channel flow is determined using the equation for shallow concentrated flow and using Manning's Equation to determine average velocity (V):

$$\boldsymbol{V = \frac{1.486 R^{\frac{2}{3}} S^{\frac{1}{2}}}{n}}$$

V = average velocity (fps)

R = hydraulic radius (A/P) (ft), where:

A = cross-sectional area (ft^2)

P = wetted perimeter (ft)

S = longitudinal slope (ft/ft)

n = Manning's roughness coefficient (**Table 9**)

3.4.5 Allowable Hydrologic Methods

There are a number of empirical hydrologic methods available to estimate runoff characteristics for a site or drainage subbasin. The following methods have been selected to support hydrologic site analysis for the design methods and procedures included in this manual:

- Rational Method
- Modified Rational Method
- Unit Hydrograph Method

The procedures and approved applications of each method are described in the following sections.

3.4.5.1 *Rational Method*

The rational method is a simple procedure for estimating peak flows from small drainage areas. The use of the rational method is limited to drainage areas of less than 100 acres, unless otherwise approved by the Town Engineer. The formula for calculation of runoff by the rational method is:

$$\boldsymbol{Q = C_f CiA}$$

Q = peak discharge (cfs)

C_f = frequency factor for use with higher intensity storms

C = runoff coefficient

i = rainfall intensity (in/hr) for a period equal to the time of concentration

A = contributing drainage area (acres)

The rational method was initially developed for design applications that considered storms with more frequent return periods than current flood protection standards (less than or equal to 10 years). Less frequent, higher intensity storms require use of a frequency factor (C_f) to account for the fact that infiltration and other initial losses have a proportionally smaller effect on runoff than for more frequent events. **Table 6** provides the frequency factors to be used with rational method applications.

Table 6: Frequency Factors for Rational Formula

Recurrence Interval (years)	Frequency Factor (C_f)
10 or less	1.0
25	1.1
100	1.25

The post-development runoff coefficient "C" shall be based on fully developed conditions. The most intense land use or zoning shall be used to determine the runoff coefficient for the drainage area. **Table 7** gives values for runoff coefficients to be used in applications of the rational method. It is often desirable to develop a composite runoff coefficient based in part on the percentage of different types of surfaces in the drainage area. Composite "C" values and other deviations from the coefficients provided in **Table 7** are subject to the approval of the Town Engineer.

Table 7: Runoff Coefficient Values and Typical Inlet Times

Land Use	Runoff Coefficient "C"	Minimum Inlet Time (min)
Residential:		
Single Family		
Low Density Residential	0.45	10
Medium Density Residential	0.55	10
High Density Residential	0.60	10
Multi-Family		
Manufactured Homes	0.60	10
Light (Townhomes, Duplex)	0.65	10
Heavy (Apartments)	0.85	5
Commercial/Industrial:		
Light	0.70	5
Heavy	0.80	5
Business Districts (Town Center, Office)	0.85	5
Parks and Open Space	0.25	15
Streets, Drives, Walks, and Roofs	0.95	5
Gravel Areas	0.50	
Graded or No Plant Cover	0.40	
Agricultural	0.30	
Forest	0.15	
Streams, Lakes, Water Surfaces	1.00	

3.4.5.2 *Modified Rational Method*

The modified rational method uses the rational method peak flow calculations combined with assumptions about the inflow and outflow hydrographs to compute an approximation of storage volumes for simple detention calculations. Further explanation of the modified rational method and a noniterative approach for detention design calculations are presented in the iSWM manual. The modified rational method is limited in use to applications as described in **Section 3.6.1**.

3.4.5.3 *Unit Hydrograph Method*

The Town requires the use of the NRCS unit hydrograph method for drainage areas larger than 100 acres. The unit hydrograph method requires drainage area, a runoff factor, time of concentration, rainfall, and methodology to consider initial and constant losses. Details of the methodology can and additional guidance can be found in the *SCS National Engineering Handbook, Section 4, Hydrology* and the iSWM manual.

The Town requires the use of HEC-HMS to perform the computations and to develop runoff hydrographs for a drainage area. Additional software may be accepted at the discretion of the Town Engineer. Typical inputs required for development of a HEC-HMS hydrograph are described below.

3.4.5.3.1 Curve Numbers

Use of the runoff curve number (CN) methodology outlined in *Urban Hydrology for Small Watersheds – NRCS Technical Release (TR)-55* is required. Curve numbers indicate the runoff potential of the land cover, considering the combined hydrologic effects of the soil type, land use, hydrologic condition of the soil cover, and the antecedent soil moisture. The NRCS Soil Survey for Denton County may be used to identify the soil group within the watershed subbasins. For computation of design events, an assumption of Antecedent Moisture Condition (AMC) II is required.

The runoff CN values for urban areas provided in *TR-55* are recommended for use. When open space is used as the cover type, fair condition shall generally be assumed. Other CN values may be approved by the Town Engineer. **Table 8** shows the land use categories and corresponding impervious percentages. These values do not supersede the existing conditions, or where proposed impervious conditions are known. For instance, if an industrial area is currently 95% paved, then 95% is the impervious condition that shall be used.

Table 8: Impervious Percentage Values for Land Use Classifications

Land Use	Impervious Condition (%)
Residential:	
Single Family	
Low Density Residential	25
Medium Density Residential	41
High Density Residential	47
Multi-Family	
Manufactured Homes	20
Light (Townhomes, Duplex)	70
Heavy (Apartments)	70
Commercial/Industrial:	
Light	90
Heavy	95
Business Districts (Town Center, Office)	85
Parks and Open Space	6
Streets, Drives, Walks, and Roofs	95
Agricultural	3
Forest	0
Streams, Lakes, Water Surfaces	100

3.4.5.3.2 Design Storm Rainfall

Use of the 24-hour storm duration and SCS Type II distribution is required for peak flow calculations, unless otherwise approved by the Town Engineer.

3.4.5.3.3 Hydrologic Stream Routing

Routing may be needed within the hydrologic model to account for the storage effects of detention facilities or significant channel reaches that are not accounted for in a hydraulic model. Detention and ponding areas shall be modeled using Modified Puls routing with explicit depth-area curves determined from topographic contours. Channel segments shall be modeled using either Modified Puls or Muskingum Cunge methods based on cross sections taken from available topography. For unsteady flow modeling, the routing is accounted for by the hydraulic software being used.

Section 3.5. Hydraulics

Hydraulic design is the process of determining the appropriate capture and transport (or storage) of stormwater that has been generated from a rainfall event to an adequate outfall. Stormwater facilities include, but are not limited to, ditches, streets, inlets, storm drain systems, swales, channels, culverts, ponds, and reservoirs.

Several sections of this chapter are adapted from the *iSWM Technical Manual for Hydraulics*. Please reference the latest edition of the iSWM manual for additional guidance as needed.

3.5.1 Streets and Gutter Flow

Surface drainage along streets is a function of transverse and longitudinal pavement slope, pavement roughness, inlet spacing, and inlet capacity. The design of these elements is dependent on storm frequency and the allowable spread of stormwater. Flow in streets and gutters is governed by Manning's equation for open channel flow:

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Q = flow (cfs)

A=cross-sectional flow area (ft^2)

R = hydraulic radius (ft), as defined previously

S = longitudinal slope (ft/ft)

n = Manning's roughness coefficient (**Table 9**)

Table 9 provides Manning's roughness coefficients and maximum permissible velocities to be used in the design of various drainage facilities in the Town. The Manning's roughness coefficient to be used in calculation of flow in concrete streets and gutters shall be 0.016 unless otherwise approved by the Town Engineer. The iSWM manual provides alternate forms of the Manning's equation with tables and nomographs to be used in the calculation of drainage capacities of streets with triangular, composite, and parabolic sections, as well as streets with curb splits.

Table 9: Roughness Coefficients and Maximum Permissible Velocities

Type of Section/Feature	Roughness Coefficient "n"			Maximum Permissible Velocity (fps)
	Minimum	Normal	Maximum	
Natural Streams				
Stream Section				6
Some Grass and Weeds; Little or No Brush	0.027	0.045	0.048	
Dense Growth of Grass or Brush	0.050	0.055	0.055	
Dense Brush and Trees	0.060	0.065	0.080	
Floodplain/Overbank Areas				6
Grass, Weeds; Some Brush and Trees	0.027	0.045	0.048	
Dense Grass, Weeds or Brush	0.050	0.055	0.065	
Dense Brush and Trees	0.070	0.080	0.150	
Buildings		0.500		N/A
Constructed/Modified Open Channels				
Concrete Blocks	0.015	0.035	0.050	15
Gabion	0.015	0.035	0.050	15
Grass (Maintained)	0.027	0.035	0.040	6
Concrete Riprap	0.014	0.016	0.030	15
Stone Riprap	0.033	0.035	0.036	
Streets				
Concrete Section				N/A
Smooth	0.015	0.016	0.017	
Rough	0.017	0.018	0.019	
Asphalt	0.014	0.015	0.019	
Pipes				15
Reinforced Concrete Pipe	0.012	0.013	0.017	
Corrugated Metal Pipe	0.015	0.022	0.033	
High Density Polyethylene Pipe (HDPE)	0.009	0.011	0.025	
Concrete Boxes (Smooth to Rough)	0.012	0.013	0.020	

3.5.1.1 *Street Drainage Criteria*

The surface drainage system and closed storm drain system for a street must be designed such that in combination, the systems provide enough capacity to fully contain the flow from 100-year storm within the street right-of-way or drainage easement. The Town also enforces a set of criteria for allowable spread of gutter flow depending on street classification, as outlined in **Table 10**. An "open" traffic lane is defined for the purposes of this manual as at least a 12-foot section of pavement that remains dry (no ponding or flowing water) for the duration of the rainfall event to allow for the safe passage of vehicles. Storm sewer inlets shall be provided along paved streets at such intervals to prevent the capacity and spread requirements from being exceeded.

Table 10: Street Drainage Criteria

Type of Street	Allowable Spread
Major Thoroughfare	One traffic lane in each direction to remain open
Collector Street	One moving traffic lane to remain open
Residential Street	n/a

Additional street drainage considerations are listed below:

1. The maximum allowable concentrated flow to a street including flow from driveways and flumes is 3 cfs.
2. Street surface drainage shall not be permitted to cross major thoroughfares or collector streets.
3. At any intersection, only one street shall be crossed with surface drainage, and this shall be the lower classified street.

3.5.2 Stormwater Inlets

Inlets are drainage structures used to collect surface drainage and to convey this water to storm drains or direct outlet to culverts. The capacity of an inlet depends upon its geometry and the cross slope, longitudinal slope, total gutter flow, depth of flow, and pavement roughness. Inlets servicing roadway drainage can be divided into three major classes:

- Curb Inlets
- Grate Inlets
- Combination (Grate and Curb-Opening) Inlets

Inlets may be classified as being on a continuous grade or in a sump. The term "on grade" refers to an inlet located on the street with a continuous slope past the inlet with water entering from one direction. The "sump" condition exists when the inlet is located at a low point and water enters from both directions. Artificial low points created by “seesaw” of street or alley grades will not be permitted. All low point inlets shall be designed in accordance with additional standards outlined in **Section 3.5.2.5**.

The procedures and technical criteria outlined in the iSWM manual shall be used for the hydraulic design of stormwater inlets. Additional criteria for various inlet types are summarized in the following sections. Refer to the Town of Little Elm Standard Construction Details for inlet construction and material requirements.

3.5.2.1 *Curb Inlets*

Curb inlets shall be a minimum of 8 feet in length. Recessed curb inlets are required on all collector and arterial streets. The Town Standard Details for both recessed and standard curb inlets include a depressed gutter line.

Where an alley or street intersects a street, inlets shall be placed in the intersecting alley or street whenever the combination of flow down the alley or intersecting street would cause the capacity of the downstream street to be exceeded. Inlets shall be placed upstream from an intersection whenever possible.

3.5.2.2 *Grate Inlets*

The Town’s MS4 program encourages measures to limit the inflow of floatables to the storm system. The installation of grate inlets in lieu of or in combination with the installation of debris separators in nonresidential developments may be permitted to help meet this objective and may be required in some instances by the Town Engineer for sites outfalling to Lewisville Lake. Installation of grate inlets in other instances requires approval by the Town Engineer. Grate inlets shall be designed with a 50% clogging factor due to the tendency of these inlets to collect debris.

3.5.2.3 *Combination Inlets*

Combination inlets consist of both a curb-opening inlet and a grate inlet placed in a side-by-side configuration, but the curb opening may be located in part upstream of the grate. Combination inlets may only be used with the approval of the Town Engineer.

All debris carried by stormwater runoff that is not intercepted by upstream inlets will be concentrated at the inlet located at the low point. Because this will increase the probability of clogging for grated inlets, the capacity of a combination inlet in sump shall be assumed to be the capacity of the curb inlet, neglecting the grate inlet capacity. On a continuous grade, the capacity of an unclogged combination inlet with the curb opening located adjacent to the grate is approximately equal to the capacity of the grate inlet alone. Capacity shall be computed by neglecting the curb opening inlet and following the design procedures for grate inlets.

3.5.2.4 *Drop Inlets*

The Town allows for the installation of drop inlets to collect water in nonpaved areas, such as ditches and swales. If used, grading plans to direct flow into drop inlets shall be included in the construction plans. Drainage interceptor swales or berms should be used, as required, to direct runoff to the drop inlets. Where swales or other means of collecting and directing runoff into drop inlets are needed, they should be contained in drainage easements according to the requirements outlined in **Section 3.3.2.1**.

Drop inlet capacity shall be evaluated with a 50% clogging factor due to the tendency of these inlets to collect debris. Flow into drop inlets shall be calculated using either the weir flow formula for an unsubmerged inlet or the orifice flow formula when depth of flow exceeds the depth of the opening.

The capacity of an unsubmerged inlet operating as a weir is:

$$\frac{\boldsymbol{Q}}{\boldsymbol{P}} = \mathbf{2.5}\boldsymbol{y}^{\mathbf{3/2}}$$

Q = flow capacity (cfs)

2.5 = weir coefficient (3.1) adjusted for 50% clogged inlet throat

P = perimeter of opening (ft)

y = head/depth (ft)

and the capacity of a submerged inlet operating as an orifice is:

$$\boldsymbol{Q} = \mathbf{0.6}\boldsymbol{A}(\mathbf{2}\boldsymbol{g}\boldsymbol{H})^{\mathbf{0.5}}$$

Q = flow capacity (cfs)

0.6 = orifice discharge coefficient

A = area of inlet opening (ft^2)

g = acceleration due to gravity = 32.2 (ft/s^2)

H = head above centerline of inlet opening height (ft)

Both conditions should be evaluated, and the capacity should be determined from the condition that produces the more conservative value. The capacity calculations for drop inlets will be limited to a maximum head of 1 foot above the flowline of the inlet throat.

3.5.2.5 *Low Point Inlets and Positive Overflow Requirements*

Inlets are required at all low points in the gutter profile. Additionally, the 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 an open course. Generally, positive overflow is provided along a street or alley, but certain circumstances may require the dedication of drainage easement and construction of a concrete flume sized to carry the overflow. Reasonable judgment should be used to limit the easements on private property to a minimum.

In areas where positive overflow is not feasible, flanking inlets are required on each side of the low point inlet to act in relief of the inlet at the low point if it should become clogged. Flanking inlets shall be located to function before water spread exceeds the allowable spread at the sump location and shall be designed with a combined capacity to match the capacity of the primary sump inlet.

3.5.3 Storm Drain (Closed Systems)

A closed storm drain system shall be required within the right-of-way where the 100-year design storm exceeds the capacity of the street surface drainage system. Closed systems shall be extended to an adequate and acceptable outfall as described in **Table 3**.

3.5.3.1 *Flow in Storm Drains*

3.5.3.1.1 Full and Partial Flow

All storm drains shall be designed by the application of the continuity equation and Manning's equation. The continuity equation is given as:

$$Q = AV$$

Q = flow capacity (cfs)

A = cross-sectional flow area (ft^2)

V = velocity (fps)

Pipe flow shall be determined either through the appropriate charts and nomographs or by direct solutions of the equations. Charts and nomographs for circular pipes flowing full and partially full are included in the iSWM manual. The Texas Department of Transportation (TxDOT) *Hydraulic Design Manual* includes equations for flow in conduits with other cross sections.

Pipes and boxes shall be designed as if flowing full. Design flow depth of less than full to get a lesser wetted perimeter is not acceptable. Four wall wetted perimeter is required in the calculations. There will be hydraulic conditions that cause the conduits to flow partially full. Where this occurs, the hydraulic gradient should be shown at the inside crown of the conduit.

3.5.3.1.2 Hydraulic Gradient and Storm Drain Profile

The hydraulic grade line (HGL) shall be established for all storm drain systems. The 25-year HGL must be at or below the gutter line for pipe systems and 1 foot or more below the top of curb at inlets. For sump conditions

without an existing structural overflow, the 100-year HGL must be 1 foot below the top of curb at the inlet. For systems where no ROW exists, the 100-year HGL must be below finished ground.

Both the fully developed 25-year and 100-year hydraulic gradient lines (HGLs) shall be shown throughout the system. They shall be labeled in the construction plans both in the hydraulic calculations and on the storm drain profile. The design storm HGL shall be below the bottom of the improved subgrade for systems under pavement. For systems outside of the pavement, the HGL shall be lower than all inlet throats. Allowance of additional head may be required for planned future extensions of the storm drainage system.

The HGL shall start at the tailwater elevation or HGL of a connecting feature; the inside top of pipe; or at the HGL determined for a coincident confluence flow condition, whichever is highest. At the discharge end of pipes outfalling to a natural creek or stream, the hydraulic gradient of the creek for the design storm must coincide with the gradient of the storm drainage conduit. If an approved flood hydrograph is available to provide a coincident flow elevation for the system's peak, the table of coincident design frequencies in the iSWM manual can be used to assist with tailwater determination. If an approved flood hydrograph is not available, the starting HGL at the outfall into a creek or channel shall be the 100-year fully developed water surface elevation. Alternatively, a detailed hydrologic and hydraulic study can be performed to determine the coincident tailwater.

3.5.3.1.3 Velocities

Storm drains should operate with velocities of flow sufficient to prevent excessive deposits of solid materials. A minimum full flow velocity of 2.5 fps in the design storm and a minimum slope of 0.5% shall be maintained in the pipe unless otherwise approved by the Town Engineer. Velocities shall not exceed those listed in **Table 9**. Supercritical flow is not allowed in main lines.

3.5.3.1.4 Headlosses

Head losses at structures shall be determined for manholes, junction boxes, wye branches, bends, curves, and changes in pipe sizes in the design of closed conduits. Head losses must be incorporated into the gradient profile. Minimum head loss used at any structure shall be one-tenth (0.10) foot. Refer to the iSWM manual for the equations to calculate energy losses at pipe junctions, bends, manholes, inlets, and other situations.

Pipe direction changes will be curves using radius pipe unless approved by the Town Engineer. Ninety-degree turns on storm sewers or outfalls are prohibited. Laterals shall intersect the trunk line at 60 degrees.

3.5.3.2 *Pipe Material and Roughness Coefficients*

Underground systems shall be constructed with Class III reinforced concrete pipe or as otherwise provided in the Town's standard construction details. Alternate materials may be approved by the Town Engineer. The pipe size shall be a minimum of 18 inches for all public systems. A higher class of pipe may be required when underground storm drainage systems are constructed at shallow or deep elevations. Refer to the pipe manufacturer specifications for cover requirements.

A roughness coefficient will be selected which will represent the average condition of the pipe consistent with the values presented in **Table 9**. Other roughness coefficients may be approved at the discretion of the Town Engineer.

3.5.3.3 *Entrance/Outfall Structures*

Headwalls or sloped end treatments shall be constructed at the pipe ends of all storm drain systems. Sloped end treatments are required along streets when the drainage feature is adjacent and parallel to traffic flow. The sloped end treatment shall be a minimum 6:1 (horizontal to vertical) end section.

Storm drain systems that outfall to a stream, natural channel, or pond shall conform to the existing side slope of the channel and be connected to a headwall. Discharge flowlines of storm sewers are to be 2 feet above the flowline of creeks and channels, unless channel lining is present. Hard armor protection and energy dissipation shall be provided when discharge velocities exceed the maximum allowable velocity in **Table 9** and when specified by the Town Engineer.

3.5.3.4 *Access Points*

A manhole or access lateral shall be constructed at least every 500 feet to provide access into the closed system, or as otherwise directed by the Town Engineer. A lateral used as an access point shall be at least 24 inches in diameter, an approved material, and no more than 50 feet long to an open-air access point. Open air access is considered a designed entrance point or outfall without obstructions.

3.5.4 Open Channels

This section includes the drainage design criteria for ditches, channels, and dams. Land disturbances that include or are adjacent to a stream and result in impacts to the 100-year floodplain shall submit a flood study to meet the requirements of **Chapter 7**. If modifications to a stream or channel are determined to impact the Jurisdictional Waters of the United States (WOTUS), then the plans shall be submitted to the USACE for review and any required permitting shall be performed and approved prior to construction per the requirements of **Section 3.1.3.2.**

3.5.4.1 *Hydraulic Design*

The Town requires a tailwater/headwater analysis on any proposed open channels, upstream and downstream channel transitions, energy dissipation structures, obstructions, or small dams (less than 6 feet). The tailwater/headwater analysis shall be used to determine the actual headwater and tailwater elevations, head losses, capacity, freeboard, and floodplain impacts. If an approved flood hydrograph is available to provide a coincident flow elevation for the system's peak, the table of coincident design frequencies in the iSWM manual can be used to assist with tailwater determination. Alternatively, a detailed hydrologic and hydraulic study will be required.

For channels that require a flood study, a hydrologic routing model and hydraulic analysis will be required to determine impacts on existing floodplains and/or adjacent properties. If a stream or channel has an effective FEMA model and/or a Town Council adopted watershed model, the engineer will be required to use those models for the analysis.

For normal depth (uniform flow) calculations, the Manning's equation and slope-area method is to be used only for initial sizing. Exceptions for small outfall channels will be made at the discretion of the Town Engineer.

Supercritical flow will not be allowed for designed channels. However, for lined channels, the HEC-RAS analysis should include a mixed-flow regime analysis, to make sure no supercritical flow occurs for the designed channel. Mixed or supercritical flow may be allowed for analysis of existing conditions when required.

Upstream or downstream transitions from natural to modified channels along with channel outfalls will require a design based on a hydraulic study and will provide a non-erosive environment. Refer to the iSWM manual for design of channel transitions and energy dissipation.

3.5.4.2 *Types of Channels*

3.5.4.2.1 Unimproved Channels/Natural Streams

Where natural streams connect to improved closed systems and/or improved channels, permanent transitional materials and energy dissipation are required. In areas along natural streams where potentially excessive erosion or head cutting may occur or worsen, grade control structures, drop structures, or other structures may be required to stabilize the stream in order to protect structures or infrastructure.

3.5.4.2.2 Constructed/Modified Open Channels

Where constructed or modified open channels connect to a closed system, natural streams, or a channel of a different material, permanent transitional materials and energy dissipation are required. Modified channels shall be designed with the following minimum criteria:

1. Side Slopes shall be 4:1 (horizontal to vertical) for vegetated channels or as specified by manufacturer for other channel materials.

2. Bottom width shall be at least 6 feet.
3. Minimum channel slope is 1% for vegetated channels and 0.5% for hard armor channels or pilot channels.
4. New channels shall be designed to fully contain the 100-year storm with 1 foot of freeboard at all locations along the channel, or to the elevation of the 100-year flood elevation of Lewisville Lake, whichever is lower.
5. Modification or improvement of existing constructed/modified channels shall at a minimum maintain the existing capacity.
6. The maximum design velocity for all channels shall be as specified in **Table 9**. Higher velocities and/or channel armoring require a sealed geotechnical study for design and approval by the Town Engineer.
7. Each reach of a channel that will require Town maintenance must have a ramp for maintenance access. Ramps shall be at least 10-feet wide and have 15% maximum grade. 12-foot width is required if the ramp is bound by vertical walls.
8. A fence shall be constructed on each side of the channel. Fences are not allowed to cross public channels.
9. New concrete channels are not allowed unless it is required as part of the repair or replacement of an existing concrete channel.

3.5.5 Culverts

3.5.5.1 *General Design Criteria*

Culverts shall be designed based on standard design procedures outlined in the iSWM manual. used to carry ditch or surface flow safely under roadways and driveways in order to meet conveyance standards for the design storm. The driveway or roadway shall have an invert above the pipe for positive overflow. If a culvert is not feasible for a driveway, then the driveway shall be constructed with an invert.

Concrete sloped end treatments are required when culverts are adjacent and parallel to traffic flow. Erosion protection will be provided at the upstream and downstream ends of the sloped end treatment for all culverts. Stabilization and/or energy dissipation shall be provided where allowable channel velocities are exceeded upstream and downstream of the culvert.

Culverts shall be constructed with Class III reinforced concrete pipe or another approved material as shown in the Town's standard construction details. The pipe size shall be a minimum of 24 inches for roadway crossings and 18 inches for driveway culverts. A higher class of pipe may be required when underground storm drainage systems are constructed at shallow or deep elevations. Refer to the pipe manufacturer specifications for cover requirements.

When practical for multiple barrel culverts (3 or more), one of the barrels should be placed at the flowline of the stream with the other barrels at a higher elevation to create a single flow path for lower flows and reduced sediment and debris accumulation.

3.5.5.2 *Minimum Elevations*

Culverts shall be designed with a minimum 1 foot of freeboard between the 100-year headwater elevation and the surface of the road and/or 2 feet of freeboard below any adjacent habitable structure, whichever establishes the more stringent requirement. Other surrounding physical conditions may be cause for an increase in this requirement at the discretion of the Town Engineer.

3.5.5.3 *Slope and Velocity*

The maximum slope using concrete pipe is 10% before pipe-restraining methods must be taken. The minimum slope is 0.5%. Maximum vertical distance from throat of intake to flowline in a drainage structure is 10 feet. Drops greater than 4 feet will require additional structural design.

Velocities in culverts should be limited to no more than 15 feet per second, but downstream conditions very likely will impose more stringent controls. Culvert discharge velocities shall not exceed the maximum permissible

velocities for open channels listed in **Table 9**. Discharge velocities that are too high must be reduced to allowable velocities using appropriate energy dissipation structures or techniques.

3.5.5.4 *Headwater Limitations*

For safety reasons, headwater depth/culvert diameter ratio (HW/D) should not exceed 1.5 for the 100-year event peak flow. Variance to this criteria may be permitted by the Town if justification is provided and sufficient measures are taken to reasonably avoid any safety impacts. Assessment of the impacts caused by exceeding the design headwater depth should account for:

- Hazard to human life and safety.
- Potential damage to the culvert, embankment stability and roadway.
- Traffic interruption in the event of roadway overtopping.
- Anticipated upstream and downstream flood risks, for a range of return frequencies.

The headwater shall be checked for the 100-year storm event elevation to ensure compliance with floodplain management criteria and to ensure it is contained within the right-of-way or easement. The headwater shall not cause damages to the upstream property.

3.5.5.5 *Tailwater Considerations*

If the culvert outlet is operating with a free outfall, the critical depth and equivalent hydraulic grade line shall be determined. If an upstream culvert outlet is located near a downstream culvert inlet, the headwater elevation of the downstream culvert will establish the design tailwater depth for the upstream culvert. For culverts discharging into natural creeks, channels, or ponds, the tailwater shall be assumed to be the 100-year fully developed water surface elevation. If an approved flood hydrograph is available to provide a coincident flow elevation for the system's peak, the table of coincident design frequencies in the iSWM manual can be used to establish the tailwater elevation. Alternatively, a detailed hydrologic and hydraulic study can be performed to establish the tailwater elevation.

3.5.6 Bridges

3.5.6.1 *Hydraulic Design*

A hydrologic and hydraulic analysis using HEC-RAS is required for designing all new bridges, bridge widening, bridge replacement, and roadway profile modifications that may adversely affect the floodplain, even if no structural modifications are necessary. The hydraulic analysis should demonstrate no-rise (0.00 feet) in the water surface elevation for the 100-year storm. Typically, this analysis should include the following:

1. Peak discharges for fully developed watershed conditions,
2. Proposed conditions water surface profiles for design flood and other frequency flood impacts.
3. Consideration of the potential for stream stability problems and scour potential.

Additional discussion on bridge hydraulics is included in the *TxDOT Hydraulic Design Manual*.

3.5.6.1.1 Loss Coefficients for Hydraulic Models

The contraction and expansion of water through the bridge opening creates hydraulic losses. These losses are accounted for through the use of loss coefficients. Contraction (K_c) and Expansion (K_e) Coefficients shall be used at the bridge location in accordance with current FEMA guidelines.

3.5.6.2 *Minimum Elevations*

Bridges shall be designed to pass the 100-year flow with a minimum 1 foot of freeboard between the 100-year surface elevation and the low chord of the bridge. Analysis must consider both the fully developed and FEMA effective discharges, and the freeboard elevation will be set using the most conservative results. Where fully

developed discharges are not available, the Engineer will be required to perform a flood study to determine 100-year water surface elevations.

3.5.6.3 *Scour Analysis*

A scour analysis shall be submitted with bridge design plans. Scour analysis shall be performed in accordance with the latest edition of the TxDOT *Geotechnical Manual*, based on the guidelines and procedures outlined in *HEC-18 Evaluating Scour at Bridges (5th Ed.)*. The HEC-RAS scour routines shall generally be used to perform bridge scour computations. Aerial utility crossings with piers located in the main channel shall also be evaluated for local pier scour using the methodology outlined in *HEC-18*.

Scour revetment shall be provided as needed and shall be designed using the methodology outlined in *HEC-23 Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Guidance*. Alternative methodologies for scour analysis and revetment may be approved at the discretion of the Town Engineer.

Section 3.6. Stormwater Storage Facilities

Proposed stormwater discharge from a site shall not exceed the calculated discharges from existing conditions for the 2-, 25-, and 100-year design storm. On-site detention may be proposed to mitigate the impacts of increased discharges due to site development. In some instances, detention may be shown to exacerbate potential flooding conditions downstream. In lieu of a detention facility, the Engineer may document that the excess flow will not create adverse impacts as defined in **Table 3**.

3.6.1 Detention Storage Calculation

The modified rational method is allowed for planning and conceptual design for watersheds of 200 acres and less. Sizing is not exact and may result in undersized detention/retention pond requirements. For final design purposes, the modified rational method is allowed only for watersheds of 25 acres and less. The modified rational method is not acceptable for basins in series. Detention basins draining watersheds over 25 acres shall be designed using unit hydrograph methodology. The unit hydrograph method is also allowed for basins with watersheds less than 25 acres and may be required at the discretion of the Town Engineer.

A calculation summary shall be provided on construction plans. For detailed calculations of unit hydrograph studies, a separate report shall be provided to the Town for review and referenced with date, engineer, and title on the construction plans. Stage-storage-discharge values shall be tabulated, and flow calculations for discharge structures shall be shown on the construction plans. Routing calculations must be used to demonstrate that the storage volume and outlet structure configuration are adequate.

3.6.2 Pond and Spillway Geometry

The following criteria shall apply:

1. Detention basin embankments shall have a 10-foot crown width.
2. Fencing may be required around the detention area at the discretion of the Town Engineer.
3. Detention Basins shall be designed with at least one maintenance ramp of at least 10 feet wide with a maximum slope of 15%. Twelve (12) feet in width is required next to vertical walls.
4. A freeboard of 1 foot will be required for all detention ponds.
5. Grassed side slopes shall be 4:1 or flatter and less than 20 feet in height. Slopes protected with concrete riprap shall be no steeper than 2:1. A detailed geotechnical investigation and slope stability analysis is required for grass and concrete slope pavement slopes greater than 12 feet in height. A concrete-lined or structural embankment can be steeper with the approval of the Town Engineer.
6. An emergency spillway shall be provided at the 100-year maximum storage elevation with sufficient capacity to convey the fully urbanized flood mitigation storm assuming blockage of the closed conduit

portion outlet works with 6 inches of freeboard. Spillway requirements must also meet all appropriate state and federal criteria. Design calculations will be added for all spillways.

7. Dry detention basins are sized to temporarily store the volume of runoff required to provide flood protection up to the flood mitigation storm, if required. Dry detention basin design should consider multiple uses, such as recreation. As such, pilot channels should follow the edges of the basin to the extent practical.
8. The bottom of the basin shall have a minimum grade of 1%, although swales may have minimum grades of 0.5%. Concrete flumes shall be provided for slopes less than 0.5% and may have slopes as shallow as 0.2%. They shall be at least 6 feet wide.

3.6.3 Permitting and Dam Safety Requirements

All federal, state, and local laws pertaining to the impoundment of surface water relating to the design, construction, and safety of the impounding structure shall apply. Criteria established by the State of Texas for dam safety (*TAC Title 30, Part 1, Chapter 299*) and impoundment of state waters (*Texas Water Code Chapter 11*) shall apply where required by the state, and where required by the Town Engineer. Should the engineer desire to utilize an existing facility that would qualify under these criteria and the use of the facility changes from an agricultural use to another use, the existing facility may need to be brought into compliance with the TCEQ *dam safety criteria*.

If a dam falls under the TCEQ dam safety criteria, the Town will require review and approval from TCEQ prior to authorizing construction. Copies of any federal, state, or local permits issued for the proposed impoundments shall be submitted to the Town Engineer. TCEQ rules and regulations regarding impoundments shall be followed. In accordance with Texas Water Code §11.142, permanent surface impoundments including retention and detention ponds may be required to obtain a water rights permit from the TCEQ.

Section 3.7. Floodplain Development

The following information is included for reference and to supplement the provisions outlined in the Town's *Flood Control and Prevention Ordinance*. Where codified flood protection provisions conflict with the provisions of this manual, the more stringent of the criteria shall apply.

The Town regulates development in all flood-prone areas. Flood-prone areas include areas located within the FEMA Special Flood Hazard Area (SFHA), flood hazards identified as part of a drainage study or Town Council adopted watershed study, or reported flood-prone areas located in Zone X. Reported flood-prone areas are subject to the requirements of this manual even if a flood zone has not been identified for the area.

Any land disturbance that includes impacts to a flood-prone area or could have impacts on floodplain limits for an associated stream shall require a hydraulic analysis (flood study) to determine drainage easements, establish minimum finished floors for insurable structures, and evaluate proposed modifications to existing floodplains or floodways. Depending upon the proposed project, location, and type of stream, the stormwater submittals may include a Flood Study, No Rise Certification, Floodplain Development Permit, FEMA Letter of Concurrent/Approval, and/or a USACE Section 10 and Section 404 Permit.

3.7.1 Effective Models

When available, effective models provided by the Town are required to be utilized to establish existing conditions and evaluate proposed project impacts to the watershed. When Town adopted models are utilized, any submitted models shall be consistent with the base modeling platform and version. Proposed conditions shall be incorporated into the Town's watershed models and submitted for review.

3.7.2 Compensatory Storage

Compensatory storage is required for all storage lost or displaced in a Regulatory Floodplain due to land disturbance. Hydraulically equivalent compensatory storage requirements for fill or structures placed in the SFHA and/or within a riverine flood hazard area identified in a Town Council adopted watershed study shall be at least equal to the volume of the storage lost or displaced. Such compensation areas shall be designed to drain freely and

openly to the channel and shall be located opposite or adjacent to fill areas. The Regulatory Floodplain storage volume lost below the existing 10-year frequency flood elevation must be replaced below the proposed 10-year frequency flood elevation. The Regulatory Floodplain storage volume lost above the 10-year existing frequency flood elevation must be replaced above the proposed 10-year frequency elevation.

3.7.3 Floodplain Development Permit

Any work to be performed within any flood-prone area of the town required a Floodplain Development Permit. Variances will not be issued from this requirement for proposed projects in the SFHA. Applications for a Floodplain Development permit shall be submitted to the Town with the flood study that evaluates existing conditions and proposed project impacts.

3.7.4 FEMA Submittal Requirements

Coordination with and approval from the Town Floodplain Administrator is required for all floodplain submittals. Payment of a review fee to the Town may be required.

All proposed projects located in the SFHA shall be evaluated for the need of a Conditional Letter of Map Revision (CLOMR). A CLOMR shall be submitted to FEMA in the event that the proposed modifications to the SFHA result in a rise greater than 0.0 feet to the effective base flood elevation. The Town reserves the right to require a CLOMR for any proposed project located within the SFHA.

Upon completion of construction within the SFHA, all applicants shall verify that the site was constructed according the proposed conditions. As-built plans, certified by a professional engineer registered in Texas, shall be submitted to the Town for verification of as-built conditions. Hydraulic modeling to reflect as-built conditions is required for projects constructed without conditional approval or where as-built conditions differ from the proposed conditions modeling. In all cases, a Letter of Map Revision (LOMR) shall be submitted to FEMA for approval.

Sec. 4.0 Water and wastewater design requirements.

Water System.

Water lines adequate for domestic supply and for fire protection needs shall be installed to serve each lot, or tract, in every subdivision where connection is to be made immediately to a community or a utility water system in accordance with the Texas Commission on Environmental Quality and town design standards and specifications. In subdivisions outside the town limits, where such connection to a system is not to be made immediately, plans shall be prepared for future installation of a water distribution system to serve each lot or tract.

A. *Water System Extensions.* Water system extensions shall be designed to provide for a domestic supply of at least 100 gallons per capita per day delivered at a minimum pressure of 50 pounds per square inch. The 100-gallon rate of supply shall not be required if, in the opinion of the town's engineer, the proper point of connection to the existing system for the extension is not capable of supplying such a volume. However, the extension shall be designed to convey the 100-gallon rate should the supply point be subsequently improved. If the 50 pounds minimum pressure cannot be provided by existing system pressure or because of the elevation of the tract to be developed, a booster pump system shall be included which will provide that minimum pressure.

B. *All Supply and Distribution Mains.* All supply and distribution mains installed within a subdivision must extend to the borders of the subdivision as required for future extensions of the system, regardless of whether or not such extensions are required for service within the subdivision.

C. *Fire Hydrants.* Fire hydrants shall be provided at locations such that all areas of development are located within a 500-foot radius from a fire hydrant. All such fire hydrants shall be served by a six inch or larger supply or distribution main.

D. *Extension for Single Customer.*

1. When it is necessary to extend a water line to serve a new single customer where only one meter will be installed, the town at its own expense will extend the said water line up to 100 feet.
2. If a greater distance than 100 feet is required to reach the nearest property line of the new single customer, the said single customer shall pay 100 percent of cost extension in excess of 100 feet.
3. If more than one single customer is served by the main extension, 100 feet of main will be allowed for each single customer thus served, and any excess footage will be paid for at 100 percent.
4. No more than one single customer credit of 100 feet will be allowed each lot or tract of record so served regardless of the number of buildings, occupied or otherwise, which might be located on said lot or tract.
5. Payment will be made in advance of construction.

E. *Extensions to Serve Developers.*

1. The developer will pay 100 percent of the construction cost of the size mains required to serve his development, including the approach main, plus ten percent of the developer's share of the construction cost for engineering, supervision and inspection, or six percent if a private engineer approved by the utilities supervisor is employed by the developer and furnishes approved plats and specifications.
2. When the developer desires that water mains be extended to serve his property, he will submit a request in writing to the utilities supervisor. The property to be served shall be listed showing the

lot, block and subdivision. Two approved plats of the area to be served shall be attached to the request and shall become the property of the town.

3. If the area to be served is a part of a larger area that is owned or controlled by the developer and which is reasonably expected to be served by water in the future, then two approved plats or approved preliminary plats of the larger area shall also be submitted. A tentative design of a main layout will be made of the entire area, but the cost estimate will be made on that portion of the subdivision to be served immediately.

F. *Materials and Workmanship.* All materials and workmanship incorporated in water system extensions shall be in accordance with the currently adopted town construction specifications.

G. *Water Well Design Requirements.* Water well must be meet current standard design practice.

Wastewater System

Sanitary sewers shall be installed to serve each lot, or tract, in every subdivision where connection is to be made immediately to a community disposal system or to a public sewerage system.

A. *Sewer Extensions.*

1. All sewer extensions shall be designed in accordance with the latest applicable rules and regulations as published by the Texas State Department of Health. No sewer lateral shall be smaller than six inch in nominal diameter. All sewers shall be designed with consideration for serving the full drainage area subject to collection by the sewer in question except as modified with the concurrence of the town's engineer because of the projected rate of development or the financial feasibility of the proposed extension.

2. All subdivisions developed subsequent to this ordinance must be served by community sanitary sewerage collection, treatment and disposal systems approved by the town with exceptions granted only if all of the following conditions exist: (1) the subdivision in question is less than five parcels of land, (2) the existing community type collection, treatment and disposal system is not and cannot feasibly, in the opinion of the town's engineer, be made available to the area of development, and (3) percolation tests run by an independent testing laboratory are submitted to both the town and county health department with results showing that a septic tank and spreader field can be developed to provide adequate disposal of the sewage.

B. *Lateral and Sewer Mains.* All lateral and sewer mains installed within a subdivision must extend to the borders of the subdivision as required for future extensions of the collecting system regardless of whether or not such extensions are required for service within the subdivision.

C. *Lift Stations or Separate Treatment Facilities.* The provision for lift stations or separate treatment facilities will not be permitted unless the cost of constructing such lift stations or separate facilities is at least 20 percent less than the costs of constructing an adequate outfall or approach sewer from the existing system.

D. *Septic Tank.* A septic tank with a capacity of not less than 500 gallons and with a drain field of not less than 150 feet shall be installed on each lot in accordance with the regulations of the county and state health officers.

E. *Extensions for Single Customers.*

1. Where it is necessary to extend a sewer line to serve a new "single customer," the town, at its own expense, will extend said sewer up to 100 feet.

2. If a greater distance than 100 feet should be required to extend the line to the nearest property line of the customer, said single customer shall pay the excess over the 100 feet allowable at the rate of 100 [percent] of cost.

3. If more than one single customer is served by the main extension, 100 lineal feet of sewer will be allowed for each single customer thus served, and any excess footage will be paid for at 100 percent of cost.

4. No more than one single customer credit of 100 feet will be allowed for each lot or tract of record so served regardless of the number of buildings, occupied or otherwise, which might be located on said lot or tract.

5. Payment will be made in advance of construction.

F. *Extensions to Serve Developers.* The developer shall pay 100 percent of the construction cost of all sewers including "approach mains," but excepting "service lines," plus ten percent of the developer's share of the construction cost for engineering, supervision and inspection, or six percent if a private engineer approved by the utilities supervisor is employed by the developer and furnishes approved plans and specifications.

1. The developer will also pay 100 percent of the cost of "service lines" to all lots to be served by a sewer located in the street. Said "service lines" will be constructed at the same time as a part of the same contract as all other sewers in the developer's addition. If the sewers are being constructed by town forces, the "service lines" will be constructed by town forces at the time all other sewers within the addition are constructed.

2. The utilities supervisor shall determine the size of "approach main" required to serve developer's property and the actual size to be constructed. Should the town elect to construct a main larger than the developer's required "approach main," the developer will not be charged for the additional size.

3. The amount of developer's payment shall be determined using unit bid prices contained in the award contract.

G. *Connections.* No connection shall be made to any sanitary sewerage system within the town which will permit the entrance of surface water or waste of other than domestic sewage characteristics without the specific authorization by the town council.

H. *Materials and Workmanship.* All materials and workmanship incorporated in the sewage system extensions shall be in accordance with the currently adopted town construction specifications.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 5.0 Other public improvements.

Street Lighting.

1. The following standards shall apply to all arterial thoroughfares:

a. Street lighting shall be placed in the medians, with spacing not to exceed one hundred eighty feet (180') and no closer than one hundred forty-five feet (145') depending on median breaks and intersections.

b. Unless a photometric analysis suggests the use of a different type of luminaire, street lighting shall use a city-approved, standard 250-watt equivalent LED luminaire with a color temperature of 3,000 kelvins.

2. All traffic signal and street lighting construction, testing, and materials shall be in accordance with the city's current standards, details, and specifications unless otherwise noted. All electrical work shall be in accordance with the most current National Electrical Code, town and TxDOT specifications and standards.

3. All lighting luminaries shall use LED lamps.
4. All site plans should provide a copies of the proposed layout of street lighting standards serving the subdivision. The type of all proposed and existing street lighting shall be indicated on the layout.
5. Contractor shall coordinate electrical services with the town and either ONCOR or COSERV representatives (according to their respective area).
6. The contractor shall coordinate with the appropriate utility company and TxDOT/NTTA (if within TxDOT/NTTA ROW) prior to beginning erection of poles, luminaries and structures located near any overhead or underground utilities.
7. Proposed concrete foundation and conduit alignment shall be staked by the contractor and approved by the town prior to installation.

Gas Lines.

The subdivider shall arrange for and shall file his request at the earliest feasible date for gas service desired for his subdivision. Where a source of gas supply is not within a reasonable distance for present installation, but, wider a gas line extension agreement gas service will be extended within five years following the recording of the final plat, those portions of such lines which will lie within the portions of streets intended for vehicular traffic shall be installed. In lieu of such installation the subdivider may defer the paving of streets and alleys until such lines are installed by making appropriate fiscal arrangements with the town.

Electric Power and Telephone Service.

The subdivider shall arrange with the appropriate utility and shall file his request at the earliest feasible date for electric power and telephone service to his subdivision.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 6.0 Retaining Wall Design Requirements.

Design and Construction Standards

A. All retaining walls in excess of four feet (4') in height (measured from the bottom of footing to top of wall) shall be designed by a Professional Engineer licensed in the State of Texas.
B. Retaining walls shall be designed and constructed to support the live load and dead load forces they will be subjected to.
C. Retaining walls shall be designed using a cantilevered reinforced concrete structure, masonry gravity structure, or stone gravity structure. Other retaining wall materials may be approved at the discretion of the Town Engineer.
D. Brick shall not be used as a structural element of a retaining wall, but it may be used as a facing material. Timber material, such as railroad ties, is prohibited for use as any part of a retaining wall, regardless of height.
E. Retaining walls shall have proper fall protection as defined within the Building Code as adopted by the Town.
F. Walls that are anticipated to support a fence or screen wall, either integrally or separately, shall be designed to handle the structural forces of the fence imposed on the wall.
G. *Tiered Retaining Wall Systems*
    1. Tiered retaining wall systems shall be designed such that the upper wall does not place additional surcharge on the lower wall, beyond the design loads of the lower wall.

2. Tiered retaining wall systems shall be designed such that the height of the upper wall is no greater than the height of the lower wall.

Retaining Wall Building Permit

A. Any earth terracing method that supports a structure or vehicle load, or that is at least four feet (4') in height (measured from the bottom of footing to top of wall) shall require a separate building permit.
B. Application for a retaining wall building permit at least four feet (4') in height, or that supports a structure or vehicle load, shall include the following:
    1. A site-specific geotechnical report, sealed by a geotechnical engineer licensed in the State of Texas. This report shall include soil parameters to be used in the design of the retaining wall for sliding and overturning stability. Additionally, global stability analysis shall be included in the geotechnical study for retaining walls with a retained height in excess of ten feet (10') or immediately adjacent to a stream or ponded water.
    2. Retaining wall plans, sealed by a professional engineer licensed in the State of Texas.
    3. Structural calculations, sealed by a professional engineer licensed in the State of Texas, that utilize the parameters provided in the geotechnical report indicating that the retaining wall is stable in sliding, overturning, and internal failure modes.
C. No building permit, other than for a retaining wall, shall be issued for any lot within a subdivision until all retaining walls are constructed in accordance with a grading plan for the subdivision.
D. Any change from the approved grading plan or design for a retaining wall within a subdivision shall not be permitted unless the applicant has submitted plans for the entire subdivision showing the proposed change in grading and the Town Engineer has approved the proposed change(s).

Retaining Wall Maintenance and Easements

A. If, in the opinion of the Town Engineer, site development construction plans indicate the need for the construction of retaining walls greater than four feet (4') in height, private retaining wall easements showing the location of the retaining wall(s) and the no-build zone shall be dedicated and shown on the Preliminary Plat and Final Plat.
B. The retaining wall easement shall include a no-build zone, extending from the retaining wall on both sides, within which any additional load from future construction would exceed the design capacity of the retaining wall.
    a. The no-build zone width shall be at least the clear height of the retaining wall.
    b. No structure (other than the retaining wall), swimming pool, or any other feature which adds load to the retaining wall shall be constructed within the no-build zone.
    c. Exceptions from these requirements may be granted by the Town Engineer if a design and supporting calculations are provided that demonstrate the wall's ability to support the proposed structure.
C. The width of the retaining wall easement shall be a minimum of five feet (5') or the width of the retaining wall (including subsurface elements), whichever is greater, plus the width of the no-build zone.
D. Retaining walls and no-build zones shall be located entirely on one lot and shall not straddle property lines, unless the wall is constructed within a retaining wall easement dedicating the ownership and maintenance responsibility to the Homeowners' or Property Owners' Association.
E. Retaining walls greater than four feet (4') in height and constructed as part of a Subdivision shall be located in a retaining wall easement dedicated to the Homeowners' or Property Owners' Association, and shall be their responsibility to maintain."

Sec. 7 GIS/survey requirements.

Coordinate System.

AutoCAD 2010 (or higher) with water, sanitary sewer, paving, grading, storm sewer. The CAD file of project should be referenced with the NAD_1983_StatePlane_Texas_North_Central_FIPS_4202_Feet projected Coordinate System.

Markers.

1. Markers consisting of minimum three-eighths-inch diameter steel rods at least twenty-four inches long with caps identifying responsible surveying firm or RPLS number shall be placed at all:
    a. Lot and block corners (wherever a lot line bearing changes);
    b. Intersection points of alley and block lines;
    c. Curve and tangent points along block, lot and right-of-way lines within the subdivision; and
    d. Right-of-way dedications.

Monuments.

1. Three dimensional coordinates, reported as state plane coordinates, shall be established using the city's monumentation system and using the city's combined scale factor. The coordinates shall be noted on the plat monuments shall be markers and installed at locations shown on the plat.
2. Subdivision Monumentation.
    a. At least two markers shall be placed at property corners in addition to at least two monuments at opposing ends of the property.
3. Capital Improvements Project Monuments.
    a. Found existing right-of-way monuments, survey markers, or property corners, and proposed monuments shall be shown on the construction drawings and located by station and offset, right or left from the control line, base line or center line, or by northing and easting.
4. If new construction will damage, destroy, or alter existing survey markers, monuments, or property corners, they must be reset prior to final acceptance.
5. Prior to final plat acceptance, all required monuments must be found and reset if damaged during construction.
6. The surveyor will provide two monuments acceptable to the town and establish grid coordinates for the monuments in reference to the Town of Little Elm GPS monuments.
7. Elevations will be established on the two monuments on the vertical datum in reference to the Town of Little Elm GPS monuments.

(Ord. No. 1444, § 2(Att. A), 3-6-2018)

Sec. 8.0 Standard details.

TOWN OF LITTLE ELM
STANDARD DETAILS

LITTLE ELM

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STANDARD DETAILS * TOWN OF LITTLE ELM, TEXAS * DECEMBER 2023

CONSTRUCTION
GENERAL NOTES

GENERAL NOTES

1. IT IS NOT THE INTENT OF THESE CONSTRUCTION NOTES TO COVER ALL DETAILS AND/OR SPECIFICATION REQUIREMENTS OF THE TOWN OF LITTLE ELM. WHEN THERE IS A CONFLICT BETWEEN THESE STANDARDS AND OTHER REGULATIONS, THE CONTRACTOR MUST ABIDE BY THE STRICTEST REQUIREMENT.
2. THE EXISTENCE AND LOCATIONS OF ALL UNDERGROUND UTILITIES SHOWN (MAIN LINES, NO LATERAL OR SERVICES SHOWN) ON THE DRAWINGS WERE OBTAINED FROM AVAILABLE RECORDS AND ARE APPROXIMATE. NO WARRANTY IS IMPLIED AS TO THE ACTUAL LOCATION OF EXISTING UTILITIES. NEITHER THE OWNER NOR THE ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL DETERMINE THE DEPTH AND LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO TRENCHING AND SHALL BE REQUIRED TO TAKE ANY PRECAUTIONARY MEASURES TO PROTECT ALL LINES SHOWN AND // OR ANY OTHER UNDERGROUND UTILITIES NOT OF RECORD OR NOT SHOWN ON THE PLANS. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL FRANCHISE AND TOWN UTILITIES PRIOR TO CONSTRUCTION.
3. ANY CONTRACTOR / SUBCONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE HIMSELF WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATIONS. SAID EXISTING IMPROVEMENTS SHALL INCLUDE BUT NOT BE LIMITED TO BERMS, DITCHES, FENCES, AND VEGETATION. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTOR AT HIS EXPENSE AND SHALL BE APPROVED BY THE TOWN OF LITTLE ELM.
4. ALL CONSTRUCTION, TESTING, AND MATERIALS SHALL MEET OR EXCEED ALL REQUIREMENTS OF THE TOWN OF LITTLE ELM. ALL SUBMITTALS MUST BE ORIGINALS WITH SIGNATURES WHERE APPLICABLE; FACSIMILES WILL NOT BE ACCEPTED.
5. TESTING SERVICES FOR PUBLIC PROJECTS SHALL BE PROVIDED BY THE TOWN. COSTS ASSOCIATED WITH THESE TESTS SHALL BE PAID BY THE TOWN. RE-TEST OF FAILED AREAS THAT DO NOT MEET THE REQUIREMENTS STATED WITHIN SHALL BE PAID FOR BY THE CONTRACTOR.
6. ALL TRAFFIC CONTROLS SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LATEST REVISION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD). ALL REFERENCE FOR (USING TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) STANDARDS AND CONSTRUCTION DETAILS SHALL BE THE LATEST REVISIONS AND/OR AMENDMENTS THEREOF. THE TOWN OF LITTLE ELM USES RAISED PAVEMENT MARKINGS (BUTTONS) FOR STRIPING AND THERMOPLASTIC MARKINGS IN LIEU OF PAINT. THE MINIMUM SIGN SIZE SHALL BE THE STANDARD SIZE IN THE MANUAL. DETAILS ARE AVAILABLE UPON REQUEST FOR THE TYPE OF BUTTON PATTERNS, POSTS, AND CONNECTIONS REQUIRED FOR THE SIGNS.
7. THE CONTRACTOR SHALL MAKE EVERY EFFORT NOT TO IMPEDE TRAFFIC ON EXISTING STREETS, ALLEYS, OR FIRE LANES OPEN TO THE PUBLIC. IN THE EVENT THE CONSTRUCTION WORK REQUIRES THE CLOSURE OF AN EXISTING STREET, ALLEY, OR FIRE LANE, THE CONTRACTOR SHALL REQUEST THE ROAD CLOSURE THROUGH THE TOWN. IF THE CLOSURE ELIMINATES THE SECOND POINT OF ACCESS TO EXISTING BUILDINGS WITH A CERTIFICATE OF OCCUPANCY, THEN THE ACCESS MAY NOT BE CLOSED FOR MORE THAN FORTY-EIGHT (48) HOURS AND WILL REQUIRE FIRE MARSHAL APPROVAL IN EITHER CASE. UNLESS OTHERWISE SPECIFIED BY THE TOWN, ALL OTHER STREETS OR ALLEYS MAY NOT BE CLOSED FOR MORE THAN SEVENTY-TWO (72) HOURS.
8. THE CONTRACTOR SHALL INSTALL TEMPORARY FENCES ADJACENT TO ALL SIDEWALKS AND ADJACENT DEVELOPED PROPERTIES. THE CONTRACTOR MUST ALSO PROVIDE TEMPORARY FENCING WHEN FENCES OR OTHER SCREENING FEATURES ARE REMOVED FOR THE DURATION OF CONSTRUCTION.
9. ALL CONCRETE STRUCTURES, WHETHER PRECAST OR CAST-IN-PLACE, SHALL BE DESIGNED WITH APPROPRIATE SULFATE RESISTANT CEMENT OR EQUIVALENT BASED ON LOCAL SOIL CONDITIONS PER GEOTECHNICAL REPORT. PRECAST MANHOLES OR OTHER SPECIAL STRUCTURES IN ANY RIGHT-OF-WAY OR FIRE LANE EASEMENTS WILL REQUIRE A CERTIFICATION FROM THE MANUFACTURER THAT THE PRODUCT MEETS THE DESIGN CRITERIA AND TWENTY-EIGHT (28) DAY COMPRESSIVE STRENGTH. CAST-IN-PLACE MANHOLES OR OTHER SPECIAL STRUCTURES IN ANY RIGHT-OF-WAY AND FIRE LANE OR UTILITY EASEMENTS WILL REQUIRE CYLINDERS TO BE MADE FOR STRENGTH TESTS BY AN APPROVED LABORATORY. LABORATORY TEST REPORTS SHALL BE SUBMITTED TO THE DESIGN ENGINEER FOR APPROVAL. SAMPLES FOR STRENGTH TESTS OF EACH CLASS OF CONCRETE PLACED EACH DAY SHALL BE TAKEN NOT LESS THAN ONCE A DAY, NOR LESS THAN ONCE FOR EACH 100-150 CU YD OF CONCRETE, NOR LESS THAN ONCE FOR EACH 5000 SQ FT OF SURFACE AREA FOR SLABS OR WALLS. FOUR (4) CYLINDERS SHALL BE MADE. ONE (1) SHALL BE BROKEN AT SEVEN (7) DAYS, TWO (2) SHALL BE BROKEN AT TWENTY-EIGHT (28) DAYS, AND ONE (1) SHALL BE HELD IN CASE OF DAMAGE OF ANY OF THE OTHER THREE (3). THE AVERAGE STRENGTH OF TWO (2) CYLINDERS FROM THE SAME SAMPLE, TESTED AT TWENTY-EIGHT (28) DAYS, IS REQUIRED FOR EACH STRENGTH TEST; ANY STRENGTH TEST BEYOND TWENTY-EIGHT (28) DAYS IS UNACCEPTABLE. IF THE TWENTY-EIGHT (28) DAY DESIGN STRENGTH IS NOT REACHED UPON STRENGTH TESTING THE CYLINDERS, THE DEFICIENT AREA SHALL BE CORED IMMEDIATELY TO BE PROVED OUT. FOR ANY AREAS DEFICIENT IN STRENGTH BY NOT MORE THAN 500 PSI, THE CONTRACTOR SHALL PAY TO THE TOWN ONE (1) TIME THE UNIT BID PRICE PER SQUARE YARD FOR THE AREA DETERMINED TO DEFICIENT IN STRENGTH. FOR ANY AREAS DEFICIENT IN STRENGTH BY MORE THAN 500 PSI BUT NOT MORE THAN 1000 PSI, THE CONTRACTOR SHALL PAY TO THE TOWN TWO (2) TIMES THE UNIT BID PRICE PER SQUARE YARD FOR THE AREA DETERMINED TO DEFICIENT IN STRENGTH. FOR ANY AREAS DEFICIENT IN STRENGTH BY MORE THAN 1000 PSI, THE STRUCTURE SHALL BE REMOVED AND RECONSTRUCTED AT THE FULL EXPENSE OF THE CONTRACTOR. PRIOR TO TOWN ACCEPTANCE OF ANY PENALTY PAYMENTS FOR ANY TRAFFIC BEARING STRUCTURE THAT DOES NOT MEET TWENTY-EIGHT (28) DAY DESIGN STRENGTH, THE DESIGN ENGINEER SHALL PROVIDE A SEALED STRUCTURAL EVALUATION THAT ASSESSES THE PERFORMANCE ADEQUACY OF THE DEFICIENT STRUCTURE AS CONSTRUCTED UNDER THE DESIGN SERVICE LOADS. ALL CORING AND ADDITIONAL LABORATORY TESTING SHALL BE AT THE EXPENSE OF THE CONTRACTOR.
10. BLASTING IS NOT PERMITTED ON THIS PROJECT.
11. ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION.
12. THESE PLANS DO NOT EXTEND TO OR INCLUDE DESIGNS OR SYSTEMS PERTAINING TO THE SAFETY OF THE CONSTRUCTION CONTRACTOR OR ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE SEAL OF THE REGISTERED PROFESSIONAL ENGINEER(S) HEREON DOES NOT EXTEND TO ANY SUCH SAFETY SYSTEMS THAT MAY NOW OR HEREAFTER BE INCORPORATED IN THE WORK.
13. NO TRENCH EXCAVATION SHALL OCCUR UNTIL THE TOWN APPROVES THE TRENCH SAFETY PLAN SUBMITTED BY THE CONTRACTOR.
14. A PRE-CONSTRUCTION CONFERENCE IS TO BE HELD PRIOR TO BEGINNING CONSTRUCTION. THIS CONFERENCE SHALL TAKE PLACE AT A LOCATION SELECTED BY OWNER & ENGINEER. CONTRACTOR TO ARRANGE A MEETING DATE WITH THE OWNER AT LEAST SEVEN DAYS PRIOR TO THE MEETING TIME.
15. CONTRACTOR SHALL NOTIFY THE OWNER, OWNER'S REPRESENTATIVE, AND TCEQ (IF APPLICABLE) BY TELEPHONE A MINIMUM OF 48 HOURS IN ADVANCE OF CONSTRUCTION STARTUP, FOLLOWED BY A LETTER OF CONFIRMATION.
16. CONTRACTOR SHALL ASSURE HIMSELF THAT ALL CONSTRUCTION PERMITS HAVE BEEN OBTAINED PRIOR TO COMMENCEMENT OF WORK. REQUIRED PERMITS THAT CAN ONLY BE ISSUED TO CONTRACTOR ARE TO BE OBTAINED AT THE CONTRACTORS EXPENSE.
17. CONTRACTOR SHALL GIVE A MINIMUM OF 48 HOURS NOTICE TO ALL AUTHORIZED INSPECTORS, SUPERINTENDENTS, OR PERSONS IN CHARGE OF PRIVATE AND PUBLIC UTILITIES AFFECTED BY HIS OPERATIONS PRIOR TO COMMENCEMENT OF WORK.
18. CONTRACTOR SHALL TAKE ALL DUE PRECAUTIONS TO PROTECT EXISTING FACILITIES FROM DAMAGE. ANY DAMAGE TO EXISTING FACILITIES INCURRED AS A RESULT OF THESE CONSTRUCTION OPERATIONS ARE TO BE REPAIRED IMMEDIATELY BY THE CONTRACTOR TO AT LEAST THE PRE-EXISTING CONDITION AT NO ADDITIONAL COST TO OWNER.
19. WHEN UNLOCATED OR INCORRECTLY LOCATED UNDERGROUND PIPING OR A BREAK IN A LINE OR OTHER UTILITIES AND SERVICES ARE ENCOUNTERED DURING SITE WORK OPERATIONS, THE CONTRACTOR SHALL NOTIFY THE APPLICABLE UTILITY COMPANY IMMEDIATELY TO OBTAIN PROCEDURE DIRECTIONS. THE CONTRACTOR SHALL COOPERATE WITH THE APPLICABLE UTILITY COMPANY IN MAINTAINING ACTIVE SERVICES IN OPERATION.
20. THE CONTRACTOR SHALL MAINTAIN ACCESS TO PUBLIC AND PRIVATE FACILITIES DURING CONSTRUCTION. CONSTRUCTION ACTIVITIES TO BE COORDINATED WITH THE OWNER.
21. THE CONTRACTOR SHALL COORDINATE INTERRUPTIONS OF ALL UTILITIES AND SERVICES WITH APPLICABLE UTILITY COMPANY OR COMPANIES. ALL WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE UTILITY COMPANY OR AGENCY INVOLVED.
22. THE CONTRACTOR SHALL LOCATE, PROTECT, AND MAINTAIN BENCHMARKS, MONUMENTS, AND CONTROL POINTS. THE CONTRACTOR SHALL RE-ESTABLISH DISTURBED OR DESTROYED ITEMS BY A REGISTERED PUBLIC SURVEYOR IN THE STATE OF TEXAS, AT NO ADDITIONAL COST TO OWNER.
23. EXISTING PAVING, BUILDING, AND OTHER ITEMS SHOWN ON PLANS NOT SPECIFICALLY RELATED TO THE WORK OF THE CONTRACTOR IS FOR INFORMATION ONLY.
24. DEMOLITION PERMITS (IF NEEDED) ARE TO BE OBTAINED BY THE CONTRACTOR.
25. COORDINATES SHOWN FOR STRUCTURE LOCATIONS ARE REFERENCED TO OUTSIDE FACE OF EXTERIOR WALL AT GRADE OR TO CENTERLINE OF STRUCTURE, UNLESS OTHERWISE ON PLANS.
26. EXISTING SURFACE AND SUBSURFACE STRUCTURES (GAS MAINS, WATER MAINS, STORM SEWERS, TELEPHONE CABLES, ETC.) ARE SHOWN ON THE PLANS IF THEIR LOCATION HAS BEEN DETERMINED, BUT IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO AVOID DAMAGING THESE EXISTING STRUCTURES WHETHER OR NOT THEY ARE SHOWN ON THE PLANS. THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR FAILURE TO SHOW ANY OR ALL OF THESE STRUCTURES ON THE PLANS OR TO SHOW THEM IN THEIR EXACT LOCATION. IF ANY STRUCTURE IS DAMAGED BY THE CONTRACTOR, IT SHALL BE HIS RESPONSIBILITY TO REPAIR THE DAMAGE AT HIS OWN EXPENSE AND RESTORE THE STRUCTURE TO ITS ORIGINAL CONDITION.
27. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY LOCATIONS, ELEVATIONS AND DIMENSIONS OF ADJACENT AND/OR CONFLICTING UTILITIES IN ADVANCE OF CONSTRUCTION IN ORDER THAT ADJUSTMENTS CAN BE MADE TO PROVIDE ADEQUATE CLEARANCES, IF REQUIRED. THE CONTRACTOR SHALL PRESERVE AND PROTECT PUBLIC UTILITIES AT ALL TIMES DURING CONSTRUCTION. ANY DAMAGE TO UTILITIES RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED AT HIS EXPENSE. THE ENGINEER SHALL BE NOTIFIED WHEN PROPOSED FACILITY GRADES CONFLICT WITH EXISTING UTILITY GRADES.
28. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING "AS-RECORDED" PLANS TO THE ENGINEER OF RECORD SHOWING THE LOCATION OF ALL IMPROVEMENTS. THIS INFORMATION SHALL BE PLACED ON THE ENGINEERING PLANS AND MARKED "RECORD DRAWING" PLANS ALONG WITH THE DATE AND THE NAME OF THE CONTRACTOR BY THE ENGINEER OF RECORD. THESE PLANS SHALL BE FURNISHED TO THE TOWN ELECTRONICALLY IN PDF FORMAT.
29. THE CONTRACTOR SHALL FURNISH A MAINTENANCE BOND IN THE AMOUNT OF 10% OF THE TOTAL CONTRACT PRICE OF ALL PUBLIC AND CERTAIN PRIVATE IMPROVEMENTS. THIS BOND SHALL RUN TWO YEARS FROM THE DATE OF FINAL ACCEPTANCE OF THE PROJECT BY THE TOWN. PRIVATE IMPROVEMENTS REQUIRING A MAINTENANCE BOND INCLUDE, BUT ARE NOT LIMITED TO, FIRE LANES, PRIVATE WATER MAINS, FIRE HYDRANTS, ETC.
30. REFER TO THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) PUBLIC WORKS CONSTRUCTION STANDARDS AND SPECIFICATIONS (LATEST EDITION) FOR REQUIREMENTS FOR ITEMS NOT INCLUDED IN THIS DOCUMENT. FINAL APPROVAL IS AT THE DISCRETION OF THE TOWN ENGINEER.
31. CONTRACTOR SHALL PROVIDE DAILY STREET SWEEPING AND GENERAL SITE CLEANUP FOR THE AREA SURROUNDING THE PROJECT SITE.
32. CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED TO PROPERTY (PUBLIC OR PRIVATE) WITHIN 48 HOURS OF NOTIFICATION BY THE TOWN.

GENERAL ENVIRONMENTAL NOTES

1. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS REGARDING EXCESS AND WASTE MATERIAL, INCLUDING METHODS OF HANDLING AND DISPOSAL.
2. CONTRACTOR SHALL LOCATE MATERIAL STORAGE AREAS AWAY FROM STORMWATER CONVEYANCE SYSTEMS. PROVIDE PROTECTED STORAGE AREAS FOR CHEMICALS, PAINTS, SOLVENTS, FERTILIZERS, AND OTHER POTENTIALLY TOXIC MATERIALS.
3. FUEL STORAGE IS NOT ALLOWED ON THIS PROJECT.
4. THE CONTRACTOR SHALL ADVISE OWNER IMMEDIATELY, VERBALLY AND IN WRITING, OF ANY FUEL OR TOXIC MATERIALS SPILLS WITHIN THE PROJECT/CONSTRUCTION AREA AND THE ACTIONS TO BE TAKEN TO REMEDY THE PROBLEM.
5. THE CONTRACTOR SHALL DISPOSE OF FUELS, HAZARDOUS MATERIALS, AND CONTAMINATED EXCAVATIONS IN A LEGALLY APPROVED MANNER.
6. NO OPEN BURNING IS ALLOWED WITHIN THE CITY LIMITS.

SITE GRADING NOTES

1. THE CONTRACTOR SHALL CONTROL DUST CAUSED BY THE WORK AND COMPLY WITH POLLUTION CONTROL REGULATIONS OF GOVERNING AUTHORITIES.
2. EXCESS EXCAVATED MATERIAL SHALL BE STOCKPILED IN DESIGNATED AREA AS SHOWN ON PLANS OR AS DIRECTED BY THE OWNER. REINFORCED FILTER FABRIC FENCE TO BE INSTALLED AROUND STOCKPILE ON DOWNSTREAM SIDE AND BOTH SIDES ADJACENT TO THE DOWNSTREAM SIDE. STOCKPILES ARE NOT TO TRAP OR POND WATER. TOPSOIL TO BE STOCKPILED SEPARATELY. ALL EXCESS EXCAVATED MATERIAL IS TO BE REMOVED FROM THE SITE. CONTRACTOR TO NOTIFY TCEQ AND THE OWNER'S REPRESENTATIVE OF LOCATION OF DISPOSAL BEFORE MATERIAL IS REMOVED.
3. THE FINISHED GRADE ELEVATIONS SHOWN ARE INTENDED TO PROVIDE ADEQUATE DRAINAGE. MINOR FIELD CHANGES MAY BE NECESSARY TO PROVIDE ADEQUATE DRAINAGE. GRADE UNIFORMLY BETWEEN ELEVATIONS SHOWN TO PROVIDE DRAINAGE.
4. ADJUST MANHOLE COVERS, VALVE BOXES, ELECTRICAL MANHOLES, ETC. TO MATCH PROPOSED FINISHED GRADE (NO SEPARATE PAY).
5. RETAINING WALLS SHALL BE NO GREATER THAN 6' IN HEIGHT AT THE END OF WALL.
6. THE MAXIMUM SLOPE IN THE FRONT AND REAR OF SINGLE FAMILY LOTS IS 6:1 UNLESS APPROVED BY THE TOWN ENGINEER.
7. TYPICAL SLOPES ON COMMERCIAL LOTS IS 6:1 WITH A MAXIMUM SLOPE ALLOWED OF 4:1 UNLESS APPROVED BY TOWN ENGINEER.

EROSION CONTROL & TREE PROTECTION NOTES

1. CONTRACTOR SHALL FOLLOW ALL STORMWATER POLLUTION PREVENTION PLAN (SWPPP) GUIDELINES AND PERMITS THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES.
2. THE CONTRACTOR TO INSTALL AND MAINTAIN EROSION/SEDIMENTATION CONTROLS AND TREE/NATURAL AREA PROTECTIVE FENCING PRIOR TO ANY SITE PREPARATION WORK (CLEARING, GRUBBING, GRADING, OR EXCAVATION). CONTRACTOR TO REMOVE EROSION/SEDIMENTATION CONTROLS AT THE COMPLETION OF PROJECT AND GRASS RESTORATION.
3. THE PLACEMENT OF EROSION/SEDIMENTATION CONTROLS TO BE IN ACCORDANCE WITH THE PROPOSED SITE GRADING PLAN. DEVIATIONS FROM THE PLAN MUST BE SUBMITTED TO AND APPROVED BY THE OWNER.
4. EROSION AND SEDIMENTATION CONTROLS TO BE INSTALLED OR MAINTAINED IN A MANNER WHICH DOES NOT RESULT IN SOIL BUILDUP WITHIN TREE DRIPLINES.
5. TO AVOID SOIL COMPACTION, NO VEHICULAR TRAFFIC, PARKING, OR STORAGE OF EQUIPMENT OR MATERIALS IS ALLOWED IN THE TREE DRIPLINE AREAS.
6. TREES TO BE REMOVED IN A MANNER WHICH DOES NOT IMPACT TREES TO BE PRESERVED.
7. INTENTIONAL RELEASE OF VEHICLE OR EQUIPMENT FLUIDS ONTO THE GROUND IS NOT ALLOWED. CONTAMINATED SOIL RESULTING FROM ACCIDENTAL SPILL TO BE REMOVED AND DISPOSED OF PROPERLY.

NO.	REVISION	DATE

DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE: NONE
JOB NUMBER: -

TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
GENERAL CONSTRUCTION NOTES 1 OF 3

LITTLE ELM

SHEET
1 OF 26

DECEMBER 2023

CONSTRUCTION
GENERAL NOTES

PAVING NOTES

1. ABSOLUTELY NO EARTHWORK, LIME APPLICATION, OR OTHER PREPARATION OF THE SUBGRADE FOR PAVING OF STREETS, ALLEYS, OR FIRE LANES SHALL BE INITIATED WITHOUT AUTHORIZATION FROM THE TOWN'S CONSTRUCTION INSPECTOR. ONCE ALL TESTING OF UNDERGROUND FACILITIES HAS BEEN COMPLETED AND VERIFIED TO MEET THE TOWN'S SPECIFICATIONS, THE TOWN CONSTRUCTION INSPECTOR WILL ISSUE A LETTER TO THE PROJECT OWNER OR SUPERINTENDENT THAT WILL AUTHORIZE THE INITIATION OF ALL SUBGRADE WORK IN PREPARATION FOR PAVING. ALL STREET, ALLEY, AND FIRE LANE RIGHT-OF-WAY OR EASEMENT WIDTH SHALL BE EXCAVATED FULL WIDTH IN ACCORDANCE WITH THE STREET AND SIDEWALK SECTION TO BE CONSTRUCTED. THE SUBGRADE FOR ALL STREETS, ALLEYS, AND FIRE LANES SHALL BE STABILIZED WITH HYDRATED LIME MATERIAL TO A DISTANCE 12 INCHES BEYOND THE BACK OF CURB OR EDGE OF PAVING AS APPLICABLE. THE AMOUNT OF LIME MATERIAL SHALL BE THAT AMOUNT WHICH WILL REDUCE THE PLASTICITY INDEX (PI) BELOW FIFTEEN (15) AS VERIFIED BY TESTING BY AN APPROVED LABORATORY; THE TOWN WILL ADD ONE (1) PERCENT TO THE LABORATORY RESULTS FOR FIELD VARIATION. LABORATORY TESTING (LIME SERIES) SHALL GENERALLY BE CONDUCTED WHEN ALL UTILITIES ARE COMPLETE AND THE ROADWAY SUBGRADE IS COMPLETE. LIME SHALL BE APPLIED BY PERCENTAGE DRY UNIT WEIGHT OF SOIL TREATED TO A MINIMUM IN PLACE COMPACTED THICKNESS OF SIX (6) INCHES. FOR 6" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 37 POUNDS PER SQUARE YARD; FOR 8" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 54 POUNDS PER SQUARE YARD. AFTER APPLICATION OF LIME, PROVIDE A MELLOWING PERIOD AS INSTRUCTED BY TXDOT PUBLICATION "TREATMENT GUIDELINES FOR SOILS AND BASE IN PAVEMENT STRUCTURES." SULFATE TESTS SHALL ALSO BE CONDUCTED ON ALL PAVING PROJECTS IN THE TOWN UNDER THE DIRECTION OF THE APPROVED LABORATORY. FREQUENCY OF TESTS SHALL NOT BE LESS THAN EVERY 300 LINEAR FEET OF SUBGRADE, ALTERNATING FROM LEFT QUARTER POINT TO CENTER LINE TO RIGHT QUARTER POINT. ADDITIONAL TESTING MAY BE DEEMED NECESSARY BY THE TOWN ENGINEER. ALL TESTING FOR THE PRESENCE OF SULFATES IN THE PAVEMENT SUBGRADE SHALL BE AT THE CONTRACTOR'S EXPENSE. IF THE SULFATES ARE PRESENT AT AN UNACCEPTABLE CONCENTRATION, THE TOWN MAY REQUIRE A RECOMMENDATION FOR FURTHER TREATMENT OF THE SOIL FROM THE APPROVED LABORATORY, WHICH SHALL BE CONFIRMED BY THE DESIGN ENGINEER OF RECORD FOR THE PROJECT.
2. SUBGRADE TESTING REQUIREMENTS: ALL FILL SHALL BE COMPACTED TO NO LESS THAN 95% OF STANDARD PROCTOR DENSITY AT 0 – 4% ABOVE OPTIMUM MOISTURE CONTENT. FREQUENCY OF TESTING SHALL BE AT LEAST EVERY 300 LINEAR FEET PER 2.0' OF LIFT UNTIL FINAL GRADE, STARTING AT 2.0' ABOVE NATURAL/SOUND GRADE TO TOP OF SUBGRADE. ALL STREET, ALLEY, AND FIRE LANE SUBGRADE SHALL BE COMPACTED TO NO LESS THAN 95% OF STANDARD PROCTOR DENSITY AT 0 – 4% ABOVE OPTIMUM MOISTURE CONTENT. FREQUENCY OF TESTS SHALL NOT BE LESS THAN 300 LINEAR FEET OF SUBGRADE, ALTERNATING FROM LEFT QUARTER POINT TO CENTER LINE TO RIGHT QUARTER POINT. VERIFICATION OF LIME DEPTH, TESTING FOR SUBGRADE GRADATIONS & PULVERIZATIONS, AND PLASTICITY INDICES OF THE SOIL SHALL ALSO BE CONDUCTED; THE FREQUENCY OF THIS TESTING SHALL BE AS PREVIOUSLY MENTIONED. ALL TESTING OF MATERIALS REQUIRED FOR THE CONSTRUCTION OF ANY STREET, ALLEY OR FIRE LANE SHALL BE PERFORMED BY AN APPROVED AGENCY FOR TESTING MATERIALS. THE NOMINATION OF THE TESTING LABORATORY AND THE PAYMENT OF SUCH TESTING SERVICES SHALL BE MADE BY THE CONTRACTOR. THE ENGINEER SHALL APPROVE THE LABORATORY NOMINATED TO DO THE TESTING OF MATERIALS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO SHOW BY STANDARD TESTING PROCEDURES THAT THE WORK CONSTRUCTED DOES MEET THE REQUIREMENTS OF THE TOWN'S SPECIFICATIONS.
3. ANY EXISTING PAVEMENT, CURBS, AND/OR SIDEWALK DAMAGED OR REMOVED BY THE CONTRACTOR ARE TO BE REPAIRED BY THE CONTRACTOR TO AT LEAST THE PREEXISTING CONDITION AT HIS EXPENSE BEFORE ACCEPTANCE OF THE WORK.
4. ALL TRAFFIC CONTROLS SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LATEST REVISION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
5. REPLACE EXISTING ROADWAY THAT IS CUT BY PIPE TRENCHES WITH SIMILAR ROADWAY.
6. MAINTAIN ALL MANHOLE FRAMES AND COVERS TO BELOW PAVEMENT SUBGRADE ELEVATION UNTIL PLACEMENT OF PAVEMENT BASE HAS BEEN COMPLETED. RAISE MANHOLE FRAMES AND COVERS TO FINISH PAVEMENT GRADES WHEN BASE IS COMPLETE.
7. MINIMUM DESIGN REQUIREMENTS: ALL STREET, ALLEY, PARKING LOT, AND FIRE LANE PAVING SHALL BE DESIGNED AND PERMITTED THROUGH THE TOWN TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT TWENTY-EIGHT (28) DAYS WITH A MINIMUM OF FIVE AND ONE HALF (5 1/2) SACKS OF CEMENT AS VERIFIED BY TESTING IN AN APPROVED LABORATORY. TWO BATCH DESIGNS SHALL BE SUBMITTED TO THE TOWN CONSTRUCTION ENGINEER FOR APPROVAL: ONE FOR MACHINE WORK AND ONE FOR HAND WORK. ALL BATCH DESIGNS MUST BE SIGNED BY THE TESTING LABORATORY AND INCLUDE ALL DOCUMENTATION, SUCH AS RESULTS OF FIELD TRIAL TESTING. IF APPLICABLE, ALL BATCH DESIGNS SHALL SPECIFY AN APPROPRIATE SULFATE RESISTANT CEMENT OR EQUIVALENT. SLUMP SHALL BE 1 – 3 INCHES FOR ALL MACHINE WORK AND 2 – 4 INCHES FOR ALL HAND WORK. STREETS (DEPENDING ON CLASSIFICATION), PARKING LOTS, AND FIRE LANES SHALL HAVE A MINIMUM THICKNESS OF SIX (6) INCHES. ALLEYS SHALL HAVE A MINIMUM THICKNESS OF 8"–5"–6". UPON COMPLETION OF CONSTRUCTION, ALL STREETS AND FIRE LANES SHALL BE CORED FOR DEPTH (2" CORES) AT A SPACING OF 300 FT MAXIMUM, ALTERNATING FROM LEFT QUARTER POINT TO CENTER LINE TO RIGHT QUARTER POINT. ALLEYS SHALL BE CORED FOR DEPTH (2" CORES) AT A SPACING OF 300 FT MAXIMUM ALONG THE CENTER LINE. PAVEMENT OF A THICKNESS LESS THAN THE THICKNESS SHOWN ON THE PLANS BY MORE THAN ONE-QUARTER (1/4) INCH BUT LESS THAN THREE-QUARTER (3/4) INCH WILL BE CONSIDERED DEFICIENT. THE CONTRACTOR SHALL PAY TO THE TOWN TWO (2) TIMES THE UNIT BID PRICE PER SQUARE YARD FOR THE AREA DETERMINED TO BE DEFICIENT IN THICKNESS AS DEFINED ABOVE. PAVEMENT DEFICIENT IN THICKNESS BY MORE THAN THREE-QUARTER (3/4) INCH SHALL BE REMOVED AND REPLACED COMPLETELY. THE DEFICIENT AREA SHALL BE CORED IMMEDIATELY ON TEN (10) FOOT CENTERS OR ONE (1) PER PANEL TO BE PROVED OUT. ALL STREETS, ALLEYS, PARKING LOTS, AND FIRE LANES WILL REQUIRE CYLINDERS TO BE MADE FOR STRENGTH TESTS BY THE APPROVED LABORATORY. SAMPLES FOR STRENGTH TESTS OF EACH CLASS OF CONCRETE PLACED EACH DAY SHALL BE TAKEN BY AN APPROVED LABORATORY NOT LESS THAN ONCE A DAY, NOR LESS THAN ONCE FOR EACH 100–150 CU YD OF CONCRETE. FOUR (4) CYLINDERS SHALL BE MADE: ONE SHALL BE BROKEN AT 7 DAYS, TWO (2) SHALL BE BROKEN AT TWENTY-EIGHT (28) DAYS, AND ONE SHALL BE HELD IN CASE OF DAMAGE OF ANY OF THE OTHER THREE (3). THE AVERAGE STRENGTH OF TWO (2) CYLINDERS FROM THE SAME SAMPLE, TESTED AT TWENTY-EIGHT (28) DAYS IS REQUIRED FOR EACH STRENGTH TEST; ANY STRENGTH TEST BEYOND TWENTY-EIGHT (28) DAYS IS UNACCEPTABLE. IF THE TWENTY-EIGHT (28) DAY DESIGN STRENGTH IS NOT REACHED UPON STRENGTH TESTING THE CYLINDERS, THE DEFICIENT AREA SHALL BE CORED IMMEDIATELY BE ON TEN (10) FOOT CENTERS OR ONE PER PANEL TO BE PROVED OUT. FOR ANY AREAS DEFICIENT IN STRENGTH BY NOT MORE THAN 500 PSI, THE CONTRACTOR SHALL PAY TO THE TOWN ONE (1) TIME THE UNIT BID PRICE PER SQUARE YARD FOR THE AREA DETERMINED TO BE DEFICIENT IN STRENGTH. FOR ANY AREAS DEFICIENT IN STRENGTH BY MORE THAN 500 PSI BUT NOT MORE THAN 1000 PSI, THE CONTRACTOR SHALL PAY TO THE TOWN TWO (2) TIMES THE UNIT BID PRICE PER SQUARE YARD FOR THE AREA DETERMINED TO BE DEFICIENT IN STRENGTH. PAVEMENT DEFICIENT IN STRENGTH BY MORE THAN 1000 PSI SHALL BE REMOVED AND REPLACED COMPLETELY. NO MORE THAN THREE (3) – FOUR (4) INCH CORES SHALL BE EXTRACTED PER PANEL WITHOUT PRIOR TOWN APPROVAL. A REBAR DETECTOR SHALL BE USED TO ENSURE THAT THE CORED AREAS ARE CLEAR OF ANY REBAR. ALL CORING AND ADDITIONAL LABORATORY TESTING SHALL BE AT THE EXPENSE OF THE CONTRACTOR. THE WIDTH TO BE CONSIDERED FOR ANY DEFICIENCIES SHALL BE THE FULL WIDTH OF THE PAVEMENT.
6. ALL REINFORCING BARS SHALL CONFORM TO ASTM A-615/A 615M, GRADE 60.
9. ALL CONCRETE AND REINFORCING STEEL SHALL CONFORM TO CURRENT A.C.I. CODE.
10. ALL WALL STEEL SHALL HAVE A MINIMUM CONCRETE COVER OF 2". SLAB REINFORCING TO HAVE A MINIMUM CONCRETE COVER OF 2" ON TOP AND 3" ON BOTTOM.
11. ALL BAR SPLICES, CORNER DOWELS, AND JOINT DOWELS SHALL HAVE A MINIMUM 40 DIAMETERS, OR 30", WHICHEVER IS GREATER.
12. JOINT AND CORNER DOWELS DESIGNATED AS "EXTRA LENGTH" SHALL HAVE A MINIMUM LAP LENGTH OF 80 BAR DIAMETERS OR 60", WHICHEVER IS GREATER, UNLESS OTHERWISE DIMENSIONED.
13. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4" x 3/4".
14. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED, UNLESS OTHERWISE NOTED. WALL FORMING AND CONCRETE PLACEMENT PLAN, TO ALLOW FOR VERTICAL CONSTRUCTION JOINTS, SHALL BE PREPARED AND SUBMITTED TO THE ENGINEER FOR APPROVAL. ALL VERTICAL CONSTRUCTION JOINTS TO INCLUDE STANDARD KEYWAY AND WATERSTOP.
15. SPEED BUMPS ARE NOT PERMITTED IN COMMERCIAL DRIVES OR STREETS.
16. POURED CONCRETE MUST BE CONSOLIDATED BY THE USE OF MECHANICAL VIBRATORS AT A MAXIMUM INTERVAL OF 18". CONTRACTOR SHALL ENSURE THAT CONCRETE IS WORKED AROUND REINFORCEMENT, OTHER EMBEDDED ITEMS, AND AGAINST FORMS TO ELIMINATE VOID SPACES.
17. FIRE LANES SHALL HAVE A MINIMUM TURNING RADIUS OF 30 FEET UNLESS DESIGNED USING AUTOTURN BY TRANSOFT SOLUTIONS, OR EQUIVALENT SOFTWARE. IN NO CASE SHALL A FIRE LANE RADIUS BE LESS THAN 20 FEET UNLESS APPROVED BY THE TOWN ENGINEER.
18. BITUMINOUS SURFACE TREATMENT (CHIP SEAL) SHALL CONFORM TO ITEM 404.4 IN THE NCTCOG PUBLIC WORKS CONSTRUCTION STANDARDS (5TH EDITION)
19. ASPHALT PAVING SHALL CONFORM TO ITEM 302 IN THE NCTCOG PUBLIC WORKS CONSTRUCTION STANDARDS (5TH EDITION).

STORM SEWER SYSTEM NOTES

1. STORM SEWER PIPE IN RIGHT OF WAY, PUBLIC DRAINAGE EASEMENTS, OR FIRE LANES SHALL BE REINFORCED CONCRETE OR DUAL WALL POLYPROPYLENE PIPE CONFORMING TO ASTM F2881.
2. BOX CULVERTS, AND OTHER STRUCTURES IN RIGHT OF WAY OR FIRE LANES SHALL BE REINFORCED CONCRETE AS PER TOWN SPECIFICATIONS AND SHALL BE CONSTRUCTED AS SHOWN IN THE STANDARD DETAILS UNLESS OTHERWISE APPROVED.
3. DENSITY TESTING REQUIREMENTS: FREQUENCY OF TRENCH COMPACTION TESTS SHALL NOT BE LESS THEN ONE EVERY 300 LINEAR FEET OF PIPE PER 2.0' OF LIFT UNTIL FINAL GRADE, STARTING AT 2.0' ABOVE TOP OF PIPE. EVERY OTHER LATERAL, STUBOUT THAT CROSSES THE EXISTING OR PROPOSED STREET, ALLEY, OR FIRE LANE SUBGRADE; INLET; AND JUNCTION BOX WILL RECEIVE A DENSITY TEST EVERY LIFT. ALL DITCHES SHALL BE MECHANICALLY TAMPED AND COMPACTED TO 95% OF STANDARD PROCTOR DENSITY AT 0 – 4% ABOVE OPTIMUM MOISTURE. WATER JETTING IS NOT PERMITTED.
4. THE JOINTS SHALL BE CONSTRUCTED AND JOINTED TOGETHER IN SUCH A MANNER THAT NO SPILL THROUGH OF BACKFILL WILL OCCUR. THIS INCLUDES THE LIFT HOLES USED IN CERTAIN PIPE OR BOX SIZES. APPROVED JOINT MATERIALS ARE COLD APPLIED, PLASTIC ASPHALT JOINT COMPOUND; RUBBER GASKETS; AND COLD APPLIED, PREFORMED PLASTIC GASKETS.
5. STORM DRAINAGE INLETS SHALL BE AS INDICATED ON THE APPROVED CONSTRUCTION PLANS. FOR SECONDARY AND MAJOR STREET INTERSECTIONS, A RECESSED TYPE INLET WILL BE REQUIRED. FOR INDUSTRIAL AND RESIDENTIAL STREETS, A CURB LINE INLET WILL BE REQUIRED UNLESS OTHERWISE APPROVED. A ROUND MANHOLE COVER WITH LOCKING DEVICE SHALL BE PLACED ON ALL INLET TOPS. THE TOP SHALL BE PLACED NEAR THE OUTLET PIPE. ALL INLETS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
6. ONLY CURB INLETS ARE ALLOWED WITHIN PAVED AREAS. GRATE INLETS ARE ALLOWED ONLY BY TOWN ENGINEER APPROVAL.
7. ALL STORM SEWER OUTFALLS THAT DRAIN TO LAKE LEWISVILLE SHALL INCLUDE A DEBRIS SEPARATOR.
8. ALL STORM SEWER CULVERTS INSTALLED IN PUBLIC RIGHT-OF-WAY OR BENEATH FIRELANES SHALL BE REINFORCED CONCRETE PIPE OR DUAL WALL POLYPROPYLENE PIPE CONFORMING TO ASTM F2881.

DETOURS, BARRICADES, WARNING SIGNS, ETC. NOTES

1. TRAFFIC MUST BE HANDLED THROUGHOUT THE PROJECT DURING CONSTRUCTION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE FOR THE SAFE AND COMFORTABLE PASSAGE OF TRAFFIC WITH MINIMAL INCONVENIENCE TO THE PUBLIC AT ALL TIMES. TRAFFIC LANES SHALL BE ENTIRELY OPEN TO TRAFFIC EACH NIGHT AND NO EQUIPMENT SHALL BE LEFT IN A POSITION OVERNIGHT THAT WILL ENDANGER TRAFFIC.
2. A FLAGGER SHALL BE STATIONED WHERE ANY EQUIPMENT IS WORKING ON THE ROAD OR WHERE ANY OTHER HAZARDS DUE TO CONSTRUCTION OPERATIONS EXIST OR AS DIRECTED BY THE ENGINEER.
3. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL ADJACENT PROPERTIES THROUGHOUT ALL PHASES OF CONSTRUCTION. ADEQUACY OF ACCESS WILL BE AT THE DISCRETION OF THE ENGINEER. SAFE ENTRANCE AND EXIT TO ALL DRIVEWAYS SHALL BE PROVIDED WITH A MINIMUM OF INCONVENIENCE.
4. THE CONTRACTOR SHALL NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT AT ANY LOCATION THAT WILL CONSTITUTE A HAZARD AND WILL ENDANGER TRAFFIC.
5. THE CONTRACTOR SHALL NOTIFY THE OWNER OF IMPENDING/UPCOMING LANE CLOSURES AS EARLY AS FIVE WORKING DAYS BUT NO LATER THAN 48 HOURS IN ADVANCE OF LANE CLOSURES.
6. FOR THIS PROJECT, UNLESS OTHERWISE NOTED IN THE PLANS AND/OR AS DIRECTED BY THE ENGINEER, NO LANE CLOSURES SHALL BE ALLOWED OTHER THAN THOSE IN THE TRAFFIC CONTROL PLAN.
7. THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY MAJOR RECOMMENDED MODIFICATION BY THE CONTRACTOR SHALL INCLUDE ANY CHANGES TO THE VARIOUS PAY ITEMS, IMPACT TO TRAFFIC, EFFECT OF OVERALL PROJECT IN TIME AND COST, ETC. THE CONTRACTOR SHALL NOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED PHASE/SEQUENCE UNTIL HE/SHE OBTAINS WRITTEN APPROVAL FROM THE ENGINEER. IF AT ANY TIME DURING CONSTRUCTION THE CONTRACTOR'S PROPOSED PLAN OF OPERATION FOR HANDLING TRAFFIC DOES NOT PROVIDE SAFE AND COMFORTABLE MOVEMENT, THE CONTRACTOR SHALL IMMEDIATELY CHANGE HIS OPERATION TO CORRECT THE UNSATISFACTORY CONDITION.
8. THE CONTRACTOR SHALL INSTALL AND MAINTAIN AN ADEQUATE NUMBER OF BARRICADES, WARNING AND DIRECTIONAL SIGNS TO DELINEATE TRAFFIC FOR ANY DETOURS.
9. ALL CONSTRUCTION TRAFFIC SHALL BE REGULATED SO AS TO CAUSE A MINIMUM OF INCONVENIENCE TO THE TRAVELING PUBLIC. AT POINTS WHERE IT IS NECESSARY FOR TRUCKS TO STOP AND UNLOAD, WARNING SIGNS AND FLAGGERS SHALL BE PROVIDED AS NECESSARY TO ADEQUATELY PROTECT TRAVEL.
10. ALL BARRICADES, SIGNS, WARNING LIGHTS, ETC. SHALL BE ACCORDING TO THE LATEST REVISION OF THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
11. THE CONTRACTOR MAY, WITH THE APPROVAL OF AND AS DIRECTED BY THE ENGINEER, BE REQUIRED TO FURNISH ADDITIONAL SIGNS AND BARRICADES TO THOSE INDICATED ON THE PLANS TO MAINTAIN THE SAFE PASSAGE OF TRAFFIC THROUGHOUT THE CONSTRUCTION SITE PARTICULARLY IN THOSE AREAS OF IMMEDIATE WORK.
12. UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE IS MADE, THE CONTRACTOR SHALL SHAPE AND FINISH SUCH PORTIONS OF THE RIGHT-OF-WAY AS MAY HAVE BEEN DISTURBED IN MAKING THE ABOVE PROVISIONS FOR TRAFFIC AND WILL BE REQUIRED TO LEAVE THE ENTIRE RIGHT-OF-WAY IN A SMOOTH, NEAT AND SIGHTLY CONDITION.
13. ALL WORK AND MATERIALS REQUIRED BY THESE PROVISIONS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS OF THE CONTRACT, UNLESS OTHERWISE INDICATED IN THE PLANS OR SPECIFICATIONS.
14. CONTRACTOR SHALL HAVE A COMPANY REPRESENTATIVE CERTIFIED IN FLAGGER TRAINING APPROVED BY TXDOT.
15. THE CONTRACTOR IS FULLY RESPONSIBLE FOR THE TRAFFIC CONTROL AND WILL BE RESPONSIBLE FOR FURNISHING ALL TRAFFIC CONTROL DEVICES AND FLAGGERS. THE CONSTRUCTION METHODS SHALL BE CONDUCTED TO PROVIDE THE LEAST POSSIBLE INTERFERENCE TO TRAFFIC SO AS TO PERMIT THE CONTINUOUS MOVEMENT OF TRAFFIC IN ALL ALLOWABLE DIRECTIONS AT ALL TIMES.
16. THE CONTRACTOR SHALL PROVIDE FOR THE PASSAGE OF TRAFFIC THROUGH THE PROJECT WITH SIGNS, LIGHTS AND BARRICADES IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AS REQUIRED FOR MAINTENANCE ACTIVITIES AND TO THE SATISFACTION OF THE ENGINEER.
17. LANE CLOSURES WILL NOT BE ALLOWED UNLESS PRIOR APPROVAL IS GIVEN BY THE ENGINEER. IF LANE CLOSURES ARE APPROVED, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNER 48 HOURS IN ADVANCE OF THE CLOSURE.

DATE | NO. | REVISION

DESIGN BY: | DRAWN BY: | CHECKED BY: KDMG | SCALE: - | JOB NUMBER:

TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
GENERAL CONSTRUCTION NOTES 2 OF 3

LITTLE ELM

SHEET
2 OF 26

DECEMBER 2023

CONSTRUCTION
GENERAL NOTES

WATER SYSTEM NOTES

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE TOWN'S STANDARD SPECIFICATIONS AND GENERAL DESIGN STANDARDS.
2. ALL TAPPING SLEEVES AND VALVES SHALL BE FULL BODY DUCTILE IRON. WITH PRIOR APPROVAL BY THE TOWN ENGINEER, STAINLESS STEEL SMITH BLAIR 623 MAY BE ALLOWED FOR CONNECTION TO EXISTING LINES TWENTY-INCH (20") OR LARGER.
3. VALVES SHALL BE MUELLER OR WATEROUS, RESILIENT SEATED, 150 PSI TEST.
4. FITTINGS SHALL BE OF THE MECHANICAL JOINT TYPE, FLANGED WHERE APPLICABLE, AND BE MANUFACTURED BY US PIPE, AMERICAN, OR OTHER AS APPROVED BY THE TOWN – CLASS 250. ALL FITTINGS SHALL BE RESTRAINED BY THE USE OF MEGA-LUGS OR APPROVED OTHER AND CONCRETE THRUST BLOCKING.
5. FIRE HYDRANTS SHALL BE MUELLER OR WATEROUS THREE-WAY STANDARD THREAD WITH VALVE IN LEAD OR APPROVED OTHER. ALL MAIN STEAMER NOZZLES SHALL HAVE A NOMINAL INSIDE DIAMETER OF FOUR INCHES (4"). ALL COMMERCIAL FIRE HYDRANTS ARE REQUIRED TO BE INSTALLED WITH 4½"-5" HYDRA-STORZ CONNECTIONS.
6. WATER LINES IN THE AREA OF STORM DRAIN INLETS SHALL BE CONSTRUCTED BEHIND THE INLET BY PULLING THE PIPE USING LONGITUDINAL BENDING IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. FITTINGS MAY BE USED IF BENDING IS IMPRACTICAL; CONSULT WITH THE TOWN'S CONSTRUCTION INSPECTOR.
7. WATER LINES CROSSING UNDER STORM DRAINS AND SANITARY SEWER LINES SHALL HAVE A MINIMUM OF EIGHTEEN INCHES (18") CLEARANCE BELOW STORM DRAINS AND TWENTY-FOUR INCHES (24") CLEARANCE BELOW SANITARY SEWER LINES OR OTHERWISE AS GOVERNED BY TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) CHAPTER 290 REQUIREMENTS. PARALLEL WATER LINES SHALL BE AT LEAST NINE FEET (9') CLEAR HORIZONTALLY FROM SANITARY SEWER LINES AND MANHOLES. WHERE MINIMUM CLEARANCE CANNOT BE ACHIEVED, WATER LINES SHALL BE ENCASED SIX INCHES (6") AROUND IN CONCRETE TO TEN FEET (10') EITHER SIDE OF THE UTILITY CROSSING. WHERE WATER LINES CROSS CREEKS OR DITCHES THE WATER LINE SHALL BE PROTECTED BY CONCRETE ENCASEMENT AT LEAST TEN FEET (10') PAST THE EMBANKMENT SLOPE ON EACH SIDE.
8. WATER MAINS: ALL WATER MAINS SHALL HAVE A MINIMUM OF FORTY EIGHT (48") COVER OVER THE TOP OF THE PIPE. ALL NEW WATER MAINS SHALL BE PVC PIPE IN ACCORDANCE WITH THE FOLLOWING: C900 DR 14 FOR FOUR-INCH (4") TO SIX-INCH (6"), C900 DR 18 FOR EIGHT-INCH (8") TO TWELVE-INCH (12"), AND C905 DR 18 FOR OVER TWELVE-INCH (12"), ALL "BLUE" IN COLOR AS PER TOWN SPECIFICATIONS; THE PIPE SHALL BE LAID ON A MINIMUM EMBEDMENT (SEE STANDARD CONSTRUCTION DETAILS). WATER MAINS UP TO TWELVE INCHES (12") SHALL BE INSTALLED TWO FEET (2') BACK OF CURB; MAINS LARGER THAN TWELVE INCHES (12") SHALL BE INSTALLED AT LEAST THREE FEET (3') FROM THE BACK OF CURB DEPENDING UPON CONDITIONS. DETECTABLE METALLIC TAPE ("BLUE-CAUTION BURIED WATER BELOW" OR APPROVED OTHER) SHALL BE INSTALLED AFTER INITIAL BACKFILL ON APPROXIMATE CENTERLINE OF PIPE PRIOR TO FINAL BACKFILL ABOVE ALL PVC MAINS.
9. THE CONTRACTOR SHALL INSTALL FIRE HYDRANTS AT THE LOCATIONS SHOWN. A M.J. AND FLANGED TEE WITH A FLANGED END TO M.J. GATE VALVE IS REQUIRED SO THAT THE GATE VALVE IS ANCHORED TO THE MAIN.
10. ALL BOLTS AND NUTS USED WITH MECHANICAL JOINT FITTING SHALL BE "COR-TEN" STEEL OR APPROVED OTHER.
11. THE INSTALLATION OF A BLUE STEMSONTE (OR OTHER) MODEL 88-SSA FIRE HYDRANT MARKER WILL BE INSTALLED OPPOSITE FIRE HYDRANTS JUST OFF CENTER TO THE SIDE OF THE STREET ADJACENT TO THE HYDRANT.
12. POLYETHYLENE ENCASEMENT – THE CONTRACTOR SHALL FURNISH AND INSTALL POLYETHYLENE WRAP AROUND DUCTILE IRON PIPE, RELATED FITTINGS, AND VALVES. THIS WRAP SHALL BE AN 8 MIL. THICKNESS POLYTUBE. SEAMS AND OVERLAPS SHALL BE WRAPPED AND HELD IN PLACE BY TWO-INCH (2") WIDE PLASTIC BACKED ADHESIVE TAPE, POLYKEN 900 OR SCOTCHRAP NO. 50, OR AN APPROVED OTHER, WITH APPROXIMATE TWO-FOOT (2') LAPS ON THE POLYTUBE. THE WRAP ON THE BARREL OF THE PIPE SHALL BE LOOSE ENOUGH TO ALLOW THE FILM TO SHIFT WITH THE SOIL. THE WRAP SHALL BE INSTALLED WITHOUT BREAKS, TEARS, OR HOLES IN THE FILM. THE COST OF THE POLYETHYLENE TUBE WRAP AND COMPLETE INSTALLATION SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE FURNISHING AND THE INSTALLATION OF DUCTILE IRON PIPE, RELATED FITTINGS, AND VALVES.
13. VALVE BOXES SHALL BE FURNISHED AT THE REQUIRED LENGTH IN ORDER TO BE SET TO FINAL GRADE ON EACH GATE VALVE. AFTER THE FINAL CLEAN UP AND ALIGNMENT HAS BEEN COMPLETED, THE CONTRACTOR SHALL POUR A REINFORCED CONCRETE BLOCK 24" X 24" X 6" AROUND ALL VALVE BOXES SO THE FINISHED GRADE IS LEVEL WITH THE FINISHED PARKWAY. ALL VALVE STACK COMPONENTS SHALL BE CAST IRON. VALVE BOXES OVER FOUR FEET (4') DEEP WILL REQUIRE EXTENSIONS. ALL VALVES SHALL BE MARKED WITH A SAW ON THE CURB OR PAVEMENT WITH "V", THE "V" SHALL POINT TO THE LOCATION OF THE VALVE AS FOLLOWS: IF THE VALVE IS IN THE PAVING, THE "V" SHALL BE MARKED UPRIGHT; IF THE VALVE IS OUTSIDE THE PAVING, THE "V" SHALL BE MARKED UPSIDE DOWN.
14. THE CONTRACTOR SHALL COORDINATE OPERATION OF ALL EXISTING VALVES WITH THE TOWN. CONTACT THE TOWN'S PUBLIC WORKS DEPARTMENT AT (972) 377-5556.
15. ALL WATER LINES SHALL BE PRESSURE TESTED TO 200 PSI FOR A THREE (3) HOUR CONTINUOUS PERIOD. LEAKAGE RATE SHALL NOT EXCEED TWENTY-FIVE (25) GALLONS PER INCH OF NOMINAL DIAMETER PER MILE OF PIPE OVER A TWENTY-FOUR (24) HOUR PERIOD. CONTRACTOR SHALL FLUSH AND STERILIZE LINES AND PROVE LINES TO BE FREE OF FECAL COLIFORM ORGANISMS BY OBTAINING SAMPLES FOR LABORATORY TESTS FOR CONTAMINATION. THE CONTRACTOR SHALL REFLUSH AND RESTERILIZE UNTIL ALL SAMPLES PROVE FREE FROM CONTAMINATION.
16. ALL RESIDENTIAL WATER SERVICES SHALL BE AS FOLLOWS:
    A. WATER SERVICES SHALL BE NORMALLY LOCATED AT TWO FOOT (2') OFF EVERY OTHER LOT LINE. A WATER METER BOX, AS APPROVED BY THE TOWN, WITH LOCK LID SHALL BE INSTALLED TWO FEET (2') BACK OF CURB LINE.
    B. SDR-9 POLYETHYLENE SERVICES ARE REQUIRED TO SERVE ALL RESIDENTIAL LOTS AND PATIO HOMES. FOR TOWN HOMES AND DUPLEXES, A SERVICE SHALL BE PROVIDED TO EACH OF THE FAMILY UNITS. SAND EMBEDMENT SHALL BE USED AROUND THE PIPE AND CORPORATION STOP. SURVCIL SADDLES SHALL BE BRASS MOLY WITH DOUBLE BRONZE FLATTENED STRAPS (NO BANDED) – FORD, CAMBRIDGE, A.Y. MCDONALD, OR APPROVED OTHER.
    C. THE UTILITY CONTRACTOR SHALL INSTALL THE WATER SERVICES TO A POINT TWO (2) FEET BACK OF THE CURB LINE AT A DEPTH OF 12 INCHES. LINE SHALL BE CONTINUOUS WITH NO FITTINGS UNDER PAVING. THE METER BOX SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AFTER THE PAVING CONTRACTOR HAS COMPLETED THE FINAL GRADING IN BACK OF THE CURB. EACH SERVICE LOCATION WILL BE MARKED ON THE CURB WITH A SINGLE VERTICAL SAW MARK BY THE UTILITY CONTRACTOR AND TIED TO PROPERTY CORNERS ON THE "AS-RECORDED" PLANS.
    D. IF THERE IS A CURB, THE CURB SHALL BE SAWCUT WITH "T" AT THE POINT WHERE THE SERVICE PIPE PASSES THE CURB.
17. FOR NON-RESIDENTIAL WATER SERVICES, THE METER BOX SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AFTER THE PAVING CONTRACTOR HAS COMPLETED THE FINAL GRADING IN BACK OF THE CURB. METER BOXES/VAULTS SHALL BE LOCATED OUTSIDE OF PAVING. EACH SERVICE LOCATION WILL BE MARKED ON THE CURB OR PAVEMENT WITH A SINGLE VERTICAL SAW MARK BY THE UTILITY CONTRACTOR AND TIED TO PROPERTY CORNERS ON THE "AS-RECORDED" PLANS.
18. DENSITY TESTING REQUIREMENTS: FREQUENCY OF TRENCH COMPACTION TESTS SHALL NOT BE LESS THAN ONE (1) FOR ANY PIPE SECTION AND EVERY THREE HUNDRED LINEAR FEET (300') LINEAR FEET OF MAIN PIPE PER TWO FEET (2') OF LIFT UNTIL FINAL GRADE, STARTING AT TWO FEET (2') ABOVE THE TOP OF PIPE. WATER SERVICES ARE TO BE TESTED AT A RATE OF ONE (1) FOR EVERY SIX (6) SERVICES WHICH CROSS THE PROPOSED RIGHT OF WAY OR EVERY THREE HUNDRED LINEAR FEET (300') OF WATER SERVICE INSTALLED. EVERY OTHER FIRE HYDRANT LEAD THAT CROSS THE EXISTING OR PROPOSED STREET, ALLEY, OR FIRE LANE SUBGRADE SHALL ALSO RECEIVE AT LEAST ONE SET OF DENSITY TESTS. ALL DITCHES SHALL BE MECHANICALLY TAMPED AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY AT ZERO PERCENT (0%) TO FOUR PERCENT (4%) ABOVE OPTIMUM MOISTURE. WATER JETTING IS NOT PERMITTED.
19. THE CONTRACTOR SHALL NOT EXCEED MANUFACTURER'S RECOMMENDATION FOR CURVATURE OF LINES AND/OR DEFLECTION OF PIPE JOINTS. INSTALL BENDS AS REQUIRED.
20. THE CONTRACTOR SHALL PROVIDE FITTINGS, PLUGS, AND OTHER DEVICES FOR USE IN FILLING, FLUSHING, TESTING, ETC. (NO SEPARATE PAY).
21. THE CONTRACTOR SHALL PROVIDE ADEQUATE THRUST BLOCKING TO WITHSTAND TEST PRESSURES. (NO SEPARATE PAY).
22. MAINTAIN MINIMUM CLEARANCE OF THREE (3) FEET FROM EDGE OF STRUCTURES TO CLOSEST EDGE OF PIPELINE ADJACENT AND PARALLEL TO EDGE OF STRUCTURE, UNLESS OTHERWISE NOTED ON PLANS.
23. DI-ELECTRIC CONNECTIONS TO BE PREVENTED BY USE OF NON-CONDUCTIVE GASKETS BETWEEN DISSIMILAR PIPING MATERIALS.
24. REFERENCE SPECIFICATIONS FOR REQUIREMENTS ON REQUIRED SEPARATION DISTANCE BETWEEN SEWER AND WATER MAINS AND REQUIREMENTS IN THE EVENT THE SEPARATION DISTANCE CANNOT BE MET.
25. ALL PIPING INSTALLED BY BORING SHALL BE COMPLETED BY DRY BORE METHOD WITHOUT THE USE OF DRILLING FLUID, UNLESS APPROVED BY THE TOWN ENGINEER.

SANITARY SEWER SYSTEM NOTES

1. ALL SANITARY SEWER PIPES FOUR INCHES (4") TO FIFTEEN INCHES (15") NOMINAL SIZE SHALL BE PVC SDR 26 MEETING ASTM D3034. ALL SANITARY SEWER PIPES EIGHTEEN INCHES (18") AND LARGER NOMINAL SIZE SHALL BE PVC MEETING ASTM F679. ALL PIPES SHALL BE "GREEN" IN COLOR AS PER TOWN SPECIFICATIONS AND BE LAID ON A MINIMUM EMBEDMENT (SEE STANDARD CONSTRUCTION DETAILS). DETECTABLE METALLIC TAPE ("GREEN-CAUTION BURIED SEWER BELOW" OR APPROVED OTHER) SHALL BE INSTALLED AFTER INITIAL BACKFILL ON APPROXIMATE CENTERLINE OF PIPE PRIOR TO FINAL BACKFILL.
2. ALL SEWER MAINS SHALL BE A MINIMUM DIAMETER OF EIGHT INCHES (8") AND SHALL MAINTAIN A MINIMUM FLOW VELOCITY OF TWO (2) FEET PER SECOND.
3. ALL RESIDENTIAL SANITARY SEWER SERVICES SHALL BE A MINIMUM FOUR INCHES (4") IN DIAMETER AND EXTENDED TO A POINT TEN FEET (10') INSIDE THE PROPERTY LINE AT A MAXIMUM DEPTH OF FIVE FEET (5'). THE SERVICE SHALL THEN BE EXTENDED AT A FORTY-FIVE DEGREE (45°) ANGLE TO FOUR FEET (4') ABOVE THE FINISHED GRADE AND CAPPED. SEWER SERVICES SHALL BE LOCATED IN THE CENTER OF THE LOT. RESIDENTIAL SEWER SERVICES SHALL NOT TIE INTO MANHOLES.
4. DENSITY TESTING REQUIREMENTS: FREQUENCY OF TRENCH COMPACTION TESTS SHALL NOT BE LESS THAN ONE (1) FOR ANY PIPE SECTION AND EVERY THREE HUNDRED LINEAR FEET (300') OF MAIN PIPE PER TWO FEET (2') OF LIFT UNTIL FINAL GRADE, STARTING AT TWO FEET (2') ABOVE TOP OF PIPE. SEWER SERVICES ARE TO BE TESTED AT A RATE OF ONE (1) FOR EVERY SIX (6) SERVICES STAGGERED OR EVERY THREE HUNDRED LINEAR FEET (300') OF SEWER SERVICE INSTALLED. EACH SEWER MANHOLE WILL RECEIVE A DENSITY TEST EVERY TWO FEET (2') OF LIFT UNTIL FINAL GRADE, ALTERNATING AROUND ALL QUADRANTS. EVERY OTHER MAIN AND STUBOUT THAT CROSSES THE EXISTING OR PROPOSED STREET, ALLEY, OR FIRE LANE SUBGRADE SHALL ALSO RECEIVE AT LEAST ONE SET OF DENSITY TESTS. ALL DITCHES SHALL BE MECHANICALLY TAMPED AND COMPACTED TO NINETY-FIVE PERCENT (95%) STANDARD PROCTOR DENSITY AT ZERO PERCENT (0%) TO FOUR PERCENT (4%) ABOVE OPTIMUM MOISTURE. WATER JETTING IS NOT PERMITTED.
5. AFTER PAVING IS COMPLETED EACH SERVICE LOCATION WILL BE MARKED ON THE CURB WITH A TWO (2) PARALLEL VERTICAL SAW MARKS BY THE UTILITY CONTRACTOR AND TIED TO AT LEAST ONE (1) PROPERTY CORNER ON THE "AS-RECORDED" PLANS. ALL MANHOLES AND CLEANOUTS SHALL BE MARKED ON THE CURB OR PAVEMENT WITH "MH" OR "CO" AS APPLICABLE.
6. VACUUM TESTING OF THE MANHOLES, AND DEFLECTION TESTING ARE REQUIRED ON ALL SEWER LINES. PRIOR TO PAVING, ALL RESIDENTIAL SANITARY SEWER SERVICES SHALL HAVE TV INSPECTIONS.
7. MANHOLES SHALL HAVE A 4000# TRAFFIC BEARING FRAME AND COVER AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT TWENTY-EIGHT (28) DAYS.
8. THE DIAMETER OF A MANHOLE CONSTRUCTED OVER THE CENTER OF A SEWER SHOULD VARY WITH THE SIZE OF THE SEWER. FOR EIGHT-INCH (8"), TEN-INCH (10"), AND TWELVE-INCH (12") SEWERS, THE MANHOLE SHALL BE FOUR-FOOT (4') MINIMUM DIAMETER; FOR FIFTEEN-INCH (15") THROUGH TWENTY-SEVEN-INCH (27") SEWERS, THE MANHOLE SHALL BE FIVE-FOOT (5') MINIMUM DIAMETER; FOR THIRTY-INCH (30") AND THIRTY-SIX-INCH (36") SEWERS, THE MANHOLE SHALL BE SIX-FOOT (6') MINIMUM DIAMETER. MANHOLES DEEPER THAN TWELVE FEET (12') SHALL BE A MINIMUM OF FIVE FOOT (5') DIAMETER.
9. THE CONTRACTOR SHALL NOT EXCEED MANUFACTURER'S RECOMMENDATION FOR CURVATURE OF LINES AND/OR DEFLECTION OF PIPE JOINTS. INSTALL JOINTS AS REQUIRED.
10. THE CONTRACTOR SHALL PROVIDE FITTINGS, PLUGS, AND OTHER DEVICES FOR USE IN FILLING, FLUSHING, TESTING, ETC. (NO SEPARATE PAY).
11. THE CONTRACTOR SHALL PROVIDE ADEQUATE THRUST BLOCKING TO WITHSTAND TEST PRESSURES. (NO SEPARATE PAY).
12. PIPING DRAWINGS INDICATE INVERT ELEVATIONS FOR GRAVITY FLOW LINES. SLOPE PIPE UNIFORMLY BETWEEN ELEVATIONS SHOWN; NO VALLEYS OR PEAKS PERMITTED IN GRAVITY FLOW LINES. FOR OTHER PIPING, REFER TO DETAIL SHEETS FOR PIPE ELEVATIONS AT EACH STRUCTURE. SITE PIPING DRAWINGS DO NOT INDICATE VERTICAL BENDS AND TRANSITIONS. WHEN NECESSARY, MAKE VERTICAL TRANSITIONS OR FURNISH AND INSTALL VERTICAL BENDS AT NO EXTRA COST. DO NOT EXCEED MANUFACTURER'S RECOMMENDATIONS FOR CURVATURE OF LINES AND/OR DEFLECTION OF PIPE JOINTS.
13. MAINTAIN MINIMUM CLEARANCE OF THREE (3) FEET FROM EDGE OF STRUCTURES TO CLOSEST EDGE OF PIPELINE ADJACENT AND PARALLEL TO EDGE OF STRUCTURE, UNLESS OTHERWISE NOTED ON PLANS.
14. DI-ELECTRIC CONNECTIONS TO BE PREVENTED BY USE OF NON-CONDUCTIVE GASKETS BETWEEN DISSIMILAR PIPING MATERIALS.
15. THE INTERIOR SURFACE OF ALL MANHOLES AND LIFT STATION WETWELLS SHALL BE CONSTRUCTED WITH POLYMER CONCRETE, ANTIMICROBIAL CONCRETE ADDITIVES, OR APPROVED EQUAL. EXISTING MANHOLES WHICH RECEIVE TIE INS SHALL BE COATED WITH RAVEN 405 EPOXY OR APPROVED EQUAL IF THEY DO NOT ALREADY HAVE CORROSION PROTECTION.
16. RESIDENTIAL SEWER SERVICES SHALL NOT TIE INTO MANHOLES WITHOUT TOWN ENGINEER APPROVAL.

NO.	REVISION	DATE

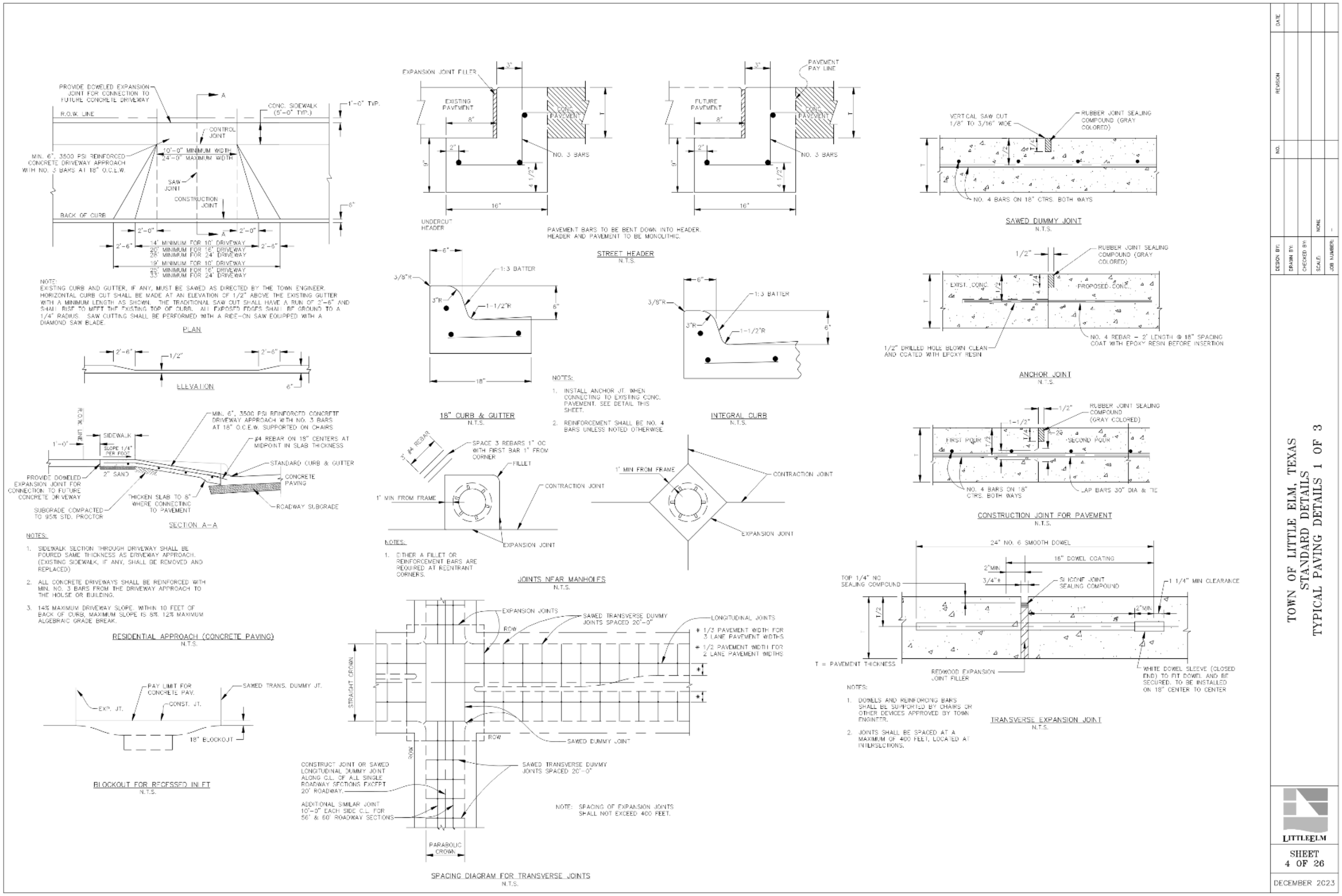
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE: NONE
JOB NUMBER: -

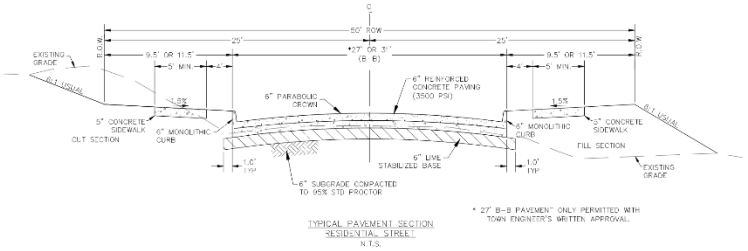
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
GENERAL CONSTRUCTION NOTES 3 OF 3

LITTLE ELM

SHEET
3 OF 26

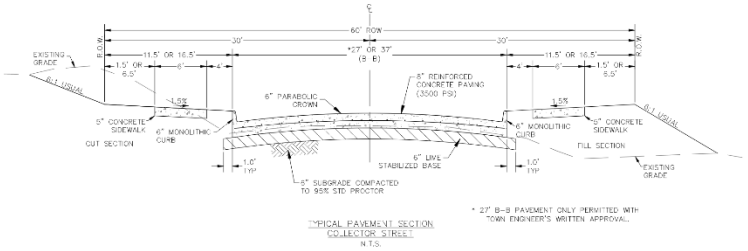
DECEMBER 2023


TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL PAVING DETAILS 1 OF 3
SHEET 4 OF 26
DECEMBER 2023
PLAN
ELEVATION
SECTION A-A
RESIDENTIAL APPROACH (CONCRETE PAVING)
N.T.S.
NOTE:
EXISTING CURB AND GUTTER, IF ANY, MUST BE SAWED AS DIRECTED BY THE TOWN ENGINEER. HORIZONTAL CURB CUT SHALL BE MADE AT AN ELEVATION OF 1/2" ABOVE THE EXISTING GUTTER WITH A MINIMUM LENGTH AS SHOWN. THE TRADITIONAL SAW CUT SHALL HAVE A RUN OF 5'-6" AND SHALL RISE TO MEET THE EXISTING TOP OF CURB. ALL EXPOSED EDGES SHALL BE GROUND TO A 1/4" RADIUS. SAW CUTTING SHALL BE PERFORMED WITH A RIDE-ON SAW EQUIPPED WITH A DIAMOND SAW BLADE.
NOTES:
1. SIDEWALK SECTION THROUGH DRIVEWAY SHALL BE POURED SAME THICKNESS AS DRIVEWAY APPROACH. (EXISTING SIDEWALK, IF ANY, SHALL BE REMOVED AND REPLACED)
2. ALL CONCRETE DRIVEWAYS SHALL BE REINFORCED WITH MIN. NO. 3 BARS FROM THE DRIVEWAY APPROACH TO THE HOUSE OR BUILDING.
3. 14% MAXIMUM DRIVEWAY SLOPE WITHIN 10 FEET OF BACK OF CURB, MAXIMUM SLOPE IS 8% 12% MAXIMUM ALGEBRAIC GRADE BREAK.
STREET HEADER
N.T.S.
PAVEMENT BARS TO BE BENT DOWN INTO HEADER. HEADER AND PAVEMENT TO BE MONOLITHIC.
18" CURB & GUTTER
INTEGRAL CURB
NOTES:
1. INSTALL ANCHOR JT. WHEN CONNECTING TO EXISTING CONC. PAVEMENT. SEE DETAIL THIS SHEET.
2. REINFORCEMENT SHALL BE NO. 4 BARS UNLESS NOTED OTHERWISE
JOINTS NEAR MANHOLES
NOTES:
1. EITHER A FILLET OR REINFORCEMENT BARS ARE REQUIRED AT REENTRANT CORNERS.
SAWED DUMMY JOINT
ANCHOR JOINT
CONSTRUCTION JOINT FOR PAVEMENT
TRANSVERSE EXPANSION JOINT
NOTES:
1. DOWELS AND REINFORCING BARS SHALL BE SUPPORTED BY CHAIRS OR OTHER DEVICES APPROVED BY TOWN ENGINEER.
2. JOINTS SHALL BE SPACED AT A MAXIMUM OF 400 FEET, LOCATED AT INTERSECTIONS.
BLOCKOUT FOR RECESSED INLET
SPACING DIAGRAM FOR TRANSVERSE JOINTS
NOTE: SPACING OF EXPANSION JOINTS SHALL NOT EXCEED 400 FEET.



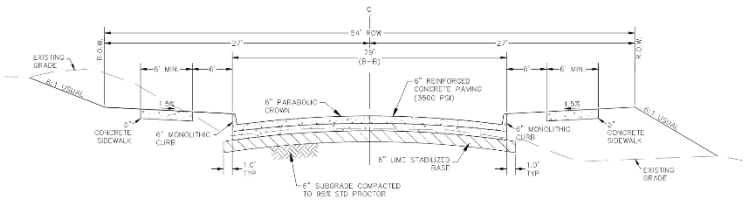
TYPICAL PAVEMENT SECTION
RESIDENTIAL STREET
N.T.S.

* 27' B-B PAVEMENT ONLY PERMITTED WITH TOWN ENGINEER'S WRITTEN APPROVAL.



TYPICAL PAVEMENT SECTION
COLLECTOR STREET
N.T.S.

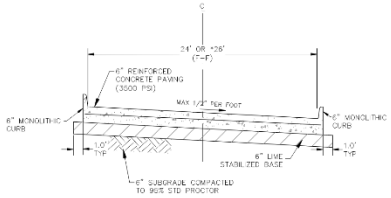
* 27' B-B PAVEMENT ONLY PERMITTED WITH TOWN ENGINEER'S WRITTEN APPROVAL.



RESIDENTIAL STREET
ALTERNATIVE PAVEMENT SECTION
(29'-0" B-B)
N.T.S.

PAVEMENT NOTES:

1. THESE NOTES ARE A REPRESENTATION OF THE MINIMUM REQUIREMENTS FOR PAVEMENT CONSTRUCTION. THE DESIGN ENGINEER IS RESPONSIBLE FOR PAVEMENT DESIGN, INCORPORATING RECOMMENDATIONS OF THE GEOTECHNICAL REPORT (IF FOUND TO BE MORE STRINGENT).
2. 3500 PSI MACHINE POUR, 4000 PSI HAND POUR (AT DRIVEWAY APPROACH ONLY). REINFORCED CONCRETE PAVEMENT (5.5 SACK/CY), NO. 4 BARS @ 18" O.C.E.W., WITH 6" MONOLITHIC CURB.
3. BAR LAPS SHALL BE 30 BAR DIAMETERS.
4. BAR CHAIRS SHALL BE PROVIDED BY CONTRACTOR.
5. DO NOT PLACE CONCRETE JOINT WITHIN 2 FEET OF GUTTER LINE AT STREET CONNECTION.
6. LIME SHALL BE APPLIED BY PERCENTAGE DRY UNIT WEIGHT OF SOIL TREATED TO A MINIMUM IN PLACE COMPACTED THICKNESS OF SIX (6) INCHES. FOR 6" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 37 LBS/SQ FT; FOR 8" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 54 LBS/SQ FT.
7. LIME STABILIZATION MAY BE OMITTED IF 6" OF FLEXIBLE BASE WITH TENSAR TX7 GEOGRID IS APPLIED TO THE SUBBASE COMPACTED TO 95% STD PROCTOR.
8. FORMING OF PAVEMENT:
   A. SLIP-FORM: SLIP-FORM PAVEMENT METHOD SHALL BE USED FOR ALL PUBLIC STREETS AND ALLEYS UNLESS OTHERWISE APPROVED BY THE TOWN ENGINEER.
   B. HAND FORM: HAND FORMED PAVEMENT METHOD MAY BE USED FOR TURN LANE, DECELERATION LANE, DRIVEWAY APPROACH, OR REPLACING A PANEL OF PUBLIC STREET OR ALLEY.

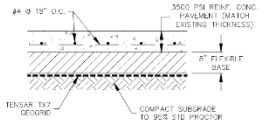


FIRE LANE
N.T.S.

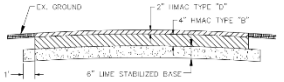
* 28' F-F PAVEMENT REQUIRED WHEN SERVING BUILDINGS 2 STORIES OR HIGHER.

FIRE LANE MAXIMUM RUNNING GRADE IS 6%

SEE FIRE LANE STRIPING DETAIL ON SHEET 10



CONCRETE PAVEMENT REPAIR
TYPICAL SECTION
N.T.S.



ASPHALT TRANSITION
TYPICAL SECTION
N.T.S.

TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL PAVING DETAILS 2 OF 3

LITTLE ELM

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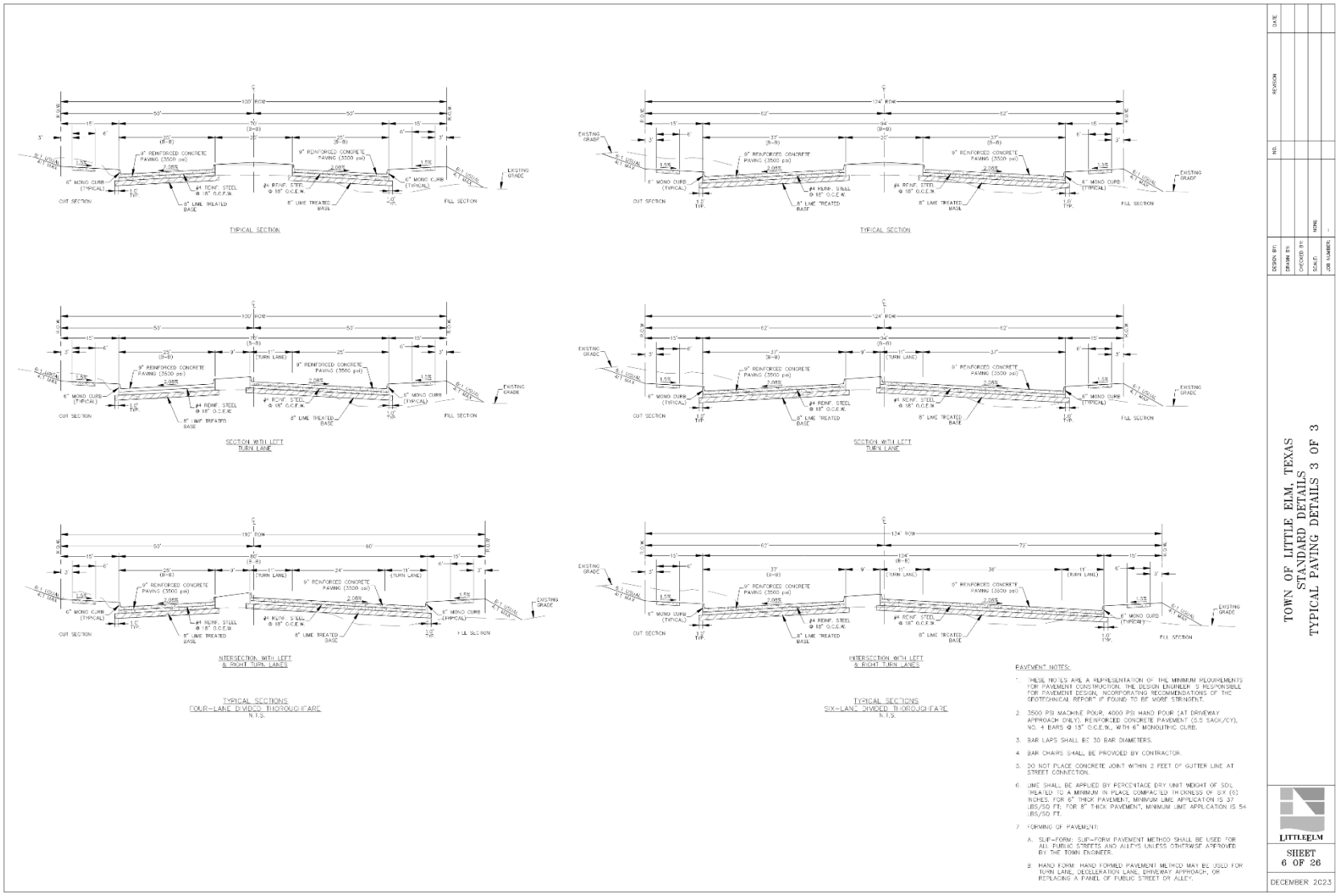
TYPICAL SECTION
TYPICAL SECTION
SECTION WITH LEFT TURN LANE
SECTION WITH LEFT TURN LANE
INTERSECTION WITH LEFT & RIGHT TURN LANES
INTERSECTION WITH LEFT & RIGHT TURN LANES
TYPICAL SECTIONS FOUR-LANE DIVIDED THOROUGHFARE N.T.S.
TYPICAL SECTIONS SIX-LANE DIVIDED THOROUGHFARE N.T.S.
PAVEMENT NOTES:
1. THESE NOTES ARE A REPRESENTATION OF THE MINIMUM REQUIREMENTS FOR PAVEMENT CONSTRUCTION. THE DESIGN ENGINEER IS RESPONSIBLE FOR PAVEMENT DESIGN, INCORPORATING RECOMMENDATIONS OF THE GEOTECHNICAL REPORT IF FOUND TO BE MORE STRINGENT.
2. 3500 PSI MACHINE POUR, 4000 PSI HAND POUR (AT DRIVEWAY APPROACH ONLY), REINFORCED CONCRETE PAVEMENT (5.5 SACK/CY), NO. 4 BARS @ 18" O.C.E.W., WITH 6" MONOLITHIC CURB.
3. BAR LAPS SHALL BE 30 BAR DIAMETERS.
4. BAR CHAIRS SHALL BE PROVIDED BY CONTRACTOR.
5. DO NOT PLACE CONCRETE JOINT WITHIN 2 FEET OF GUTTER LINE AT STREET CONNECTION.
6. LIME SHALL BE APPLIED BY PERCENTAGE DRY UNIT WEIGHT OF SOIL TREATED TO A MINIMUM IN PLACE COMPACTED THICKNESS OF SIX (6) INCHES. FOR 6" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 37 LBS/SQ FT. FOR 8" THICK PAVEMENT, MINIMUM LIME APPLICATION IS 54 LBS/SQ FT.
7. FORMING OF PAVEMENT:
A. SLIP-FORM: SLIP-FORM PAVEMENT METHOD SHALL BE USED FOR ALL PUBLIC STREETS AND ALLEYS UNLESS OTHERWISE APPROVED BY THE TOWN ENGINEER.
B. HAND FORM: HAND FORMED PAVEMENT METHOD MAY BE USED FOR TURN LANE, DECELERATION LANE, DRIVEWAY APPROACH, OR REPLACING A PANEL OF PUBLIC STREET OR ALLEY.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
NONE
JOB NUMBER:
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL PAVING DETAILS 3 OF 3
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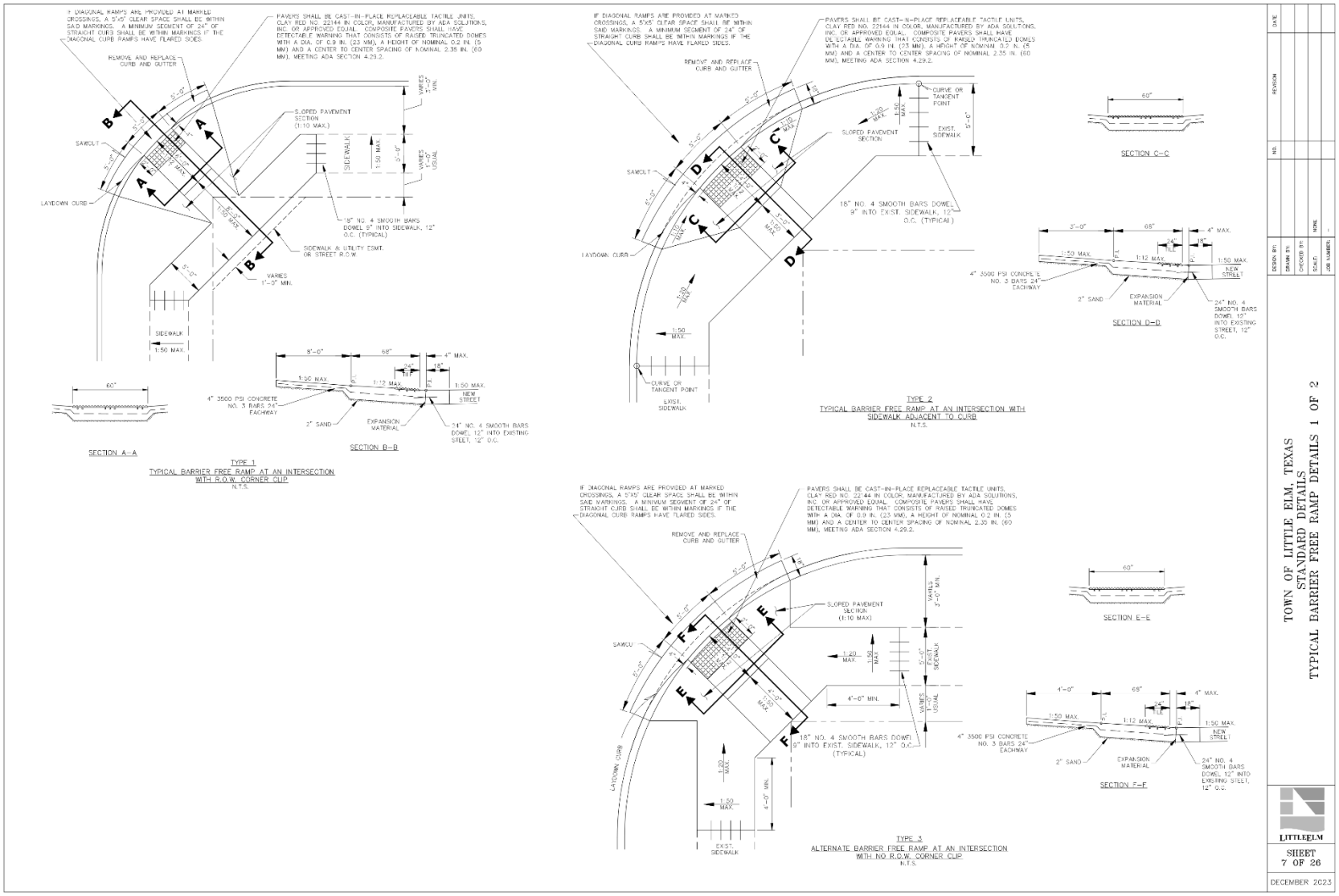
TYPE 1
TYPICAL BARRIER FREE RAMP AT AN INTERSECTION WITH R.O.W. CORNER CLIP
N.T.S.
SECTION A–A
SECTION B–B
TYPE 2
TYPICAL BARRIER FREE RAMP AT AN INTERSECTION WITH SIDEWALK ADJACENT TO CURB
N.T.S.
SECTION C–C
SECTION D–D
TYPE 3
ALTERNATE BARRIER FREE RAMP AT AN INTERSECTION WITH NO R.O.W. CORNER CLIP
N.T.S.
SECTION E–E
SECTION F–F
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL BARRIER FREE RAMP DETAILS 1 OF 2
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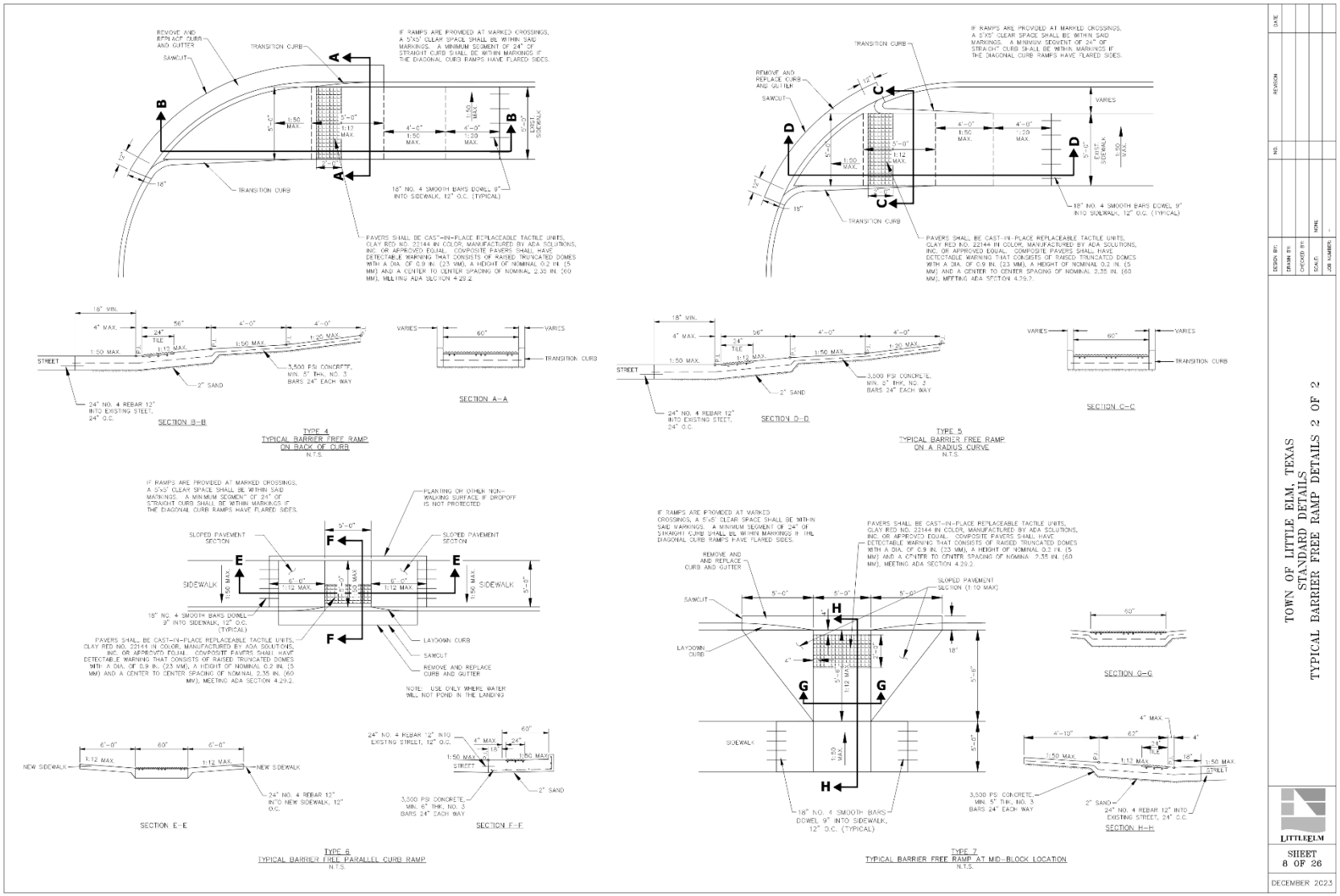
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL BARRIER FREE RAMP DETAILS 2 OF 2
LITTLEELM
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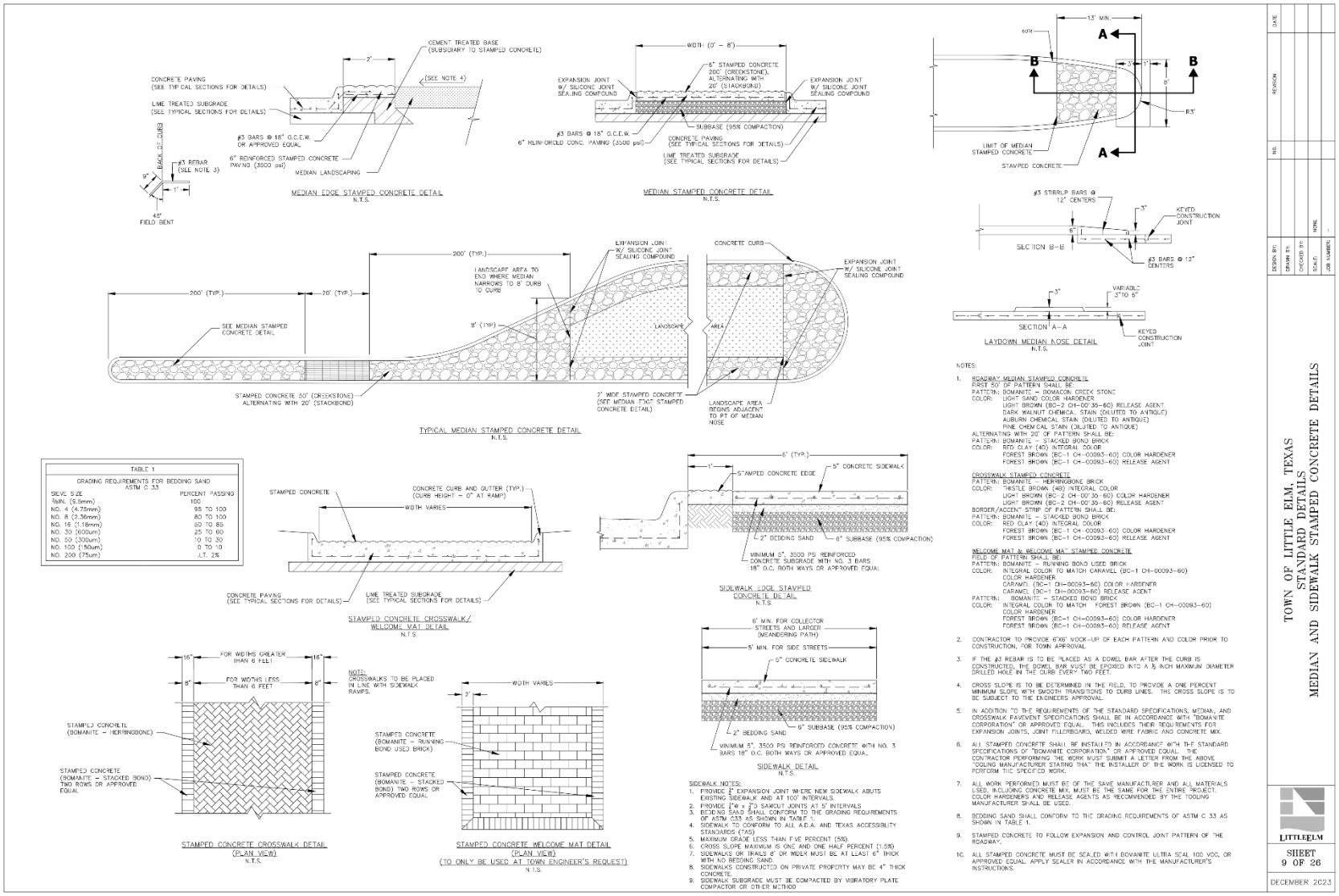
TYPE 4
TYPICAL BARRIER FREE RAMP
ON BACK OF CURB
N.T.S.
SECTION B-B
SECTION A-A
TYPE 5
TYPICAL BARRIER FREE RAMP
ON A RADIUS CURVE
N.T.S.
SECTION D-D
SECTION C-C
TYPE 6
TYPICAL BARRIER FREE PARALLEL CURB RAMP
N.T.S.
SECTION E-E
SECTION F-F
TYPE 7
TYPICAL BARRIER FREE RAMP AT MID-BLOCK LOCATION
N.T.S.
SECTION G-G
SECTION H-H


MEDIAN EDGE STAMPED CONCRETE DETAIL
N.T.S.
MEDIAN STAMPED CONCRETE DETAIL
N.T.S.
TYPICAL MEDIAN STAMPED CONCRETE DETAIL
N.T.S.
LAYDOWN MEDIAN NOSE DETAIL
N.T.S.
STAMPED CONCRETE CROSSWALK/ WELCOME MAT DETAIL
N.T.S.
SIDEWALK EDGE STAMPED CONCRETE DETAIL
N.T.S.
SIDEWALK DETAIL
N.T.S.
STAMPED CONCRETE CROSSWALK DETAIL (PLAN VIEW)
N.T.S.
STAMPED CONCRETE WELCOME MAT DETAIL (PLAN VIEW)
(TO ONLY BE USED AT TOWN ENGINEER'S REQUEST)
N.T.S.
TABLE 1
GRADING REQUIREMENTS FOR BEDDING SAND ASTM C 33
SIEVE SIZE | PERCENT PASSING
3/8IN. (9.5mm) 100
NO. 4 (4.75mm) 95 TO 100
NO. 8 (2.36mm) 80 TO 100
NO. 16 (1.18mm) 50 TO 85
NO. 30 (600um) 25 TO 60
NO. 50 (300um) 10 TO 30
NO. 100 (150um) 0 TO 10
NO. 200 (75um) LT. 2%
NOTES:
1. ROADWAY MEDIAN STAMPED CONCRETE
FIRST 50' OF PATTERN SHALL BE:
PATTERN: BOMANITE – DOMACON CREEK STONE
COLOR: LIGHT SAND COLOR HARDENER
LIGHT BROWN (BC–2 CH–00130–60) RELEASE AGENT
DARK WALNUT CHEMICAL STAIN (DILUTED TO ANTIQUE)
AUBURN CHEMICAL STAIN (DILUTED TO ANTIQUE)
PINE CHEMICAL STAIN (DILUTED TO ANTIQUE)
ALTERNATING WITH 20' OF PATTERN SHALL BE:
PATTERN: BOMANITE – STACKED BOND BRICK
COLOR: RED CLAY (40) INTEGRAL COLOR
FOREST BROWN (BC–1 CH–00093–60) COLOR HARDENER
FOREST BROWN (BC–1 CH–00093–60) RELEASE AGENT
CROSSWALK STAMPED CONCRETE
PATTERN: BOMANITE – HERRINGBONE BRICK
COLOR: "THISTLE BROWN (48) INTEGRAL COLOR
LIGHT BROWN (BC–2 CH–00130–60) COLOR HARDENER
LIGHT BROWN (BC–2 CH–00130–60) RELEASE AGENT
BORDER/"ACCENT" STRIP OF PATTERN SHALL BE:
PATTERN: BOMANITE – STACKED BOND BRICK
COLOR: RED CLAY (40) INTEGRAL COLOR
FOREST BROWN (BC–1 CH–00093–60) COLOR HARDENER
FOREST BROWN (BC–1 CH–00093–60) RELEASE AGENT
WELCOME MAT & WELCOME MAT STAMPED CONCRETE
FIELD OF PATTERN SHALL BE:
PATTERN: BOMANITE – RUNNING BOND USED BRICK
COLOR: INTEGRAL COLOR TO MATCH CARAMEL (BC–1 CH–00093–60) COLOR HARDENER
CARAMEL (BC–1 CH–00093–60) COLOR HARDENER
CARAMEL (BC–1 CH–00093–60) RELEASE AGENT
PATTERN: – STACKED BOND BRICK
COLOR: INTEGRAL COLOR TO MATCH FOREST BROWN (BC–1 CH–00093–60) COLOR HARDENER
FOREST BROWN (BC–1 CH–00093–60) COLOR HARDENER
FOREST BROWN (BC–1 CH–00093–60) RELEASE AGENT
2. CONTRACTOR TO PROVIDE 6'X6' MOCK–UP OF EACH PATTERN AND COLOR PRIOR TO CONSTRUCTION, FOR TOWN APPROVAL.
3. IF THE #3 REBAR IS TO BE PLACED AS A DOWEL BAR AFTER THE CURB IS CONSTRUCTED, THE DOWEL BAR MUST BE EPOXIED INTO A ½ INCH MAXIMUM DIAMETER DRILLED HOLE IN THE CURB EVERY TWO FEET.
4. CROSS SLOPE IS TO BE DETERMINED IN THE FIELD, TO PROVIDE A ONE PERCENT MINIMUM SLOPE WITH SMOOTH TRANSITIONS TO CURB LINES. THE CROSS SLOPE IS TO BE SUBJECT TO THE ENGINEERS APPROVAL.
5. IN ADDITION TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS, MEDIAN, AND CROSSWALK PAVEMENT SPECIFICATIONS SHALL BE IN ACCORDANCE WITH "BOMANITE CORPORATION" OR APPROVED EQUAL. THIS INCLUDES THEIR REQUIREMENTS FOR EXPANSION JOINTS, JOINT FILLERBOARD, WELDED WIRE FABRIC AND CONCRETE MIX.
6. ALL STAMPED CONCRETE SHALL BE INSTALLED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF "BOMANITE CORPORATION." OR APPROVED EQUAL. THE CONTRACTOR PERFORMING THE WORK MUST SUBMIT A LETTER FROM THE ABOVE "TOOLING MANUFACTURER STATING THA" THE INSTALLER OF THE WORK IS LICENSED TO PERFORM THIS SPECIFIED WORK.
7. ALL WORK PERFORMED MUST BE OF THE SAME MANUFACTURER AND ALL MATERIALS USED, INCLUDING CONCRETE MIX, MUST BE THE SAME FOR THE ENTIRE PROJECT. COLOR HARDENERS AND RELEASE AGENTS AS RECOMMENDED BY THE TOOLING MANUFACTURER SHALL BE USED.
8. BEDDING SAND SHALL CONFORM TO THE GRADING REQUIREMENTS OF ASTM C 33 AS SHOWN IN TABLE 1.
9. STAMPED CONCRETE TO FOLLOW EXPANSION AND CONTROL JOINT PATTERN OF THE ROADWAY.
10. ALL STAMPED CONCRETE MUST BE SEALED WITH BOMANITE ULTRA SEAL 100 VOC, OR APPROVED EQUAL. APPLY SEALER IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
SIDEWALK NOTES:
1. PROVIDE ½" EXPANSION JOINT WHERE NEW SIDEWALK ABUTS EXISTING SIDEWALK AND AT 100' INTERVALS.
2. PROVIDE ¼"W x ¾"D SAWCUT JOINTS AT 5' INTERVALS
3. BEDDING SAND SHALL CONFORM TO THE GRADING REQUIREMENTS OF ASTM C33 AS SHOWN IN TABLE 1.
4. SIDEWALK TO CONFORM TO ALL A.D.A. AND TEXAS ACCESSIBILITY STANDARDS (TAS)
5. MAXIMUM GRADE LESS THAN FIVE PERCENT (5%).
6. CROSS SLOPE MAXIMUM IS ONE AND ONE HALF PERCENT (1.5%)
7. SIDEWALKS OR TRAILS 8' OR WIDER MUST BE AT LEAST 6" THICK WITH NO BEDDING SAND.
8. SIDEWALKS CONSTRUCTED ON PRIVATE PROPERTY MAY BE 4" THICK CONCRETE.
9. SIDEWALK SUBGRADE MUST BE COMPACTED BY VIBRATORY PLATE COMPACTOR OR OTHER METHOD
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
MEDIAN AND SIDEWALK STAMPED CONCRETE DETAILS
LITTLEELM
SHEET
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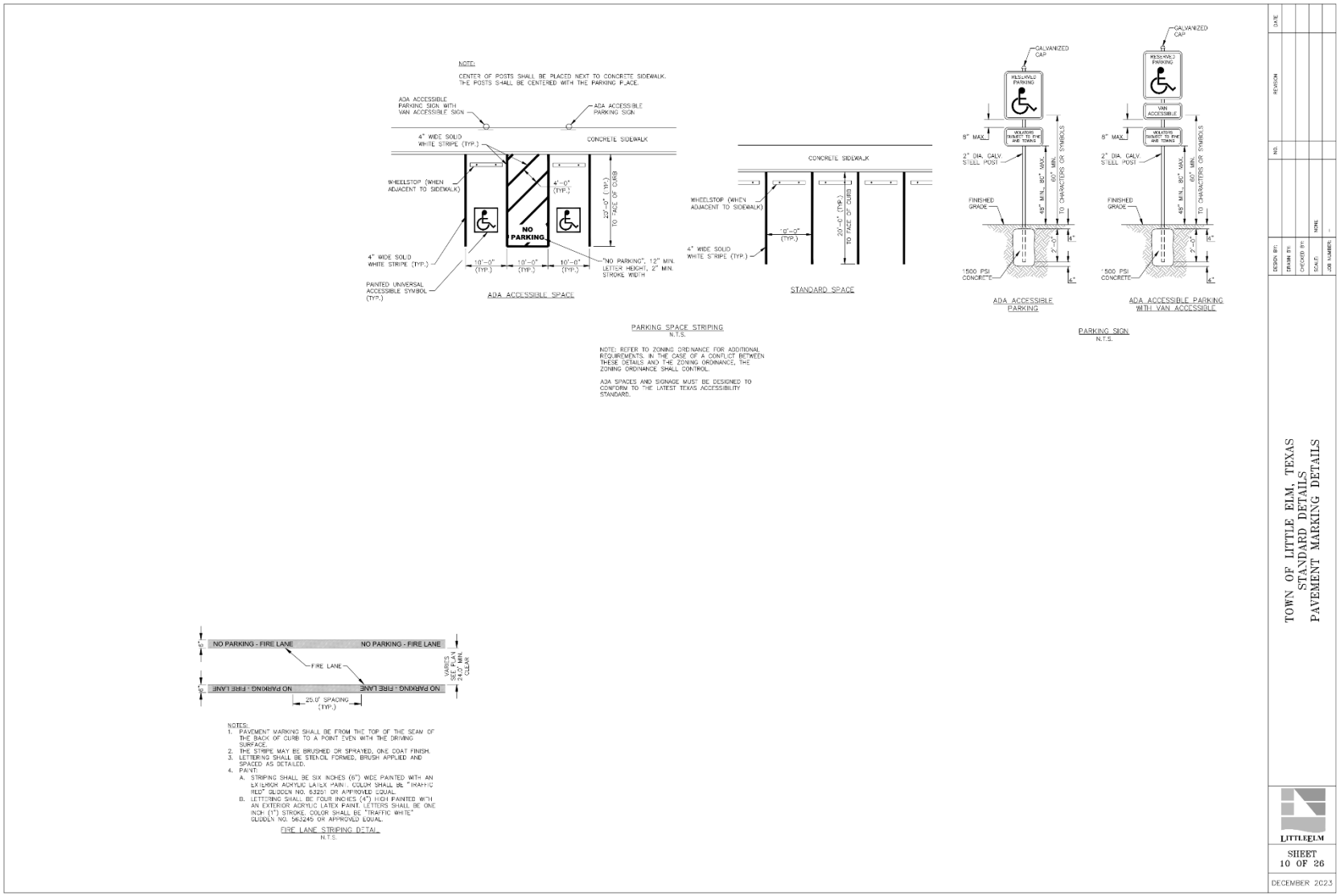
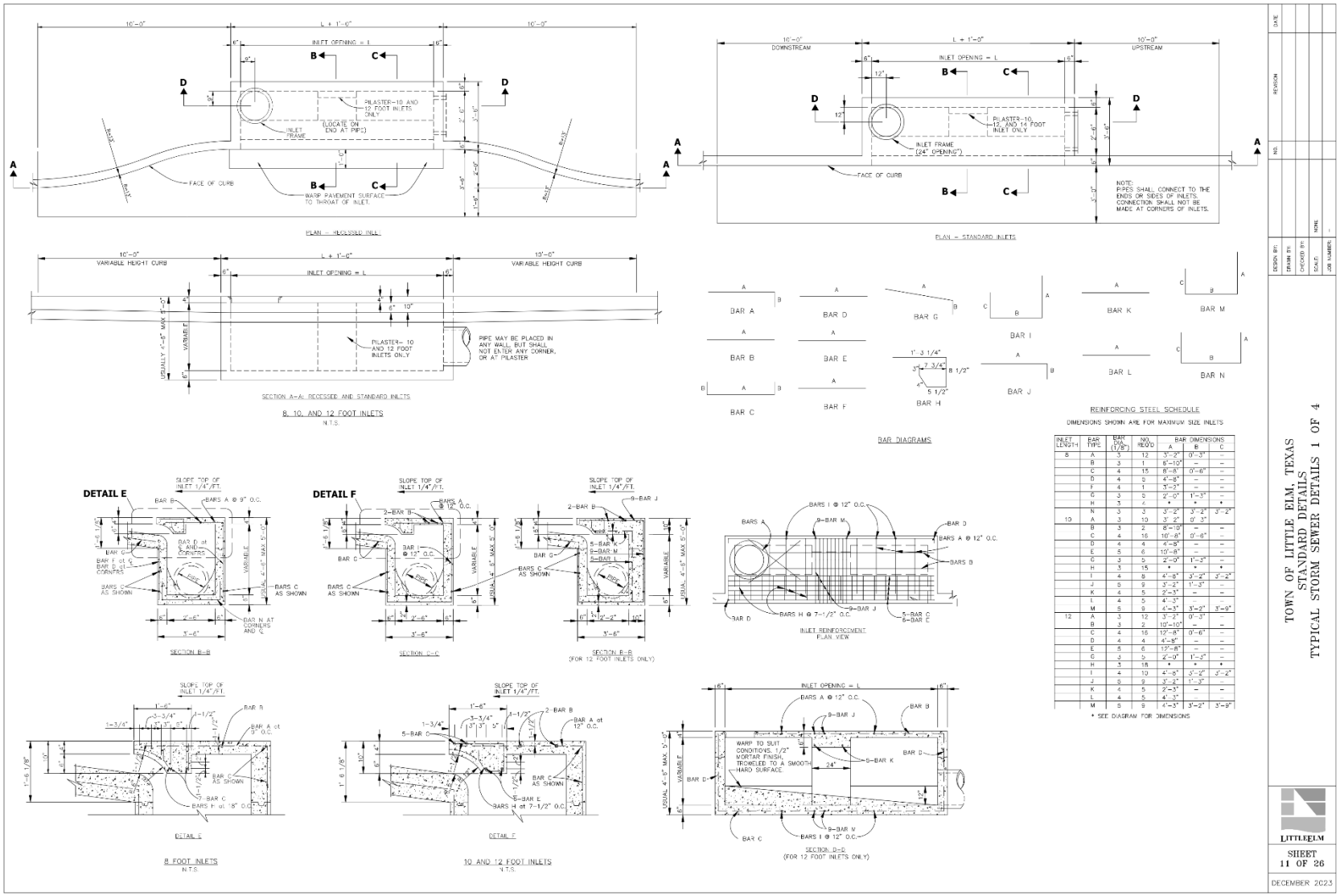
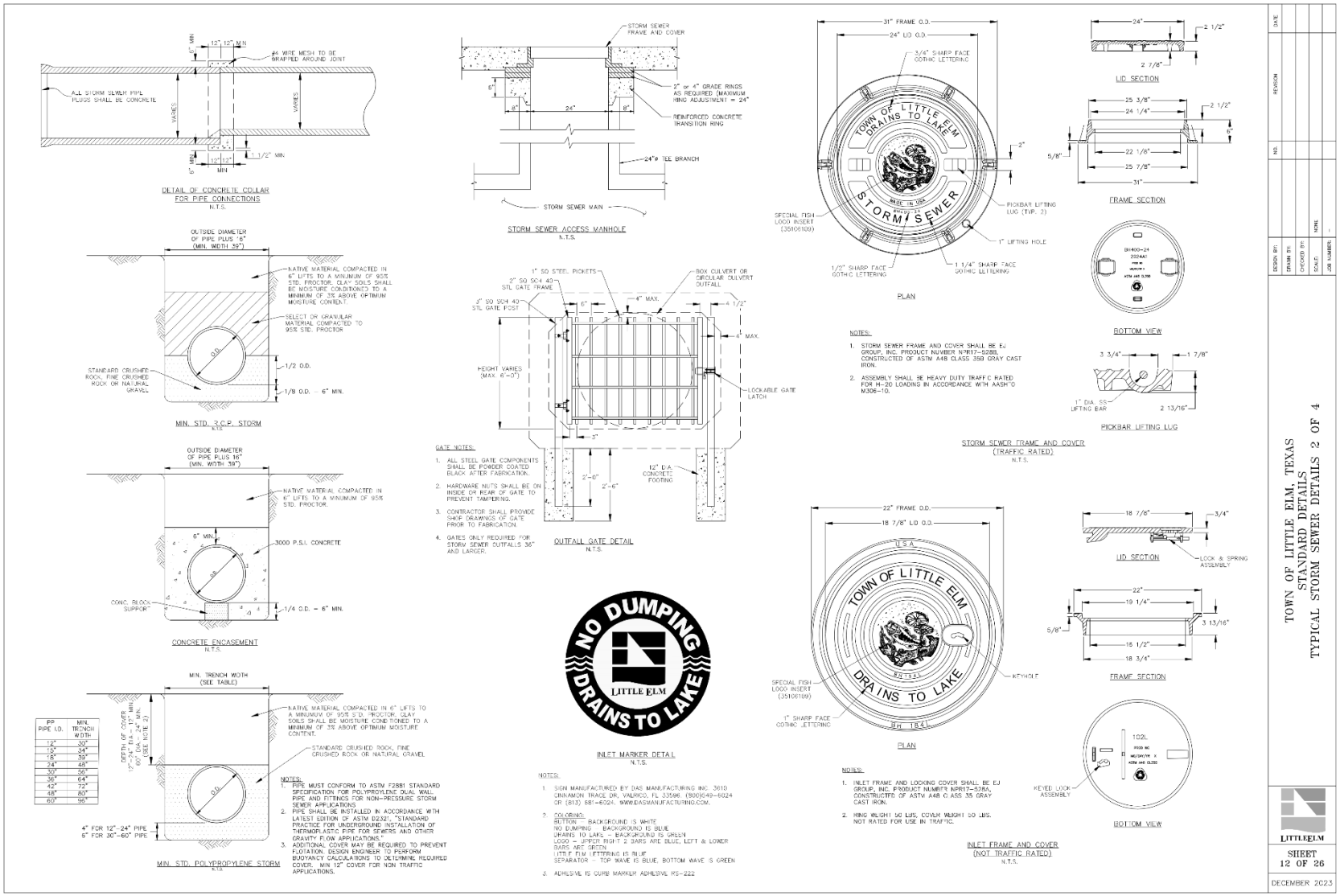
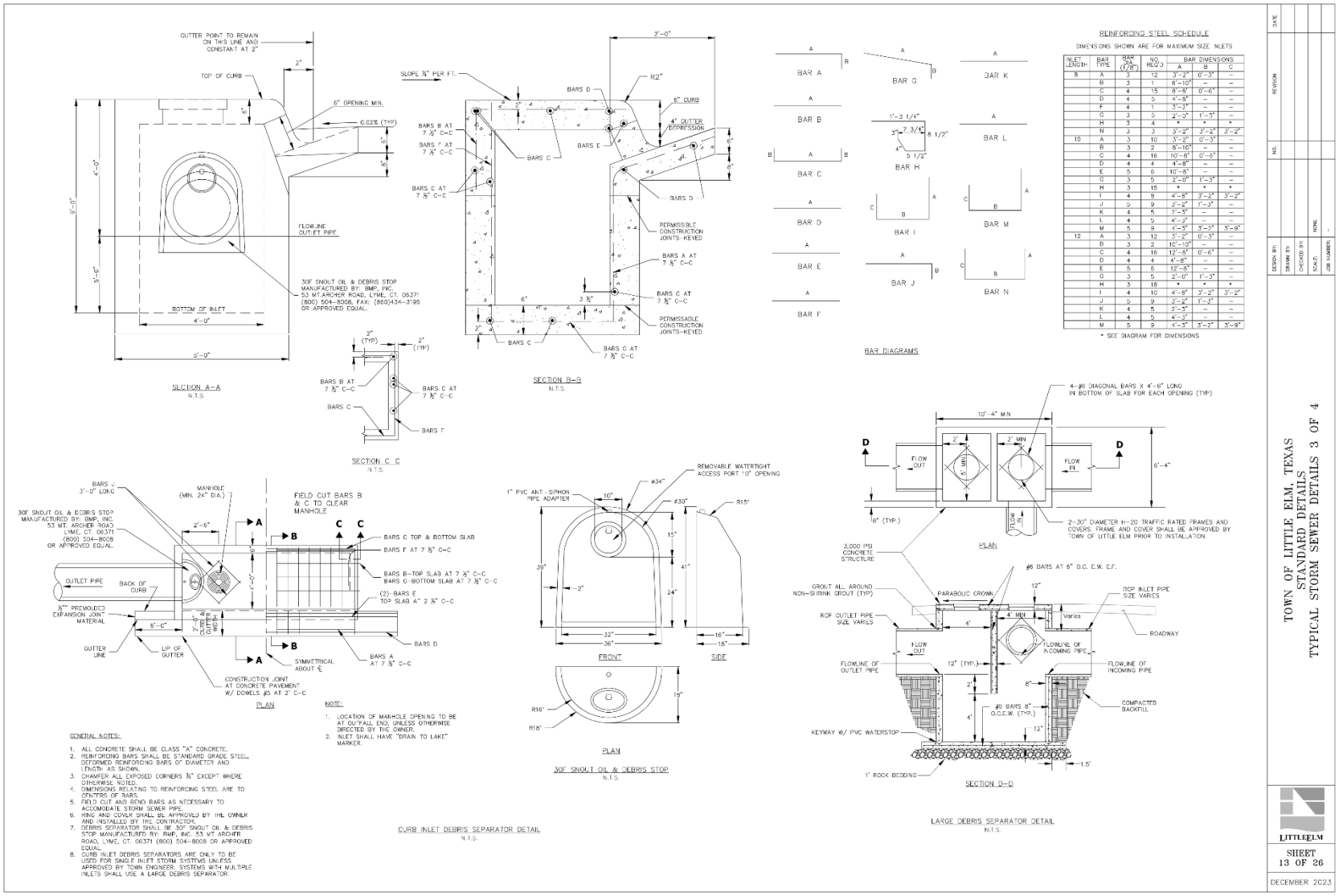
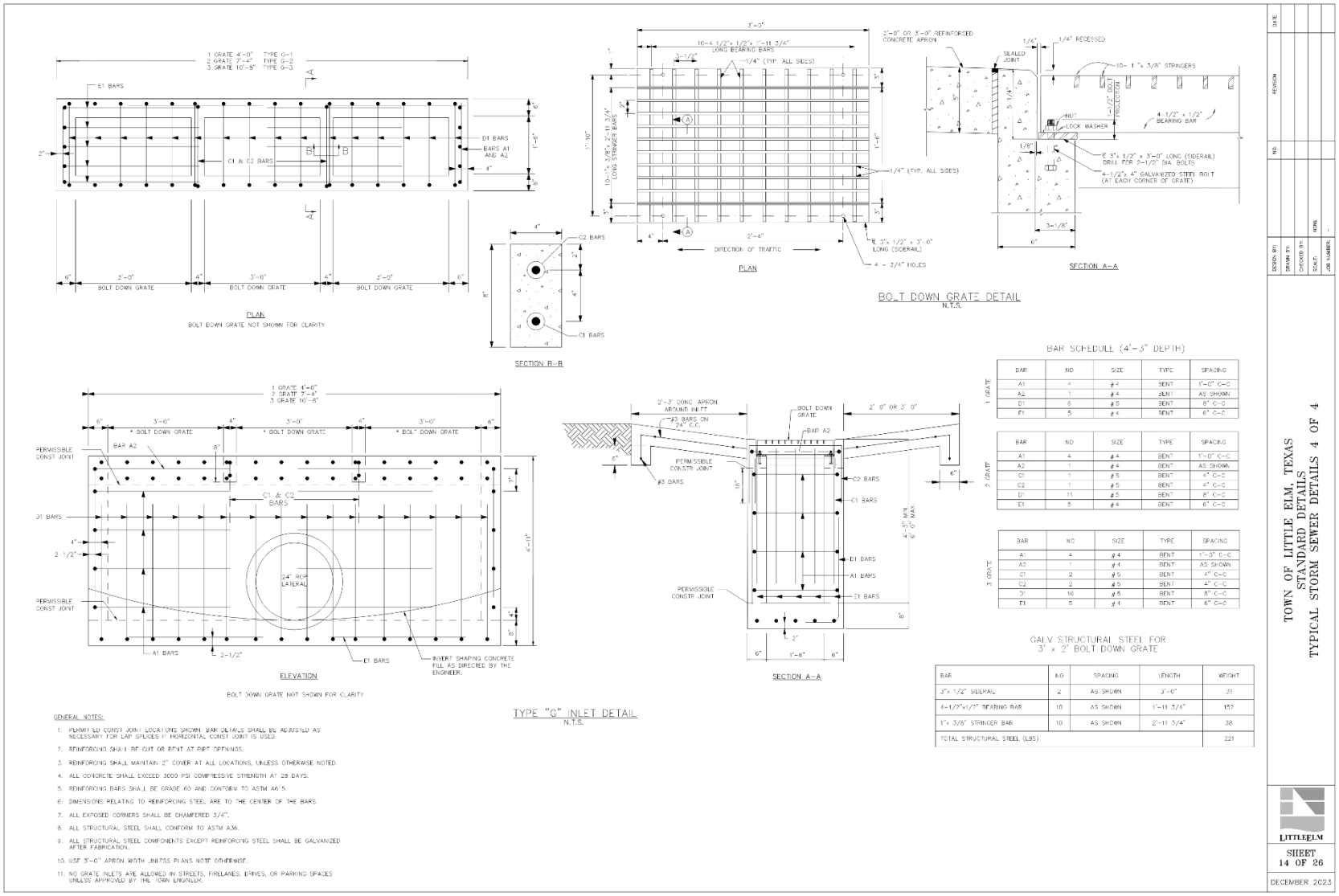
DECEMBER 2023


NOTE:
CENTER OF POSTS SHALL BE PLACED NEXT TO CONCRETE SIDEWALK. THE POSTS SHALL BE CENTERED WITH THE PARKING PLACE.
ADA ACCESSIBLE PARKING SIGN WITH VAN ACCESSIBLE SIGN
ADA ACCESSIBLE PARKING SIGN
4" WIDE SOLID WHITE STRIPE (TYP.)
CONCRETE SIDEWALK
WHEELSTOP (WHEN ADJACENT TO SIDEWALK)
4'-0" (TYP.)
20'-0" (TYP.) TO FACE OF CURB
NO PARKING
4" WIDE SOLID WHITE STRIPE (TYP.)
10'-0" (TYP.)
10'-0" (TYP.)
10'-0" (TYP.)
"NO PARKING", 12" MIN. LETTER HEIGHT, 2" MIN. STROKE WIDTH
PAINTED UNIVERSAL ACCESSIBLE SYMBOL (TYP.)
ADA ACCESSIBLE SPACE
CONCRETE SIDEWALK
WHEELSTOP (WHEN ADJACENT TO SIDEWALK)
4" WIDE SOLID WHITE STRIPE (TYP.)
2'-0" (TYP.)
20'-0" (TYP.) TO FACE OF CURB
STANDARD SPACE
PARKING SPACE STRIPING
N.T.S.
NOTE: REFER TO ZONING ORDINANCE FOR ADDITIONAL REQUIREMENTS. IN THE CASE OF A CONFLICT BETWEEN THESE DETAILS AND THE ZONING ORDINANCE, THE ZONING ORDINANCE SHALL CONTROL.
ADA SPACES AND SIGNAGE MUST BE DESIGNED TO CONFORM TO THE LATEST TEXAS ACCESSIBILITY STANDARD.
GALVANIZED CAP
MUTCD R7-8 PARKING
8" MAX.
VIOLATORS SUBJECT TO FINE AND TOWING
2" DIA. GALV. STEEL POST
60" MIN.
48" MIN.
80" MAX.
TO CHARACTERS OR SYMBOLS
FINISHED GRADE
2'-0"
6"
4"
1500 PSI CONCRETE
ADA ACCESSIBLE PARKING
MUTCD R7-8P VAN ACCESSIBLE
ADA ACCESSIBLE PARKING WITH VAN ACCESSIBLE
PARKING SIGN
N.T.S.
NO PARKING - FIRE LANE
FIRE LANE
VARIES SEE PLAN 24' CLEAR
25.0' SPACING (TYP.)
NOTES:
1. PAVEMENT MARKING SHALL BE FROM THE TOP OF THE SEAM OF THE BACK OF CURB TO A POINT EVEN WITH THE DRIVING SURFACE.
2. THE STRIPE MAY BE BRUSHED OR SPRAYED, ONE COAT FINISH.
3. LETTERING SHALL BE STENCIL FORMED, BRUSH APPLIED AND SPACED AS DETAILED.
4. PAINT:
A. STRIPING SHALL BE SIX INCHES (6") WIDE PAINTED WITH AN EXTERIOR ACRYLIC LATEX PAINT. COLOR SHALL BE "TRAFFIC RED" GLIDDEN NO. 6329 OR APPROVED EQUAL.
B. LETTERING SHALL BE FOUR INCHES (4") HIGH PAINTED WITH AN EXTERIOR ACRYLIC LATEX PAINT. LETTERS SHALL BE ONE INCH (1") STROKE. COLOR SHALL BE "TRAFFIC WHITE" GLIDDEN NO. 56224 OR APPROVED EQUAL.
FIRE LANE STRIPING DETAIL
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
KONG
JOB NUMBER:
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
PAVEMENT MARKING DETAILS
LITTLEELM
SHEET
10 OF 26
DECEMBER 2023


PLAN – RECESSED INLET
PLAN – STANDARD INLETS
FACE OF CURB
WARP PAVEMENT SURFACE TO THROAT OF INLET.
INLET FRAME
PILASTER–10 AND 12 FOOT INLETS ONLY
(LOCATE ON END AT PIPE)
INLET OPENING = L
VARIABLE HEIGHT CURB
PILASTER– 10 AND 12 FOOT INLETS ONLY
PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER, OR AT PILASTER
SECTION A–A: RECESSED AND STANDARD INLETS
8, 10, AND 12 FOOT INLETS
N.T.S.
BAR A
BAR B
BAR C
BAR D
BAR E
BAR F
BAR G
BAR H
BAR I
BAR J
BAR K
BAR L
BAR M
BAR N
BAR DIAGRAMS
REINFORCING STEEL SCHEDULE
DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS
INLET LENGTH | BAR TYPE | BAR DIA (1/8") | NO. REQ'D | BAR DIMENSIONS A | B | C
8 | A | 3 | 12 | 3'–2" | 0'–3" | –
B | 3 | 1 | 6'–10" | – | –
C | 4 | 15 | 8'–8" | 0'–6" | –
D | 4 | 5 | 4'–8" | – | –
F | 4 | 1 | 3'–2" | – | –
G | 3 | 5 | 2'–0" | 1'–3" | –
H | 3 | * | * | * | *
N | 3 | 3 | 3'–2" | 3'–2" | 3'–2"
10 | A | 3 | 10 | 3'–2" | 0'–3" | –
B | 3 | 2 | 8'–10" | – | –
C | 4 | 16 | 10'–8" | 0'–6" | –
D | 4 | 4 | 4'–8" | – | –
E | 5 | 6 | 10'–8" | – | –
G | 3 | 5 | 2'–0" | 1'–3" | –
H | 3 | * | * | * | *
I | 4 | 8 | 4'–8" | 3'–2" | 3'–2"
J | 5 | 9 | 3'–2" | 1'–3" | –
K | 4 | 5 | 2'–3" | – | –
L | 4 | 5 | 4'–3" | – | –
M | 5 | 9 | 4'–3" | 3'–2" | 3'–9"
12 | A | 3 | 12 | 3'–2" | 0'–3" | –
B | 3 | 2 | 10'–10" | – | –
C | 4 | 16 | 12'–8" | 0'–6" | –
D | 4 | 4 | 4'–8" | – | –
E | 5 | 6 | 12'–8" | – | –
G | 3 | 5 | 2'–0" | 1'–3" | –
H | 3 | * | * | * | *
I | 4 | 10 | 4'–8" | 3'–2" | 3'–2"
J | 5 | 9 | 3'–2" | 1'–3" | –
K | 4 | 5 | 2'–3" | – | –
L | 4 | 5 | 4'–3" | – | –
M | 5 | 9 | 4'–3" | 3'–2" | 3'–9"
* SEE DIAGRAM FOR DIMENSIONS
DETAIL E
DETAIL F
SECTION B–B
SECTION C–C
SECTION E–E (FOR 12 FOOT INLETS ONLY)
INLET REINFORCEMENT PLAN VIEW
DETAIL E
DETAIL F
8 FOOT INLETS
N.T.S.
10 AND 12 FOOT INLETS
N.T.S.
SECTION D–D (FOR 12 FOOT INLETS ONLY)
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL STORM SEWER DETAILS 1 OF 4
LITTLE ELM
SHEET 11 OF 26
DECEMBER 2023


DETAIL OF CONCRETE COLLAR FOR PIPE CONNECTIONS
N.T.S.
STORM SEWER ACCESS MANHOLE
N.T.S.
MIN. STD. R.C.P. STORM
N.T.S.
CONCRETE ENCASEMENT
N.T.S.
MIN. STD. POLYPROPYLENE STORM
N.T.S.
OUTFALL GATE DETAIL
N.T.S.
INLET MARKER DETAIL
N.T.S.
PLAN
LID SECTION
FRAME SECTION
BOTTOM VIEW
PICKBAR LIFTING LUG
STORM SEWER FRAME AND COVER (TRAFFIC RATED)
N.T.S.
INLET FRAME AND COVER (NOT TRAFFIC RATED)
N.T.S.
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL STORM SEWER DETAILS 2 OF 4
LITTLE ELM
SHEET 12 OF 26
DECEMBER 2023


SECTION A–A
N.T.S.
SECTION B–B
N.T.S.
SECTION C C
N.T.S.
BAR DIAGRAMS
REINFORCING STEEL SCHEDULE
DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS
* SEE DIAGRAM FOR DIMENSIONS
PLAN
FRONT
SIDE
30F SNOUT OIL & DEBRIS STOP
N.T.S.
CURB INLET DEBRIS SEPARATOR DETAIL
N.T.S.
SECTION D–D
LARGE DEBRIS SEPARATOR DETAIL
N.T.S.
GENERAL NOTES:
1. ALL CONCRETE SHALL BE CLASS "A" CONCRETE.
2. REINFORCING BARS SHALL BE STANDARD GRADE STEEL, DEFORMED REINFORCING BARS OF DIAMETER AND LENGTH AS SHOWN.
3. CHAMFER ALL EXPOSED CORNERS ¾" EXCEPT WHERE OTHERWISE NOTED.
4. DIMENSIONS RELATING TO REINFORCING STEEL ARE TO CENTERS OF BARS.
5. FIELD CUT AND BEND BARS AS NECESSARY TO ACCOMODATE STORM SEWER PIPE.
6. KIND AND COVER SHALL BE APPROVED BY THE OWNER AND INSTALLED BY THE CONTRACTOR.
7. DEBRIS SEPARATOR SHALL BE 30F SNOUT OIL & DEBRIS STOP MANUFACTURED BY: BMP, INC. 53 MT ARCHER ROAD, LYME, CT. 06371 (800) 504-8008 OR APPROVED EQUAL.
8. CURB INLET DEBRIS SEPARATORS ARE ONLY TO BE USED FOR SINGLE INLET STORM SYSTEMS UNLESS APPROVED BY TOWN ENGINEER. SYSTEMS WITH MULTIPLE INLETS SHALL USE A LARGE DEBRIS SEPARATOR.
NOTE:
1. LOCATION OF MANHOLE OPENING TO BE AT OUTFALL END, UNLESS OTHERWISE DIRECTED BY THE OWNER.
2. INLET SHALL HAVE "DRAIN TO LAKE" MARKER.
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL STORM SEWER DETAILS 3 OF 4
LITTLE ELM
SHEET
13 OF 26
DECEMBER 2023



BAR SCHEDULE (4'-3" DEPTH)

1 GRATE

BAR	NO	SIZE	TYPE	SPACING
A1	4	# 4	BENT	1'-0" C-C
A2	1	# 4	BENT	AS SHOWN
D1	6	# 5	BENT	8" C-C
E1	5	# 4	BENT	6" C-C

2 GRATE

BAR	NO	SIZE	TYPE	SPACING
A1	4	# 4	BENT	1'-0" C-C
A2	1	# 4	BENT	AS SHOWN
C1	1	# 5	BENT	4" C-C
C2	1	# 5	BENT	4" C-C
D1	11	# 5	BENT	8" C-C
E1	5	# 4	BENT	6" C-C

3 GRATE

BAR	NO	SIZE	TYPE	SPACING
A1	4	# 4	BENT	1'-0" C-C
A2	1	# 4	BENT	AS SHOWN
C1	2	# 5	BENT	4" C-C
C2	2	# 5	BENT	4" C-C
D1	16	# 5	BENT	8" C-C
E1	5	# 4	BENT	6" C-C

GALV STRUCTURAL STEEL FOR 3' x 2' BOLT DOWN GRATE

BAR	NO	SPACING	LENGTH	WEIGHT
3"x 1/2" SIDERAIL	2	AS SHOWN	3'-0"	31
4-1/2"x1/2" BEARING BAR	10	AS SHOWN	1'-11 3/4"	153
1"x 3/8" STRINGER BAR	10	AS SHOWN	2'-11 3/4"	38
TOTAL STRUCTURAL STEEL (LBS)				221

GENERAL NOTES:

1. PERMITTED CONST JOINT LOCATIONS SHOWN. BAR DETAILS SHALL BE ADJUSTED AS NECESSARY FOR LAP SPLICES IF HORIZONTAL CONST JOINT IS USED.
2. REINFORCING SHALL BE CUT OR BENT AT PIPE OPENINGS.
3. REINFORCING SHALL MAINTAIN 2" COVER AT ALL LOCATIONS, UNLESS OTHERWISE NOTED.
4. ALL CONCRETE SHALL EXCEED 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
5. REINFORCING BARS SHALL BE GRADE 60 AND CONFORM TO ASTM A615.
6. DIMENSIONS RELATING TO REINFORCING STEEL ARE TO THE CENTER OF THE BARS.
7. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4".
8. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.
9. ALL STRUCTURAL STEEL COMPONENTS EXCEPT REINFORCING STEEL SHALL BE GALVANIZED AFTER FABRICATION.
10. USE 3'-0" APRON WIDTH UNLESS PLANS NOTE OTHERWISE.
11. NO GRATE INLETS ARE ALLOWED IN STREETS, FIRELANES, DRIVES, OR PARKING SPACES UNLESS APPROVED BY THE TOWN ENGINEER.

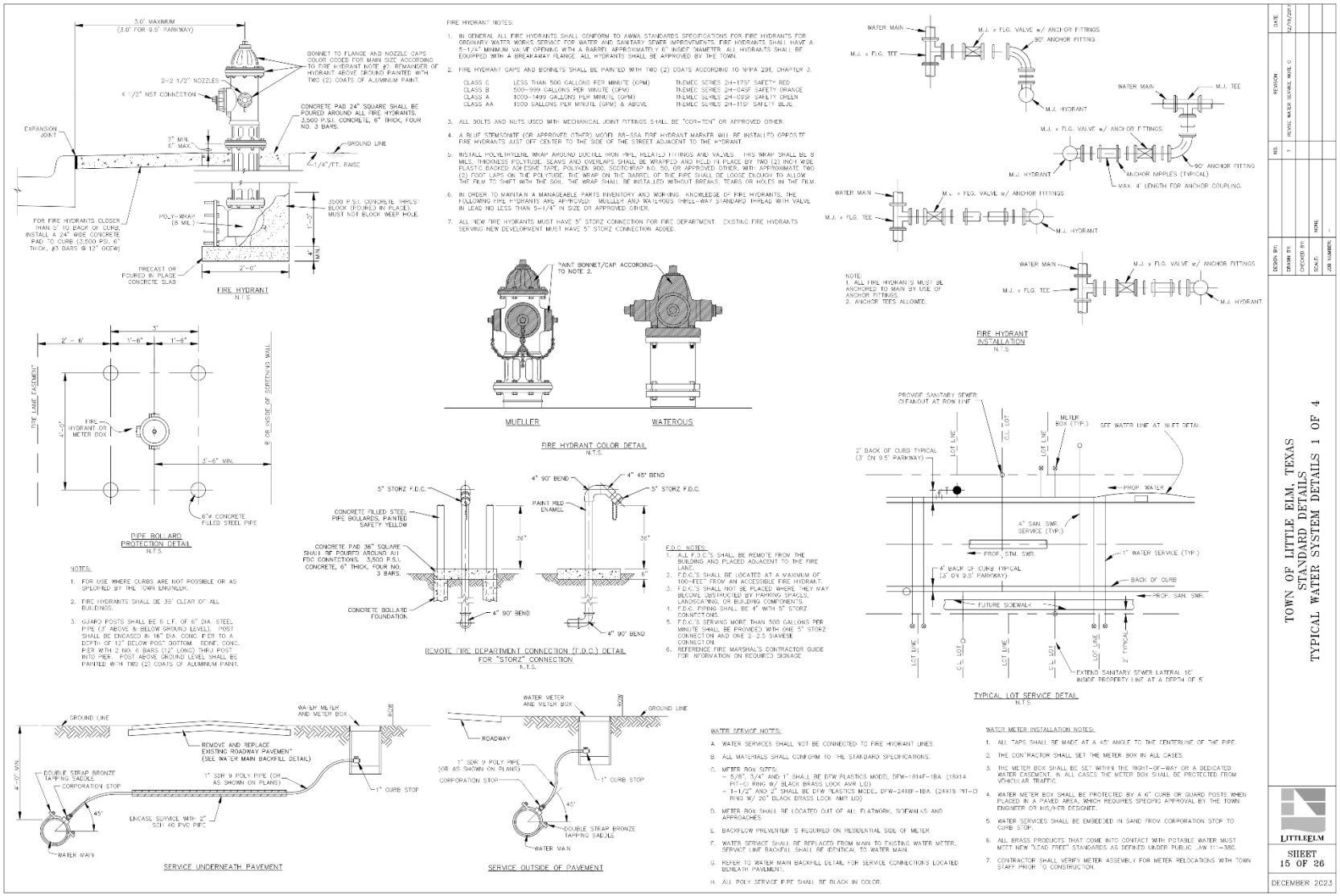
DATE | REVISION | NO. | DESIGN BY: | DRAWN BY: | CHECKED BY: | SCALE: NONE | JOB NUMBER: -

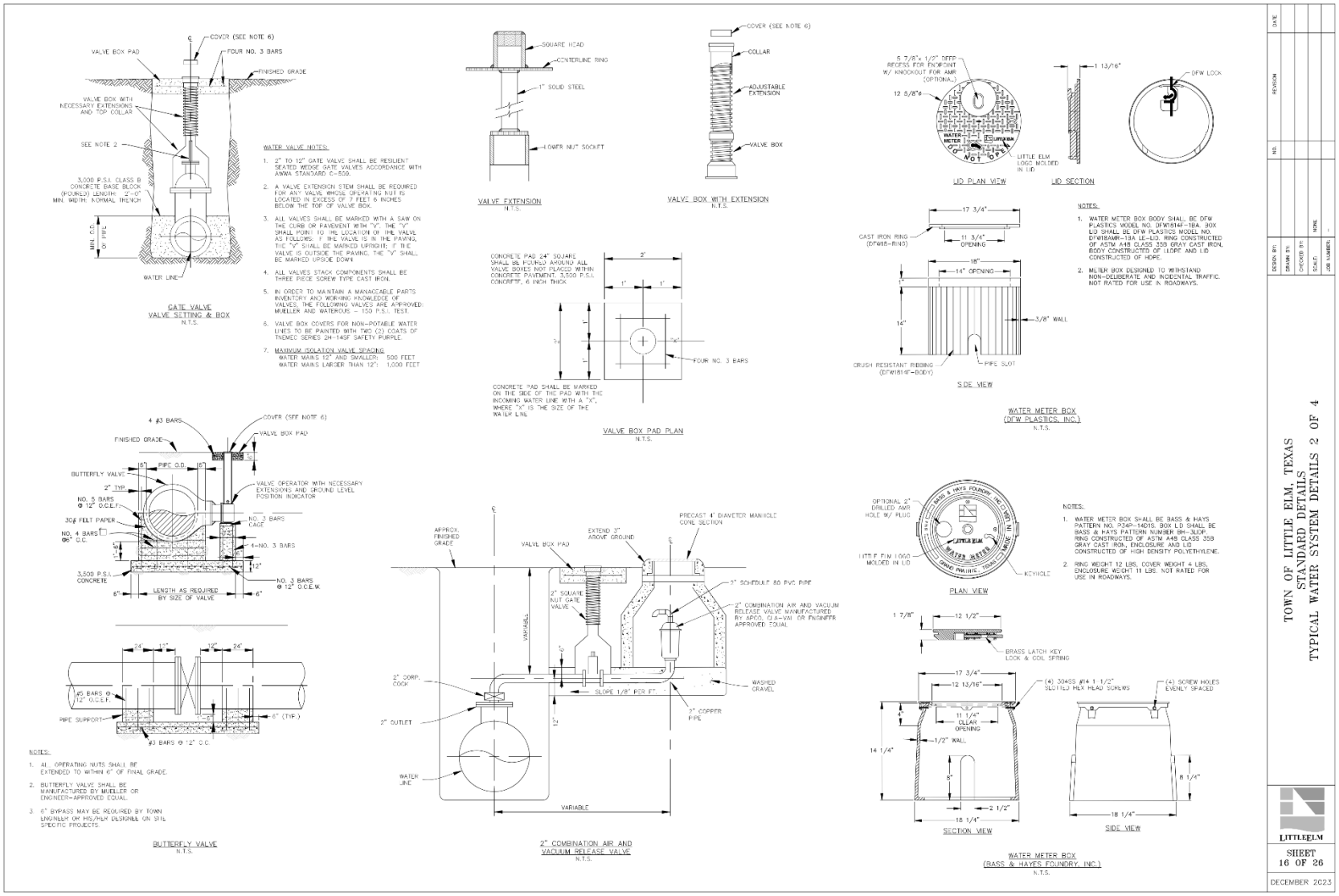
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL STORM SEWER DETAILS 4 OF 4

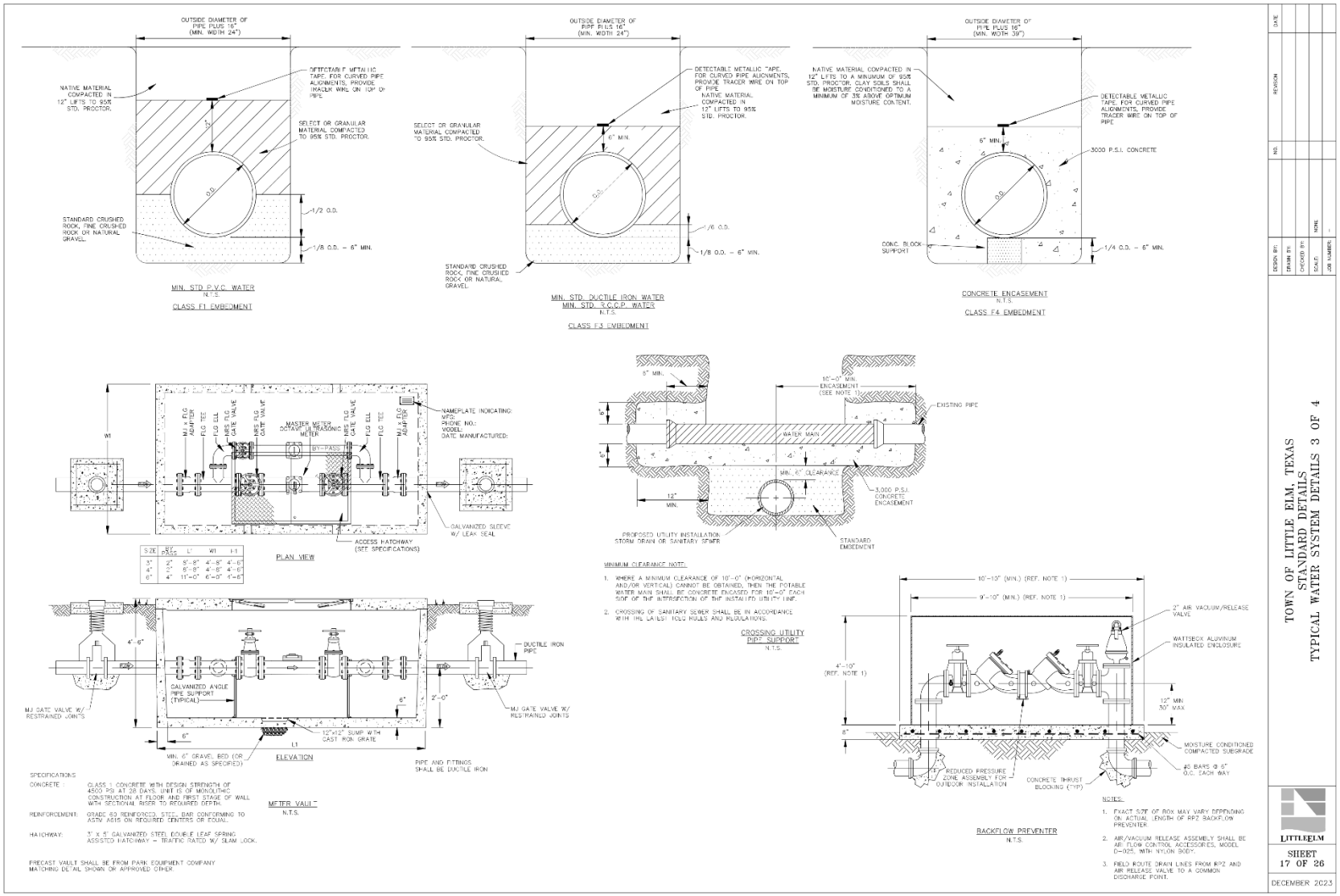
LITTLE ELM

SHEET 14 OF 26

DECEMBER 2023


FIRE HYDRANT NOTES:
1. IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARDS SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE FOR WATER AND SANITARY SEWER IMPROVEMENTS. FIRE HYDRANTS SHALL HAVE A 5-1/4" MINIMUM VALVE OPENING WITH A BARREL APPROXIMATELY 6" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE. ALL HYDRANTS SHALL BE APPROVED BY THE TOWN.
2. FIRE HYDRANT CAPS AND BONNETS SHALL BE PAINTED WITH TWO (2) COATS ACCORDING TO NFPA 291, CHAPTER 3.
CLASS C LESS THAN 500 GALLONS PER MINUTE (GPM) TNEMEC SERIES 2H-1375" SAFETY RED
CLASS B 500~999 GALLONS PER MINUTE (GPM) TNEMEC SERIES 2H-04SF SAFETY ORANGE
CLASS A 1000~1499 GALLONS PER MINUTE (GPM) TNEMEC SERIES 2H-05SF SAFETY GREEN
CLASS AA 1500 GALLONS PER MINUTE (GPM) & ABOVE TNEMEC SERIES 2H-11SF SAFETY BLUE
3. ALL BOLTS AND NUTS USED WITH MECHANICAL JOINT FITTINGS SHALL BE "COR-TEN" OR APPROVED OTHER.
4. A BLUE STEMSONITE (OR APPROVED OTHER) MODEL 88-SSA PVC HYDRANT MARKER WILL BE INSTALLED OPPOSITE FIRE HYDRANTS JUST OFF CENTER TO THE SIDE OF THE STREET ADJACENT TO THE HYDRANT.
5. INSTALL POLYETHYLENE WRAP AROUND DUCTILE IRON PIPE, RELATED FITTINGS AND VALVES. THIS WRAP SHALL BE 8 MILS THICKNESS POLYTUBE, SEAMS AND OVERLAPS SHALL BE WRAPPED AND HELD IN PLACE BY TWO (2) INCH WIDE PLASTIC BACKED ADHESIVE TAPE, POLYKEN 900, SCOTCHWRAP NO. 50, OR APPROVED OTHER, WITH APPROXIMATE TWO (2) FOOT LAPS ON THE POLYTUBE. THE WRAP ON THE BARREL OF THE PIPE SHALL BE LOOSE ENOUGH TO ALLOW THE FILM TO SHIFT WITH THE SOIL. THE WRAP SHALL BE INSTALLED WITHOUT BREAKS, TEARS OR HOLES IN THE FILM.
6. IN ORDER TO MAINTAIN A MANAGEABLE PARTS INVENTORY AND WORKING KNOWLEDGE OF FIRE HYDRANTS, THE FOLLOWING FIRE HYDRANTS ARE APPROVED: MUELLER AND WATEROUS THREE-WAY STANDARD THREAD WITH VALVE IN LEAD NO LESS THAN 5-1/4" IN SIZE OR APPROVED OTHER.
7. ALL NEW FIRE HYDRANTS MUST HAVE 5" STORZ CONNECTION FOR FIRE DEPARTMENT. EXISTING FIRE HYDRANTS SERVING NEW DEVELOPMENT MUST HAVE 5" STORZ CONNECTION ADDED.
3.0' MAXIMUM (3.0' FOR 9.5' PARKWAY)
BONNET TO FLANGE AND NOZZLE CAPS COLOR CODED FOR MAIN SIZE ACCORDING TO FIRE HYDRANT NOTE #2. REMAINDER OF HYDRANT ABOVE GROUND PAINTED WITH TWO (2) COATS OF ALUMINUM PAINT.
2-2 1/2" NOZZLES
4 1/2" NST CONNECTION
CONCRETE PAD 24" SQUARE SHALL BE POURED AROUND ALL FIRE HYDRANTS, 3,500 P.S.I. CONCRETE, 6" THICK, FOUR NO. 3 BARS.
EXPANSION JOINT
3" MIN. 6" MAX.
GROUND LINE
2-1/4"/FT. RAISE
3500 P.S.I. CONCRETE THRUST BLOCK (POURED IN PLACE). MUST NOT BLOCK WEEP HOLE.
POLY-WRAP (8 MIL)
FOR FIRE HYDRANTS CLOSER THAN 5' TO BACK OF CURB, INSTALL A 24" WIDE CONCRETE PAD TO CURB (3,500 PSI, 6" THICK, #3 BARS @ 12" OCEW)
PRECAST OR POURED IN PLACE CONCRETE SLAB
FIRE HYDRANT
N.T.S.
PAINT BONNET/CAP ACCORDING TO NOTE 2.
MUELLER
WATEROUS
FIRE HYDRANT COLOR DETAIL
N.T.S.
WATER MAIN
M.J. x FLG. VALVE w/ ANCHOR FITTINGS
90° ANCHOR FITTING
M.J. x FLG. TEE
M.J. HYDRANT
M.J. TEE
ANCHOR NIPPLES (TYPICAL)
90° ANCHOR FITTING
MAX. 4' LENGTH FOR ANCHOR COUPLING.
NOTE:
1. ALL FIRE HYDRANTS MUST BE ANCHORED TO MAIN BY USE OF ANCHOR FITTINGS.
2. ANCHOR TEES ALLOWED.
FIRE HYDRANT INSTALLATION
N.T.S.
FIRE LANE EASEMENT
FIRE HYDRANT OR METER BOX
6"ø CONCRETE FILLED STEEL PIPE
PIPE BOLLARD PROTECTION DETAIL
N.T.S.
NOTES:
1. FOR USE WHERE CURBS ARE NOT POSSIBLE OR AS SPECIFIED BY THE TOWN ENGINEER.
2. FIRE HYDRANTS SHALL BE 35' CLEAR OF ALL BUILDINGS.
3. GUARD POSTS SHALL BE 6 L.F. OF 6" DIA. STEEL PIPE (3' ABOVE & BELOW GROUND LEVEL). POST SHALL BE ENCASED IN 16" DIA. CONC. PIER TO A DEPTH OF 12" BELOW POST BOTTOM. REINF. CONC. PIER WITH 2 NO. 6 BARS (12' LONG) THRU POST INTO PIER. POST ABOVE GROUND LEVEL SHALL BE PAINTED WITH TWO (2) COATS OF ALUMINUM PAINT.
5" STORZ F.D.C.
4" 90° BEND
4" 45° BEND
PAINT RED ENAMEL
CONCRETE FILLED STEEL PIPE BOLLARDS, PAINTED SAFETY YELLOW
CONCRETE PAD 36" SQUARE SHALL BE POURED AROUND ALL FDC CONNECTIONS. 3,500 P.S.I. CONCRETE, 6" THICK, FOUR NO. 3 BARS.
CONCRETE BOLLARD FOUNDATION
REMOTE FIRE DEPARTMENT CONNECTION (F.D.C.) DETAIL FOR "STORZ" CONNECTION
N.T.S.
F.D.C. NOTES:
1. ALL F.D.C.'S SHALL BE REMOTE FROM THE BUILDING AND PLACED ADJACENT TO THE FIRE LANE.
2. F.D.C.'S SHALL BE LOCATED AT A MAXIMUM OF 100-FEET FROM AN ACCESSIBLE FIRE HYDRANT.
3. F.D.C.'S SHALL NOT BE PLACED WHERE THEY MAY BECOME OBSTRUCTED BY PARKING SPACES, LANDSCAPING, OR BUILDING COMPONENTS.
4. F.D.C. PIPING SHALL BE 4" WITH 5" STORZ CONNECTIONS.
5. F.D.C.'S SERVING MORE THAN 500 GALLONS PER MINUTE SHALL BE PROVIDED WITH ONE 5" STORZ CONNECTION AND ONE 2-2.5 SIAMESE CONNECTION.
6. REFERENCE FIRE MARSHAL'S CONTRACTOR GUIDE FOR INFORMATION ON REQUIRED SIGNAGE
PROVIDE SANITARY SEWER CLEANOUT AT ROW LINE
METER BOX (TYP.)
SEE WATER LINE AT MUET DETAIL
2' BACK OF CURB TYPICAL (3' ON 9.5' PARKWAY)
LOT LINE
C.L. LOT
PROP. WATER
4" SAN. SWR. SERVICE (TYP.)
PROP. STM. SWR.
1" WATER SERVICE (TYP.)
4' BACK OF CURB TYPICAL (3' ON 9.5' PARKWAY)
BACK OF CURB
PROP. SAN. SWR.
FUTURE SIDEWALK
2' TYPICAL
EXTEND SANITARY SEWER LATERAL 10' INSIDE PROPERTY LINE AT A DEPTH OF 5'
TYPICAL LOT SERVICE DETAIL
N.T.S.
GROUND LINE
WATER METER AND METER BOX
REMOVE AND REPLACE EXISTING ROADWAY PAVEMENT (SEE WATER MAIN BACKFILL DETAIL)
DOUBLE STRAP BRONZE TAPPING SADDLE
CORPORATION STOP
1" SDR 9 POLY PIPE (OR AS SHOWN ON PLANS)
1" CURB STOP
45°
ENCASE SERVICE WITH 2" SCH 40 PVC PIPE
WATER MAIN
SERVICE UNDERNEATH PAVEMENT
ROADWAY
SERVICE OUTSIDE OF PAVEMENT
WATER SERVICE NOTES:
A. WATER SERVICES SHALL NOT BE CONNECTED TO FIRE HYDRANT LINES.
B. ALL MATERIALS SHALL CONFORM TO THE STANDARD SPECIFICATIONS.
C. METER BOX SIZES:
– 5/8", 3/4" AND 1" SHALL BE DFW PLASTICS MODEL DFW-1814F-1BA. (18X14 PIT-O RING W/ BLACK BRASS LOCK AMR LID)
– 1-1/2" AND 2" SHALL BE DFW PLASTICS MODEL DFW-2418F-1BA. (24X18 PIT-O RING W/ 20" BLACK BRASS LOCK AMR LID)
D. METER BOX SHALL BE LOCATED OUT OF ALL FLATWORK, SIDEWALKS AND APPROACHES.
E. BACKFLOW PREVENTER IS REQUIRED ON RESIDENTIAL SIDE OF METER.
F. WATER SERVICE SHALL BE REPLACED FROM MAIN TO EXISTING WATER METER. SERVICE LINE BACKFILL SHALL BE IDENTICAL TO WATER MAIN.
G. REFER TO WATER MAIN BACKFILL DETAIL FOR SERVICE CONNECTIONS LOCATED BENEATH PAVEMENT.
H. ALL POLY SERVICE PIPE SHALL BE BLACK IN COLOR.
WATER METER INSTALLATION NOTES:
1. ALL TAPS SHALL BE MADE AT A 45° ANGLE TO THE CENTERLINE OF THE PIPE.
2. THE CONTRACTOR SHALL SET THE METER BOX IN ALL CASES.
3. THE METER BOX SHALL BE SET WITHIN THE RIGHT-OF-WAY OR A DEDICATED WATER EASEMENT. IN ALL CASES THE METER BOX SHALL BE PROTECTED FROM VEHICULAR TRAFFIC.
4. WATER METER BOX SHALL BE PROTECTED BY A 6" CURB OR GUARD POSTS WHEN PLACED IN A PAVED AREA, WHICH REQUIRES SPECIFIC APPROVAL BY THE TOWN ENGINEER OR HIS/HER DESIGNEE.
5. WATER SERVICES SHALL BE EMBEDDED IN SAND FROM CORPORATION STOP TO CURB STOP.
6. ALL BRASS PRODUCTS THAT COME INTO CONTACT WITH POTABLE WATER MUST MEET NEW "LEAD FREE" STANDARDS AS DEFINED UNDER PUBLIC LAW 111-380.
7. CONTRACTOR SHALL VERIFY METER ASSEMBLY FOR METER RELOCATIONS WITH TOWN STAFF PRIOR TO CONSTRUCTION.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
JOB NUMBER
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL WATER SYSTEM DETAILS 1 OF 4
LITTLE ELM
SHEET 15 OF 26
DECEMBER 2023


COVER (SEE NOTE 6)
VALVE BOX PAD
FOUR NO. 3 BARS
FINISHED GRADE
VALVE BOX WITH NECESSARY EXTENSIONS AND TOP COLLAR
SEE NOTE 2
3,500 P.S.I. CLASS B CONCRETE BASE BLOCK (POURED) LENGTH: 2'-0" MIN. WIDTH: NORMAL TRENCH
MIN. O.D. OF PIPE
WATER LINE
GATE VALVE VALVE SETTING & BOX
N.T.S.
WATER VALVE NOTES:
1. 2" TO 12" GATE VALVE SHALL BE RESILIENT SEATED WEDGE GATE VALVES ACCORDANCE WITH AWWA STANDARD C-509.
2. A VALVE EXTENSION STEM SHALL BE REQUIRED FOR ANY VALVE WHOSE OPERATING NUT IS LOCATED IN EXCESS OF 7 FEET 6 INCHES BELOW THE TOP OF VALVE BOX.
3. ALL VALVES SHALL BE MARKED WITH A SAW ON THE CURB OR PAVEMENT WITH "V". THE "V" SHALL POINT TO THE LOCATION OF THE VALVE AS FOLLOWS: IF THE VALVE IS IN THE PAVING, THE "V" SHALL BE MARKED UPRIGHT; IF THE VALVE IS OUTSIDE THE PAVING, THE "V" SHALL BE MARKED UPSIDE DOWN.
4. ALL VALVES STACK COMPONENTS SHALL BE THREE PIECE SCREW TYPE CAST IRON.
5. IN ORDER TO MAINTAIN A MANAGEABLE PARTS INVENTORY AND WORKING KNOWLEDGE OF VALVES, THE FOLLOWING VALVES ARE APPROVED: MUELLER AND WATEROUS – 150 P.S.I. TEST.
6. VALVE BOX COVERS FOR NON-POTABLE WATER LINES TO BE PAINTED WITH TWO (2) COATS OF TNEMEC SERIES 2H-1439F SAFETY PURPLE.
7. MAXIMUM ISOLATION VALVE SPACING
WATER MAINS 12" AND SMALLER: 500 FEET
WATER MAINS LARGER THAN 12": 1,000 FEET
SQUARE HEAD
CENTERLINE RING
1" SOLID STEEL
LOWER NUT SOCKET
VALVE EXTENSION
N.T.S.
COVER (SEE NOTE 6)
COLLAR
ADJUSTABLE EXTENSION
VALVE BOX
VALVE BOX WITH EXTENSION
N.T.S.
2" CONCRETE PAD 24" SQUARE SHALL BE POURED AROUND ALL VALVE BOXES NOT PLACED WITHIN CONCRETE PAVEMENT, 3,500 P.S.I. CONCRETE, 6 INCH THICK
FOUR NO. 3 BARS
CONCRETE PAD SHALL BE MARKED ON THE SIDE OF THE PAD WITH THE INCOMING WATER LINE WITH A "X", WHERE "X" IS THE SIZE OF THE WATER LINE
VALVE BOX PAD PLAN
N.T.S.
2 7/8"x 1/2" DEEP RECESS FOR ENGRAVING W/ KNOCKOUT FOR AMR (OPTIONAL)
12 5/8"ø
LITTLE ELM LOGO MOLDED IN LID
1 13/16"
DFW LOCK
LID PLAN VIEW
LID SECTION
17 3/4"
CAST IRON RING (DFW18-RING)
11 3/4" OPENING
18"
14" OPENING
14"
3/8" WALL
CRUSH RESISTANT RIBBING (DFW1814F-BODY)
PIPE SLOT
SIDE VIEW
WATER METER BOX (DFW PLASTICS, INC.)
N.T.S.
NOTES:
1. WATER METER BOX BODY SHALL BE DFW PLASTICS MODEL NO. DFW1814F-1BA. BOX LID SHALL BE DFW PLASTICS MODEL NO. DFW18AMR-13A LE-LID. RING CONSTRUCTED OF ASTM A48 CLASS 35B GRAY CAST IRON. BODY CONSTRUCTED OF ULDPE AND LID CONSTRUCTED OF HDPE.
2. METER BOX DESIGNED TO WITHSTAND NON-DELIBERATE AND INCIDENTAL TRAFFIC. NOT RATED FOR USE IN ROADWAYS.
4 #3 BARS
COVER (SEE NOTE 6)
FINISHED GRADE
VALVE BOX PAD
8" PIPE O.D.
6"
BUTTERFLY VALVE
2" TYP.
VALVE OPERATOR WITH NECESSARY EXTENSIONS AND GROUND LEVEL POSITION INDICATOR
NO. 5 BARS @ 12" O.C.E.F.
NO. 3 BARS CAGE
30# FELT PAPER
NO. 4 BARS @6" O.C.
4-NO. 3 BARS
12"
3,500 P.S.I. CONCRETE
NO. 3 BARS @ 12" O.C.E.W.
6"
LENGTH AS REQUIRED BY SIZE OF VALVE
24"
12"
12"
24"
#5 BARS @ 12" O.C.E.F.
PIPE SUPPORT
6" (TYP.)
#3 BARS @ 12" O.C.
NOTES:
1. ALL OPERATING NUTS SHALL BE EXTENDED TO WITHIN 6" OF FINAL GRADE.
2. BUTTERFLY VALVE SHALL BE MANUFACTURED BY MUELLER OR ENGINEER-APPROVED EQUAL.
3. 6" BYPASS MAY BE REQUIRED BY TOWN UNIVERSALLY OR HIS/HER DESIGNEE ON SPILL SPECIFIC PROJECTS.
BUTTERFLY VALVE
N.T.S.
APPROX. FINISHED GRADE
VALVE BOX PAD
EXTEND 3" ABOVE GROUND
PRECAST 4' DIAMETER MANHOLE CORE SECTION
3" SCHEDULE 80 PVC PIPE
2" COMBINATION AIR AND VACUUM RELEASE VALVE MANUFACTURED BY APCO, CLA-VAL OR ENGINEER APPROVED EQUAL
2" SQUARE NUT GATE VALVE
VARIABLE
2" CORP. COCK
2" OUTLET
WATER LINE
SLOPE 1/8" PER FT.
WASHED GRAVEL
3" COPPER PIPE
VARIABLE
2" COMBINATION AIR AND VACUUM RELEASE VALVE
N.T.S.
OPTIONAL 2" DRILLED AMR HOLE W/ PLUG
LITTLE ELM LOGO MOLDED IN LID
KEYHOLE
PLAN VIEW
NOTES:
1. WATER METER BOX SHALL BE BASS & HAYS PATTERN NO. P34P-1401S. BOX LID SHALL BE BASS & HAYS PATTERN NUMBER 8H-3LIDP. RING CONSTRUCTED OF ASTM A48 CLASS 35B GRAY CAST IRON. ENCLOSURE AND LID CONSTRUCTED OF HIGH DENSITY POLYETHYLENE.
2. RING WEIGHT 12 LBS, COVER WEIGHT 4 LBS, ENCLOSURE WEIGHT 11 LBS. NOT RATED FOR USE IN ROADWAYS.
1 7/8"
12 1/2"
BRASS LATCH KEY LOCK & COIL SPRING
17 3/4"
12 13/16"
(4) 304SS #14 1 1/2" SLOTTED HEX HEAD SCREWS
(4) SCREW HOLES EVENLY SPACED
11 1/4" CLEAR OPENING
1/2" WALL
14 1/4"
5"
2 1/2"
18 1/4"
SECTION VIEW
8 1/4"
18 1/4"
SIDE VIEW
WATER METER BOX (BASS & HAYS FOUNDRY, INC.)
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
KHMG
JOB NUMBER:
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL WATER SYSTEM DETAILS 2 OF 4
LITTLE ELM
SHEET 16 OF 26
DECEMBER 2023


OUTSIDE DIAMETER OF PIPE PLUS 16" (MIN. WIDTH 24")
NATIVE MATERIAL COMPACTED IN 12" LIFTS TO 95% STD. PROCTOR.
DETECTABLE METALLIC TAPE, FOR CURVED PIPE ALIGNMENTS, PROVIDE TRACER WIRE ON TOP OF PIPE
SELECT OR GRANULAR MATERIAL COMPACTED TO 95% STD. PROCTOR.
STANDARD CRUSHED ROCK, FINE CRUSHED ROCK OR NATURAL GRAVEL.
1/2 O.D.
1/8 O.D. – 6" MIN.
MIN. STD P.V.C. WATER
N.T.S.
CLASS F1 EMBEDMENT
6" MIN.
1/6 O.D.
MIN. STD. DUCTILE IRON WATER
MIN. STD. R.C.C.P. WATER
CLASS F3 EMBEDMENT
NATIVE MATERIAL COMPACTED IN 12" LIFTS TO A MINIMUM OF 95% STD. PROCTOR. CLAY SOILS SHALL BE MOISTURE CONDITIONED TO A MINIMUM OF 3% ABOVE OPTIMUM MOISTURE CONTENT.
3000 P.S.I. CONCRETE
CONC. BLOCK SUPPORT
1/4 O.D. – 6" MIN.
CONCRETE ENCASEMENT
CLASS F4 EMBEDMENT
MASTER METER OCTAVE NEPTUNE METRASONIC METER
BY-PASS
NAMEPLATE INDICATING: MFR: PHONE NO.: MODEL: DATE MANUFACTURED:
GALVANIZED SLEEVE W/ LEAK SEAL
ACCESS HATCHWAY (SEE SPECIFICATIONS)
PLAN VIEW
WATER MAIN
EXISTING PIPE
MIN. 6" CLEARANCE
3,000 P.S.I. CONCRETE ENCASEMENT
PROPOSED UTILITY INSTALLATION STORM DRAIN OR SANITARY SEWER
STANDARD EMBEDMENT
MINIMUM CLEARANCE NOTE:
1. WHERE A MINIMUM CLEARANCE OF 10'-0" (HORIZONTAL AND/OR VERTICAL) CANNOT BE OBTAINED, THEN THE POTABLE WATER MAIN SHALL BE CONCRETE ENCASED FOR 10'-0" EACH SIDE OF THE INTERSECTION OF THE INSTALLED UTILITY LINE.
2. CROSSING OF SANITARY SEWER SHALL BE IN ACCORDANCE WITH TNRCC RULES AND REGULATIONS.
CROSSING UTILITY PIPE SUPPORT
N.T.S.
GALVANIZED ANGLE PIPE SUPPORT (TYPICAL)
DUCTILE IRON PIPE
MJ GATE VALVE W/ RESTRAINED JOINTS
12"x12" SUMP WITH CAST IRON GRATE
MIN. 6" GRAVEL BED (OR DRAINED AS SPECIFIED)
ELEVATION
PIPE AND FITTINGS SHALL BE DUCTILE IRON
SPECIFICATIONS:
CONCRETE: CLASS 'A' CONCRETE WITH DESIGN STRENGTH OF 4500 PSI AT 28 DAYS. UNIT IS OF MONOLITHIC CONSTRUCTION AT FLOOR AND FIRST STAGE OF WALL WITH SECTIONAL RISER TO REQUIRED DEPTH.
REINFORCEMENT: GRADE 60 REINFORCED STEEL BAR CONFORMING TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.
HATCHWAY: 3' X 5' GALVANIZED STEEL DOUBLE LEAF SPRING ASSISTED HATCHWAY – TRAFFIC RATED W/ SLAM LOCK.
PRECAST VAULT SHALL BE FROM PARK EQUIPMENT COMPANY MATCHING DETAIL SHOWN OR APPROVED OTHER.
METER VAULT
N.T.S.
10'-10" (MIN.) (REF. NOTE 1)
9'-10" (MIN.) (REF. NOTE 1)
2" AIR VACUUM/RELEASE VALVE
WATTSBOX ALUMINUM INSULATED ENCLOSURE
4'-10" (REF. NOTE 1)
12" MIN 30" MAX
MOISTURE CONDITIONED COMPACTED SUBGRADE
#5 BARS @ 6" O.C. EACH WAY
REDUCED PRESSURE ZONE ASSEMBLY FOR OUTDOOR INSTALLATION
CONCRETE THRUST BLOCKING (TYP)
NOTES:
1. EXACT SIZE OF BOX MAY VARY DEPENDING ON ACTUAL LENGTH OF RPZ BACKFLOW PREVENTER
2. AIR/VACUUM RELEASE ASSEMBLY SHALL BE AIR FLOW CONTROL ACCESSORIES, MODEL D-025, WITH NYLON BODY.
3. FIELD ROUTE DRAIN LINES FROM RPZ AND AIR RELEASE VALVE TO A COMMON DISCHARGE POINT.
BACKFLOW PREVENTER
N.T.S.
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL WATER SYSTEM DETAILS 3 OF 4
LITTLEELM
SHEET 17 OF 26
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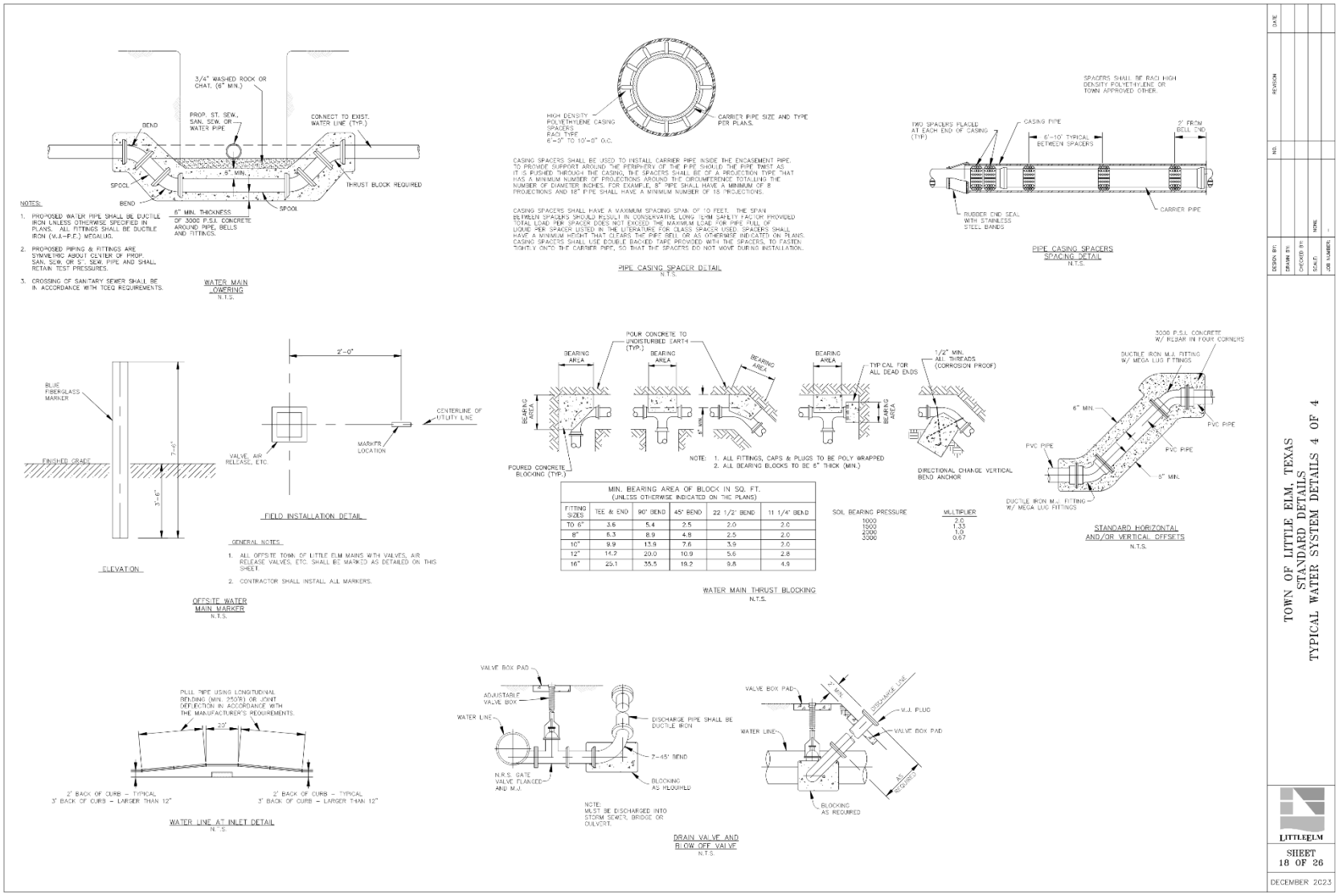
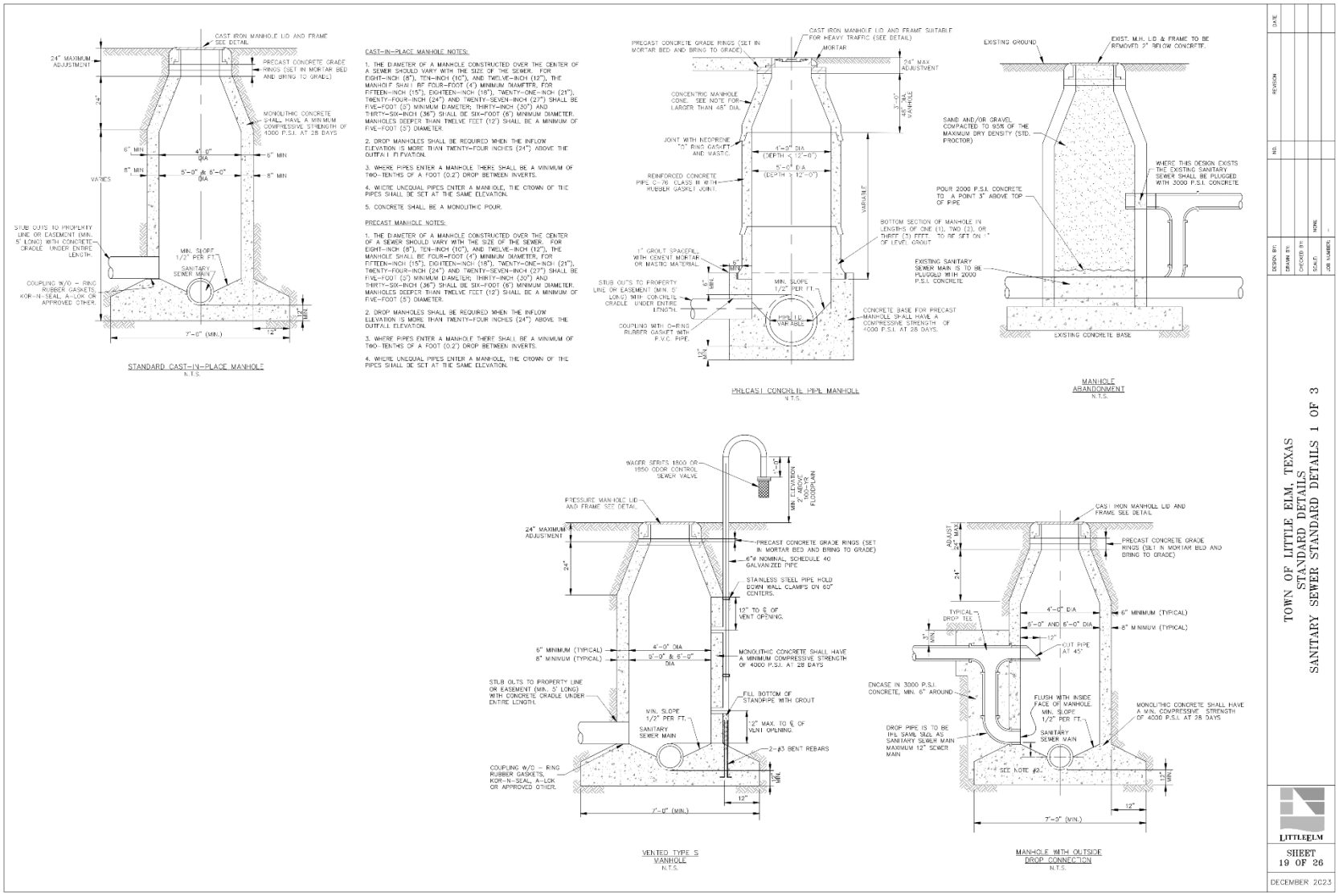

3/4" WASHED ROCK OR CHAT, (6" MIN.)
PROP. ST. SEW., SAN. SEW. OR WATER PIPE
CONNECT TO EXIST. WATER LINE (TYP.)
BEND
SPOOL
6" MIN.
THRUST BLOCK REQUIRED
BEND
SPOOL
6" MIN. THICKNESS OF 3000 P.S.I. CONCRETE AROUND PIPE, BELLS AND FITTINGS.
NOTES:
1. PROPOSED WATER PIPE SHALL BE DUCTILE IRON UNLESS OTHERWISE SPECIFIED IN PLANS. ALL FITTINGS SHALL BE DUCTILE IRON (M.J.-P.E.) MEGALUG.
2. PROPOSED PIPING & FITTINGS ARE SYMMETRIC ABOUT CENTER OF PROP. SAN. SEW. OR S". SEW. PIPE AND SHALL RETAIN TEST PRESSURES.
3. CROSSING OF SANITARY SEWER SHALL BE IN ACCORDANCE WITH TCEQ REQUIREMENTS.
WATER MAIN CWERING
N.T.S.
HIGH DENSITY POLYETHYLENE CASING SPACERS RADI TYPE 6'-0" TO 10'-0" O.C.
CARRIER PIPE SIZE AND TYPE PER PLANS.
CASING SPACERS SHALL BE USED TO INSTALL CARRIER PIPE INSIDE THE ENCASEMENT PIPE. TO PROVIDE SUPPORT AROUND THE PERIPHERY OF THE PIPE SHOULD THE PIPE TWIST AS IT IS PUSHED THROUGH THE CASING. THE SPACERS SHALL BE OF A PROJECTION TYPE THAT HAS A MINIMUM NUMBER OF PROJECTIONS AROUND THE CIRCUMFERENCE TOTALLING THE NUMBER OF DIAMETER INCHES. FOR EXAMPLE, 8" PIPE SHALL HAVE A MINIMUM OF 8 PROJECTIONS AND 18" PIPE SHALL HAVE A MINIMUM NUMBER OF 18 PROJECTIONS.
CASING SPACERS SHALL HAVE A MAXIMUM SPACING SPAN OF 10 FEET. THE SPAN BETWEEN SPACERS SHOULD RESULT IN CONSERVATIVE LONG TERM SAFETY FACTOR PROVIDED TOTAL LOAD PER SPACER DOES NOT EXCEED THE MAXIMUM LOAD FOR PIPE FULL OF LIQUID PER SPACER LISTED IN THE LITERATURE FOR CLASS SPACER USED. SPACERS SHALL HAVE A MINIMUM HEIGHT THAT CLEARS THE PIPE BELL OR AS OTHERWISE INDICATED ON PLANS. CASING SPACERS SHALL USE DOUBLE BACKED TAPE PROVIDED WITH THE SPACERS, TO FASTEN TIGHTLY ONTO THE CARRIER PIPE, SO THAT THE SPACERS DO NOT MOVE DURING INSTALLATION.
PIPE CASING SPACER DETAIL
N.T.S.
SPACERS SHALL BE RADI HIGH DENSITY POLYETHYLENE OR TOWN APPROVED OTHER.
TWO SPACERS PLACED AT EACH END OF CASING (TYP.)
CASING PIPE
6'-10" TYPICAL BETWEEN SPACERS
2' FROM BELL END
RUBBER END SEAL WITH STAINLESS STEEL BANDS
CARRIER PIPE
PIPE CASING SPACERS SPACING DETAIL
N.T.S.
BLUE FIBERGLASS MARKER
FINISHED GRADE
7'-6"
3'-6"
2'-0"
CENTERLINE OF UTILITY LINE
VALVE, AIR RELEASE, ETC.
MARKER LOCATION
FIELD INSTALLATION DETAIL
ELEVATION
GENERAL NOTES
1. ALL OFFSITE TOWN OF LITTLE ELM MAINS WITH VALVES, AIR RELEASE VALVES, ETC. SHALL BE MARKED AS DETAILED ON THIS SHEET.
2. CONTRACTOR SHALL INSTALL ALL MARKERS.
OFFSITE WATER MAIN MARKER
N.T.S.
POUR CONCRETE TO UNDISTURBED EARTH (TYP.)
BEARING AREA
POURED CONCRETE BLOCKING (TYP.)
4" MIN.
NOTE: 1. ALL FITTINGS, CAPS & PLUGS TO BE POLY WRAPPED
2. ALL BEARING BLOCKS TO BE 6" THICK (MIN.)
TYPICAL FOR ALL DEAD ENDS
1/2" MIN. ALL THREADS (CORROSION PROOF)
DIRECTIONAL CHANGE VERTICAL BEND ANCHOR
MIN. BEARING AREA OF BLOCK IN SQ. FT. (UNLESS OTHERWISE INDICATED ON THE PLANS)
FITTING SIZES | TEE & END | 90° BEND | 45° BEND | 22 1/2° BEND | 11 1/4° BEND
TO 6" | 3.6 | 5.4 | 2.5 | 2.0 | 2.0
8" | 6.3 | 8.9 | 4.8 | 2.5 | 2.0
10" | 9.9 | 13.9 | 7.6 | 3.9 | 2.0
12" | 14.2 | 20.0 | 10.9 | 5.6 | 2.8
16" | 25.1 | 35.5 | 19.2 | 9.8 | 4.9
SOIL BEARING PRESSURE | MULTIPLIER
1000 | 2.0
1500 | 1.33
2000 | 1.0
3000 | 0.67
WATER MAIN THRUST BLOCKING
N.T.S.
3000 P.S.I. CONCRETE W/ REBAR IN FOUR CORNERS
DUCTILE IRON M.J. FITTING W/ MEGA LUG FITTINGS
6" MIN.
PVC PIPE
PVC PIPE
PVC PIPE
8" MIN.
DUCTILE IRON M.J. FITTING W/ MEGA LUG FITTINGS
STANDARD HORIZONTAL AND/OR VERTICAL OFFSETS
N.T.S.
PULL PIPE USING LONGITUDINAL BENDING (MIN. 250'R) OR JOINT DEFLECTION IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS.
2'-0"
2' BACK OF CURB – TYPICAL
3' BACK OF CURB – LARGER THAN 12"
2' BACK OF CURB – TYPICAL
3' BACK OF CURB – LARGER THAN 12"
WATER LINE AT INLET DETAIL
N.T.S.
VALVE BOX PAD
ADJUSTABLE VALVE BOX
WATER LINE
DISCHARGE PIPE SHALL BE DUCTILE IRON
7-45° BEND
N.R.S. GATE VALVE FLANGED AND M.J.
BLOCKING AS REQUIRED
NOTE: MUST BE DISCHARGED INTO STORM SEWER, BRIDGE OR CULVERT.
VALVE BOX PAD
2' MIN.
DISCHARGE LINE
M.J. PLUG
VALVE BOX PAD
WATER LINE
45° (TYP.)
BLOCKING AS REQUIRED
DRAIN VALVE AND BLOW OFF VALVE
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
KDMG
JOB NUMBER
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
TYPICAL WATER SYSTEM DETAILS 4 OF 4
LITTLE ELM
SHEET 18 OF 26
DECEMBER 2023


CAST IRON MANHOLE LID AND FRAME SEE DETAIL
24" MAXIMUM ADJUSTMENT
PRECAST CONCRETE GRADE RINGS (SET IN MORTAR BED AND BRING TO GRADE)
MONOLITHIC CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS
4'-0" DIA
5'-0" & 6'-0" DIA
6" MIN
8" MIN
VARIES
STUB OUTS TO PROPERTY LINE OR EASEMENT (MIN. 5' LONG) WITH CONCRETE CRADLE UNDER ENTIRE LENGTH.
MIN. SLOPE 1/2" PER FT.
SANITARY SEWER MAIN
COUPLING W/O - RING RUBBER GASKETS, KOR-N-SEAL, A-LOK OR APPROVED OTHER.
7'-0" (MIN.)
STANDARD CAST-IN-PLACE MANHOLE
N.T.S.
CAST-IN-PLACE MANHOLE NOTES:
1. THE DIAMETER OF A MANHOLE CONSTRUCTED OVER THE CENTER OF A SEWER SHOULD VARY WITH THE SIZE OF THE SEWER. FOR EIGHT-INCH (8"), TEN-INCH (10"), AND TWELVE-INCH (12"), THE MANHOLE SHALL BE FOUR-FOOT (4') MINIMUM DIAMETER. FOR FIFTEEN-INCH (15"), EIGHTEEN-INCH (18"), TWENTY-ONE-INCH (21"), TWENTY-FOUR-INCH (24") AND TWENTY-SEVEN-INCH (27") SHALL BE FIVE-FOOT (5') MINIMUM DIAMETER; THIRTY-INCH (30") AND THIRTY-SIX-INCH (36") SHALL BE SIX-FOOT (6') MINIMUM DIAMETER. MANHOLES DEEPER THAN TWELVE FEET (12') SHALL BE A MINIMUM OF FIVE-FOOT (5') DIAMETER.
2. DROP MANHOLES SHALL BE REQUIRED WHEN THE INFLOW ELEVATION IS MORE THAN TWENTY-FOUR INCHES (24") ABOVE THE OUTFALL ELEVATION.
3. WHERE PIPES ENTER A MANHOLE THERE SHALL BE A MINIMUM OF TWO-TENTHS OF A FOOT (0.2') DROP BETWEEN INVERTS.
4. WHERE UNEQUAL PIPES ENTER A MANHOLE, THE CROWN OF THE PIPES SHALL BE SET AT THE SAME ELEVATION.
5. CONCRETE SHALL BE A MONOLITHIC POUR.
PRECAST MANHOLE NOTES:
1. THE DIAMETER OF A MANHOLE CONSTRUCTED OVER THE CENTER OF A SEWER SHOULD VARY WITH THE SIZE OF THE SEWER. FOR EIGHT-INCH (8"), TEN-INCH (10"), AND TWELVE-INCH (12"), THE MANHOLE SHALL BE FOUR-FOOT (4') MINIMUM DIAMETER. FOR FIFTEEN-INCH (15"), EIGHTEEN-INCH (18"), TWENTY-ONE-INCH (21"), TWENTY-FOUR-INCH (24") AND TWENTY-SEVEN-INCH (27") SHALL BE FIVE-FOOT (5') MINIMUM DIAMETER; THIRTY-INCH (30") AND THIRTY-SIX-INCH (36") SHALL BE SIX-FOOT (6') MINIMUM DIAMETER. MANHOLES DEEPER THAN TWELVE FEET (12') SHALL BE A MINIMUM OF FIVE-FOOT (5') DIAMETER.
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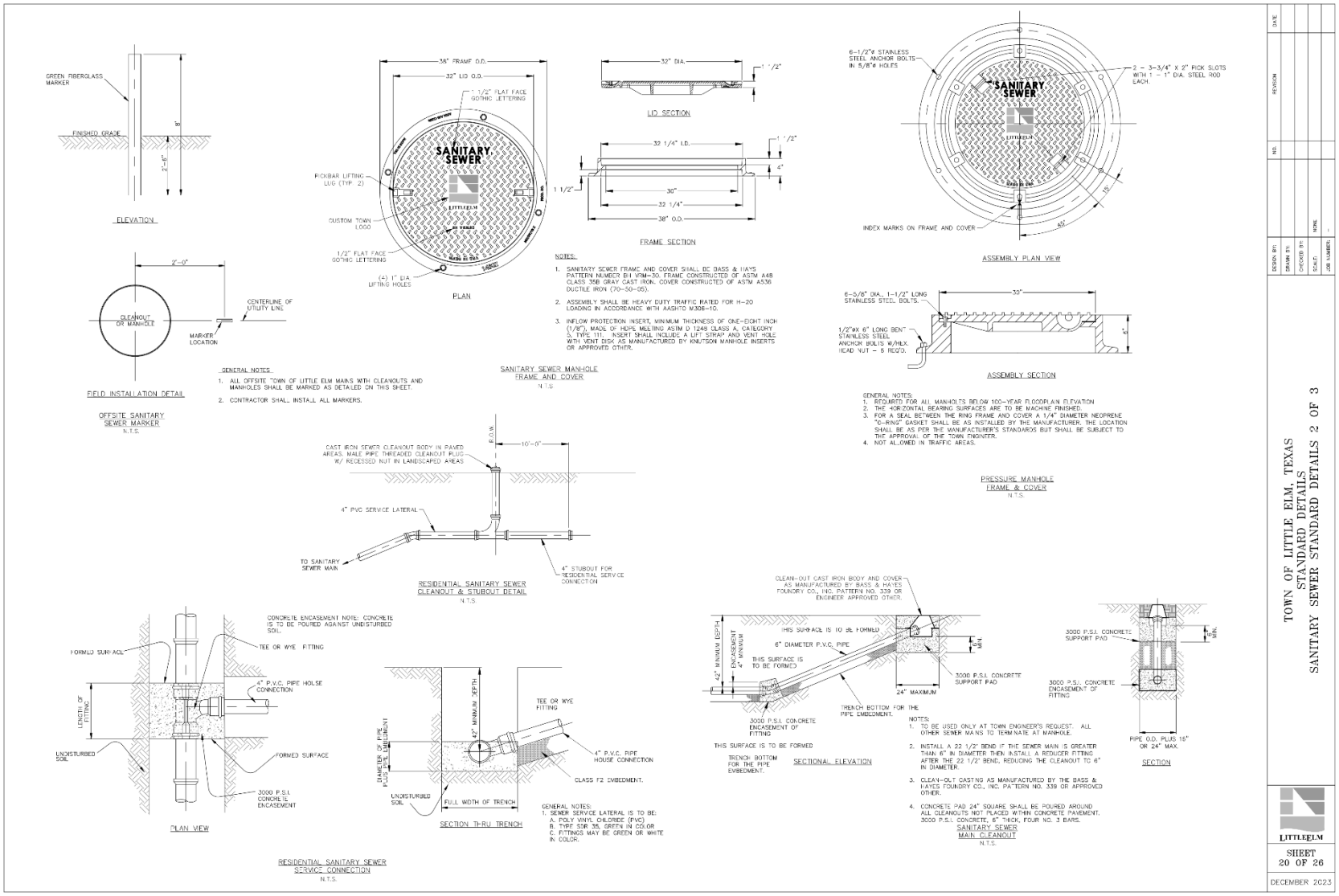
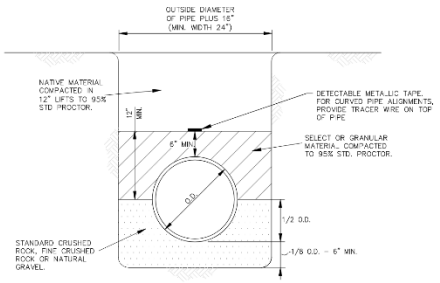
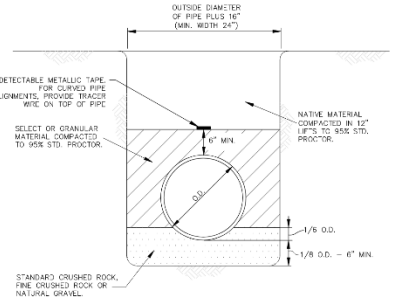
4. WHERE UNEQUAL PIPES ENTER A MANHOLE, THE CROWN OF THE PIPES SHALL BE SET AT THE SAME ELEVATION.
PRECAST CONCRETE GRADE RINGS (SET IN MORTAR BED AND BRING TO GRADE)
CAST IRON MANHOLE LID AND FRAME SUITABLE FOR HEAVY TRAFFIC (SEE DETAIL)
MORTAR
24" MAX ADJUSTMENT
CONCENTRIC MANHOLE CONE. SEE NOTE FOR LARGER THAN 48" DIA.
3'-0" 48" DIA MANHOLE
JOINT WITH NEOPRENE "O" RING GASKET AND MASTIC.
4'-0" DIA (DEPTH < 12'-0")
5'-0" DIA (DEPTH > 12'-0")
REINFORCED CONCRETE PIPE C-76 CLASS III WITH RUBBER GASKET JOINT.
VARIABLE
BOTTOM SECTION OF MANHOLE IN LENGTHS OF ONE (1), TWO (2), OR THREE (3) FEET. TO BE SET ON 1" OF LEVEL GROUT
1" GROUT SPACEFILL WITH CEMENT MORTAR OR MASTIC MATERIAL
6" MIN
STUB OUTS TO PROPERTY LINE OR EASEMENT (MIN. 5' LONG) WITH CONCRETE CRADLE UNDER ENTIRE LENGTH.
MIN. SLOPE 1/2" PER FT.
PIPE I.D. VARIABLE
COUPLING WITH O-RING RUBBER GASKET WITH P.V.C. PIPE.
CONCRETE BASE FOR PRECAST MANHOLE SHALL HAVE A COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS.
PRECAST CONCRETE PIPE MANHOLE
N.T.S.
EXISTING GROUND
EXIST. M.H. LID & FRAME TO BE REMOVED 2" BELOW CONCRETE.
SAND AND/OR GRAVEL COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY (STD. PROCTOR)
WHERE THIS DESIGN EXISTS THE EXISTING SANITARY SEWER SHALL BE PLUGGED WITH 3000 P.S.I. CONCRETE
POUR 2000 P.S.I. CONCRETE TO A POINT 3" ABOVE TOP OF PIPE
EXISTING SANITARY SEWER MAIN IS TO BE PLUGGED WITH 2000 P.S.I. CONCRETE
EXISTING CONCRETE BASE
MANHOLE ABANDONMENT
N.T.S.
WADER SERIES 1800 OR 1950 ODOR CONTROL SEWER VALVE
MIN. ELEVATION 2' ABOVE 100 YR FLOODPLAIN
PRESSURE MANHOLE LID AND FRAME SEE DETAIL
24" MAXIMUM ADJUSTMENT
PRECAST CONCRETE GRADE RINGS (SET IN MORTAR BED AND BRING TO GRADE)
6"ø NOMINAL, SCHEDULE 40 GALVANIZED PIPE
STAINLESS STEEL PIPE HOLD DOWN WALL CLAMPS ON 60" CENTERS.
12" TO 6" OF VENT OPENING.
6" MINIMUM (TYPICAL)
8" MINIMUM (TYPICAL)
4'-0" DIA
5'-0" & 6'-0" DIA
MONOLITHIC CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS
STUB OUTS TO PROPERTY LINE OR EASEMENT (MIN. 5' LONG) WITH CONCRETE CRADLE UNDER ENTIRE LENGTH.
FILL BOTTOM OF STANDPIPE WITH GROUT
MIN. SLOPE 1/2" PER FT.
SANITARY SEWER MAIN
12" MAX. TO 6" OF VENT OPENING.
2-#3 BENT REBARS
COUPLING W/O - RING RUBBER GASKETS, KOR-N-SEAL, A-LOK OR APPROVED OTHER.
12" MIN
12"
7'-0" (MIN.)
VENTED TYPE S MANHOLE
N.T.S.
CAST IRON MANHOLE LID AND FRAME SEE DETAIL
ADJUST 24" MAX
PRECAST CONCRETE GRADE RINGS (SET IN MORTAR BED AND BRING TO GRADE)
TYPICAL DROP TEE
4'-0" DIA
5'-0" AND 6'-0" DIA
6" MINIMUM (TYPICAL)
8" MINIMUM (TYPICAL)
12"
CUT PIPE AT 45°
ENCASE IN 3000 P.S.I. CONCRETE, MIN. 6" AROUND
FLUSH WITH INSIDE FACE OF MANHOLE
MONOLITHIC CONCRETE SHALL HAVE A MIN. COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS
MIN. SLOPE 1/2" PER FT.
DROP PIPE IS TO BE THE SAME SIZE AS SANITARY SEWER MAIN MAXIMUM 12" SEWER MAIN
SANITARY SEWER MAIN
SEE NOTE #2
12" MIN
12"
7'-0" (MIN.)
MANHOLE WITH OUTSIDE DROP CONNECTION
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
NONE
JOB NUMBER
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
SANITARY SEWER STANDARD DETAILS 1 OF 3
LITTLE ELM
SHEET 19 OF 26
DECEMBER 2023

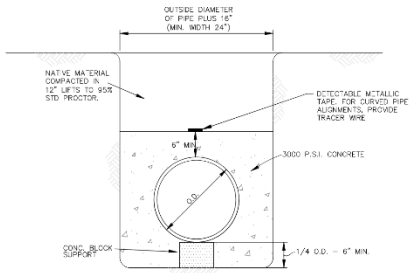

GREEN FIBERGLASS MARKER
FINISHED GRADE
ELEVATION
OFFSITE SANITARY SEWER MARKER
N.T.S.
36" FRAME O.D.
32" LID O.D.
1 1/2" FLAT FACE GOTHIC LETTERING
SANITARY SEWER
PICKBAR LIFTING LUG (TYP. 2)
CUSTOM TOWN LOGO
1/2" FLAT FACE GOTHIC LETTERING
(4) 1" DIA LIFTING HOLES
PLAN
32" DIA.
1 1/2"
LID SECTION
32 1/4" I.D.
30"
38" O.D.
4"
FRAME SECTION
NOTES:
1. SANITARY SEWER FRAME AND COVER SHALL BE BASS & HAYS PATTERN NUMBER BH VRM-30. FRAME CONSTRUCTED OF ASTM A48 CLASS 35B GRAY CAST IRON. COVER CONSTRUCTED OF ASTM A536 DUCTILE IRON (70-50-05).
2. ASSEMBLY SHALL BE HEAVY DUTY TRAFFIC RATED FOR H-20 LOADING IN ACCORDANCE WITH AASHTO M306-10.
3. INFLOW PROTECTION INSERT, MINIMUM THICKNESS OF ONE-EIGHT INCH (1/8"), MADE OF HDPE MELTING ASTM D 1248 CLASS A, CATEGORY 5, TYPE III. INSERT SHALL INCLUDE A LIFT STRAP AND VENT HOLE WITH VENT DISK AS MANUFACTURED BY KNUTSON MANHOLE INSERTS OR APPROVED OTHER.
SANITARY SEWER MANHOLE FRAME AND COVER
N.T.S.
6-1/2"ø STAINLESS STEEL ANCHOR BOLTS IN 5/8"ø HOLES
2 - 3-3/4" X 2" PICK SLOTS WITH 1 - 1" DIA. STEEL ROD EACH.
INDEX MARKS ON FRAME AND COVER
ASSEMBLY PLAN VIEW
6-5/8" DIA., 1-1/2" LONG STAINLESS STEEL BOLTS.
1/2"ØX 6" LONG BENT STAINLESS STEEL ANCHOR BOLTS W/HEX. HEAD NUT - 8 REQ'D.
30"
ASSEMBLY SECTION
GENERAL NOTES:
1. REQUIRED FOR ALL MANHOLES BELOW 100-YEAR FLOODPLAIN ELEVATION
2. THE HORIZONTAL BEARING SURFACES ARE TO BE MACHINE FINISHED.
3. FOR A SEAL BETWEEN THE RING FRAME AND COVER A 1/4" DIAMETER NEOPRENE "O-RING" GASKET SHALL BE AS INSTALLED BY THE MANUFACTURER. THE LOCATION SHALL BE AS PER THE MANUFACTURER'S STANDARDS BUT SHALL BE SUBJECT TO THE APPROVAL OF THE TOWN ENGINEER.
4. NOT ALLOWED IN TRAFFIC AREAS.
PRESSURE MANHOLE FRAME & COVER
N.T.S.
CLEANOUT OR MANHOLE
CENTERLINE OF UTILITY LINE
MARKER LOCATION
FIELD INSTALLATION DETAIL
GENERAL NOTES:
1. ALL OFFSITE TOWN OF LITTLE ELM MAINS WITH CLEANOUTS AND MANHOLES SHALL BE MARKED AS DETAILED ON THIS SHEET.
2. CONTRACTOR SHALL INSTALL ALL MARKERS.
CAST IRON SEWER CLEANOUT BODY IN PAVED AREAS. MALE PIPE THREADED CLEANOUT PLUG W/ RECESSED NUT IN LANDSCAPED AREAS
R.O.W.
10'-0"
4" PVC SERVICE LATERAL
TO SANITARY SEWER MAIN
4" STUBOUT FOR RESIDENTIAL SERVICE CONNECTION
RESIDENTIAL SANITARY SEWER CLEANOUT & STUBOUT DETAIL
N.T.S.
CONCRETE ENCASEMENT NOTE: CONCRETE IS TO BE POURED AGAINST UNDISTURBED SOIL.
FORMED SURFACE
TEE OR WYE FITTING
4" P.V.C. PIPE HOUSE CONNECTION
LENGTH OF FITTING
UNDISTURBED SOIL
FORMED SURFACE
3000 P.S.I. CONCRETE ENCASEMENT
PLAN VIEW
TEE OR WYE FITTING
42" MINIMUM DEPTH
DIAMETER OF PIPE PLUS 6" EMBEDMENT
4" P.V.C. PIPE HOUSE CONNECTION
CLASS F2 EMBEDMENT.
UNDISTURBED SOIL
FULL WIDTH OF TRENCH
SECTION THRU TRENCH
GENERAL NOTES:
1. SEWER SERVICE LATERAL IS TO BE:
A. POLY VINYL CHLORIDE (PVC)
B. TYPE SDR 35, GREEN IN COLOR
C. FITTINGS MAY BE GREEN OR WHITE IN COLOR.
RESIDENTIAL SANITARY SEWER SERVICE CONNECTION
N.T.S.
CLEAN-OUT CAST IRON BODY AND COVER AS MANUFACTURED BY BASS & HAYES FOUNDRY CO., INC. PATTERN NO. 339 OR ENGINEER APPROVED OTHER.
42" MINIMUM DEPTH
ENCASEMENT MINIMUM
THIS SURFACE IS TO BE FORMED
6" DIAMETER P.V.C. PIPE
THIS SURFACE IS TO BE FORMED
3000 P.S.I. CONCRETE SUPPORT PAD
24" MAXIMUM
TRENCH BOTTOM FOR THE PIPE EMBEDMENT.
3000 P.S.I. CONCRETE ENCASEMENT OF FITTING
THIS SURFACE IS TO BE FORMED
TRENCH BOTTOM FOR THE PIPE EMBEDMENT.
SECTIONAL ELEVATION
NOTES:
1. TO BE USED ONLY AT TOWN ENGINEER'S REQUEST. ALL OTHER SEWER MAINS TO TERMINATE AT MANHOLE.
2. INSTALL A 22 1/2° BEND IF THE SEWER MAIN IS GREATER THAN 8" IN DIAMETER THEN INSTALL A REDUCER FITTING AFTER THE 22 1/2° BEND, REDUCING THE CLEANOUT TO 6" IN DIAMETER.
3. CLEAN-OUT CASTING AS MANUFACTURED BY THE BASS & HAYES FOUNDRY CO., INC. PATTERN NO. 339 OR APPROVED OTHER.
4. CONCRETE PAD 24" SQUARE SHALL BE POURED AROUND ALL CLEANOUTS NOT PLACED WITHIN CONCRETE PAVEMENT. 3000 P.S.I. CONCRETE, 6" THICK, FOUR NO. 3 BARS.
SANITARY SEWER MAIN CLEANOUT
N.T.S.
3000 P.S.I. CONCRETE SUPPORT PAD
6" MIN.
3000 P.S.I. CONCRETE ENCASEMENT OF FITTING
PIPE O.D. PLUS 16" OR 24" MAX.
SECTION
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
JOB NUMBER:
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
SANITARY SEWER STANDARD DETAILS 2 OF 3
LITTLEELM
SHEET
20 OF 26
DECEMBER 2023



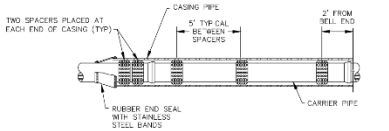
MIN. STD. P.V.C. SEWER
CLASS 1F2 EMBEDMENT
N.T.S.



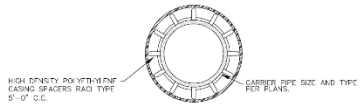
MIN. STD. DUCTILE IRON SEWER
CLASS 1F3 EMBEDMENT
N.T.S.



CONCRETE ENCASEMENT
CLASS 1F4 EMBEDMENT
N.T.S.



PIPE CASING SPACER
SPACING DETAILS

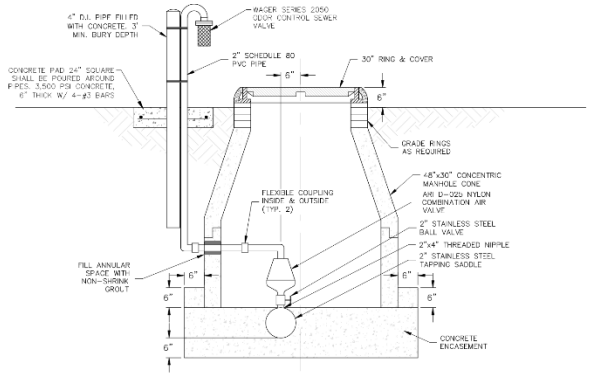


NOTES:

CASING SPACERS SHALL BE USED TO INSTALL CARRIER PIPE INSIDE THE ENCASEMENT PIPE. TO PROVIDE SUPPORT AROUND THE PERIMETRY OF THE PIPE SHOULD THE PIPE TWIST AS IT IS PUSHED THROUGH THE CASING. THE SPACERS SHALL BE OF A PROJECTION TYPE THAT HAS A MINIMUM NUMBER OF PROJECTIONS AROUND THE CIRCUMFERENCE TOTALLING THE NUMBER OF DIAMETER INCHES. FOR EXAMPLE, 8" PIPE SHALL HAVE A MINIMUM OF 8 PROJECTIONS AND 18" PIPE SHALL HAVE A MINIMUM NUMBER OF 18 PROJECTIONS.

CASING SPACERS SHALL HAVE A MAXIMUM SPACING SPAN OF 5 FEET. THE SPAN BETWEEN SPACERS SHOULD RESULT IN CONSERVATIVE LONG TERM SAFETY FACTOR PROVIDED TOTAL LOAD PER SPACER DOES NOT EXCEED THE MAXIMUM LOAD FOR PIPE FULL OF LIQUID PER SPACER LISTED IN THE LITERATURE FOR CLASS SPACER USED. SPACERS SHALL HAVE A MINIMUM HEIGHT THAT CLEARS THE PIPE BELL OR AS OTHERWISE INDICATED ON PLANS. CASING SPACERS SHALL USE DOUBLE BACKED TAPE PROVIDED WITH THE SPACERS, TO FASTEN TOP-TLY ONTO THE CARRIER PIPE, SO THAT THE SPACERS DO NOT MOVE DURING INSTALLATION.

PIPE CASING SPACER DETAIL
N.T.S.



2" AIR RELEASE VALVE
FOR FORCE MAIN
N.T.S.

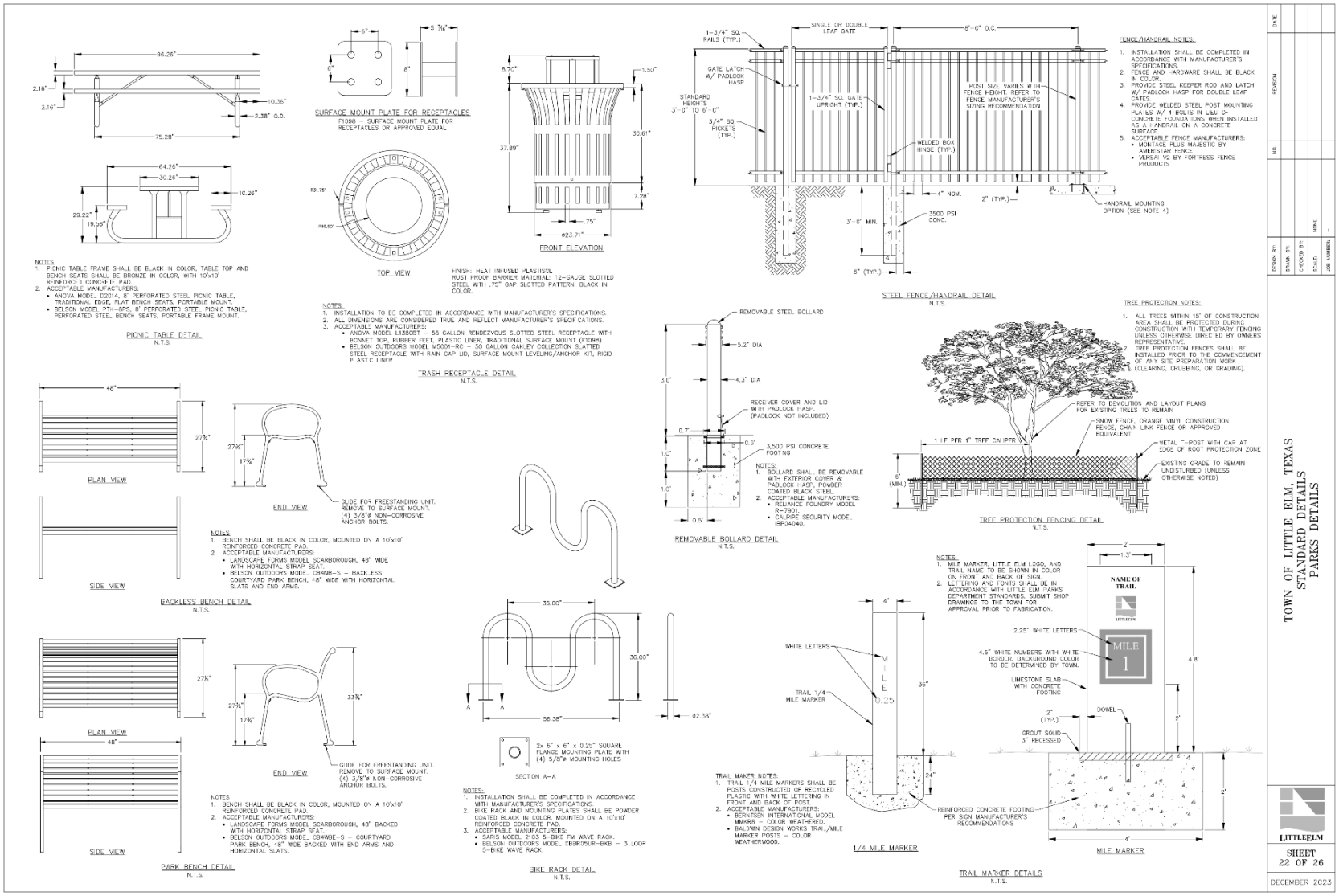
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
NONE
JOB NUMBER:
-

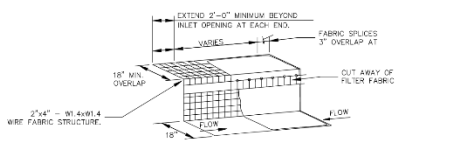
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
SANITARY SEWER STANDARD DETAILS 3 OF 3

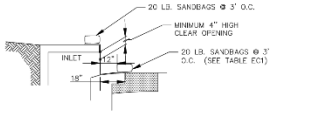
LITTLEELM

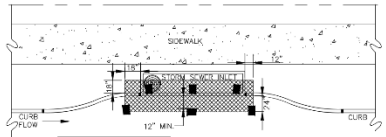
SHEET
21 OF 26

DECEMBER 2023


PICNIC TABLE DETAIL
N.T.S.
SURFACE MOUNT PLATE FOR RECEPTACLES
TOP VIEW
FRONT ELEVATION
TRASH RECEPTACLE DETAIL
N.T.S.
STEEL FENCE/HANDRAIL DETAIL
N.T.S.
FENCE/HANDRAIL NOTES:
TREE PROTECTION NOTES:
TREE PROTECTION FENCING DETAIL
N.T.S.
REMOVABLE BOLLARD DETAIL
N.T.S.
PLAN VIEW
SIDE VIEW
END VIEW
BACKLESS BENCH DETAIL
N.T.S.
PARK BENCH DETAIL
N.T.S.
SECTION A-A
BIKE RACK DETAIL
N.T.S.
1/4 MILE MARKER
MILE MARKER
TRAIL MARKER DETAILS
N.T.S.
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
PARKS DETAILS
LITTLE ELM
SHEET
22 OF 26
DECEMBER 2023



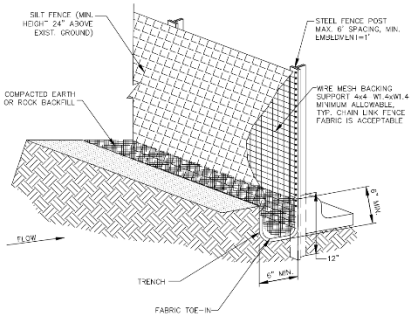




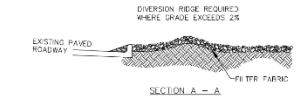
INLET OPENING	MINIMUM NUMBER OF SAND BAGS	
	TOP	FRONT
5'	2	3
10'	3	3
15'	3	4
20'	4	4

SAND BAGS SHALL BE EVENLY SPACED ALONG TOP AND ALONG THE FRONT OF INLET.

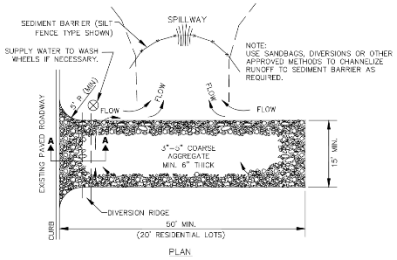
CURB INLET ON GRADE PROTECTION DETAIL
N.T.S.



SILT FENCE ISOMETRIC PLAN VIEW
N.T.S.

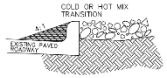


SECTION A – A



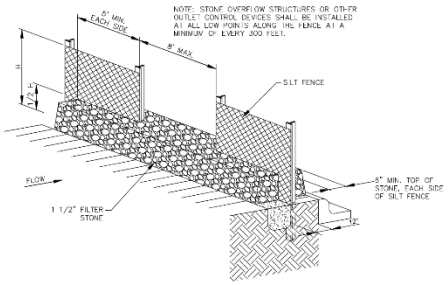
PLAN

WHEN SEDIMENT HAS SUBSTANTIALLY CLOGGED THE VOID AREA BETWEEN THE ROCKS, THE AGGREGATE MAT MUST BE WASHED DOWN OR REPLACED. PERIODIC RE-GRADING AND TOP DRESSING WITH ADDITIONAL STONE MUST BE DONE TO KEEP THE EFFICIENCY OF THE ENTRANCE FROM DIMINISHING.

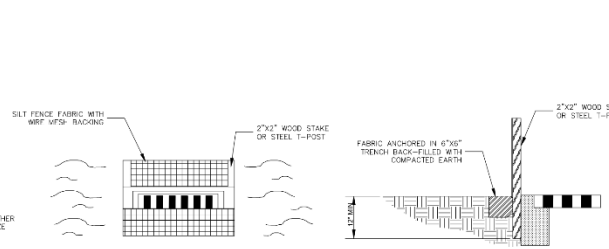


TRANSITION

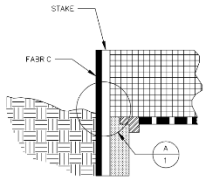
TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIST
N.T.S.



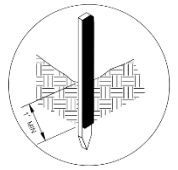
SILT FENCE STONE OVERFLOW STRUCTURE
N.T.S.



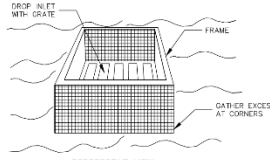
I. STANDARD FILTER BARRIER INSTALLATION
N.T.S.



ELEVATION OF STAKE AND FABRIC ORIENTATION

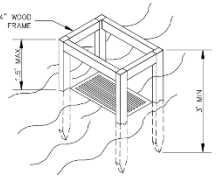


DETAIL A



PERSPECTIVE VIEW

SPECIFIC APPLICATION
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVER-LAND FLOWS (NOT TO EXCEED 1 C.F.S.) ARE TYPICAL. THIS METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS SUCH AS IN STREETS OR HIGHWAY MEDIANS



PERSPECTIVE VIEW

II. ALTERNATE FILTER BARRIER INSTALLATION
N.T.S.

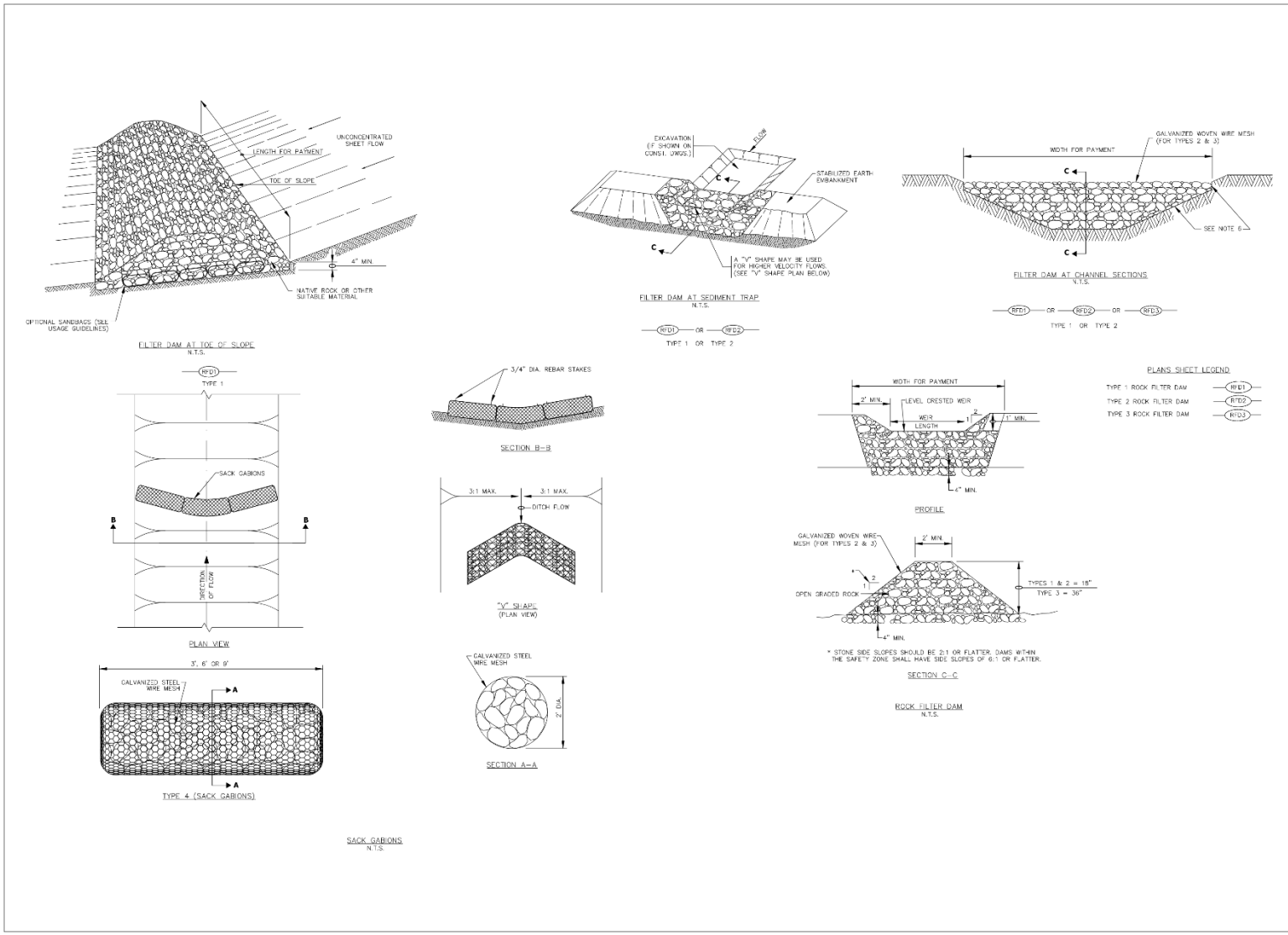
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE: NONE
JOB NUMBER: -

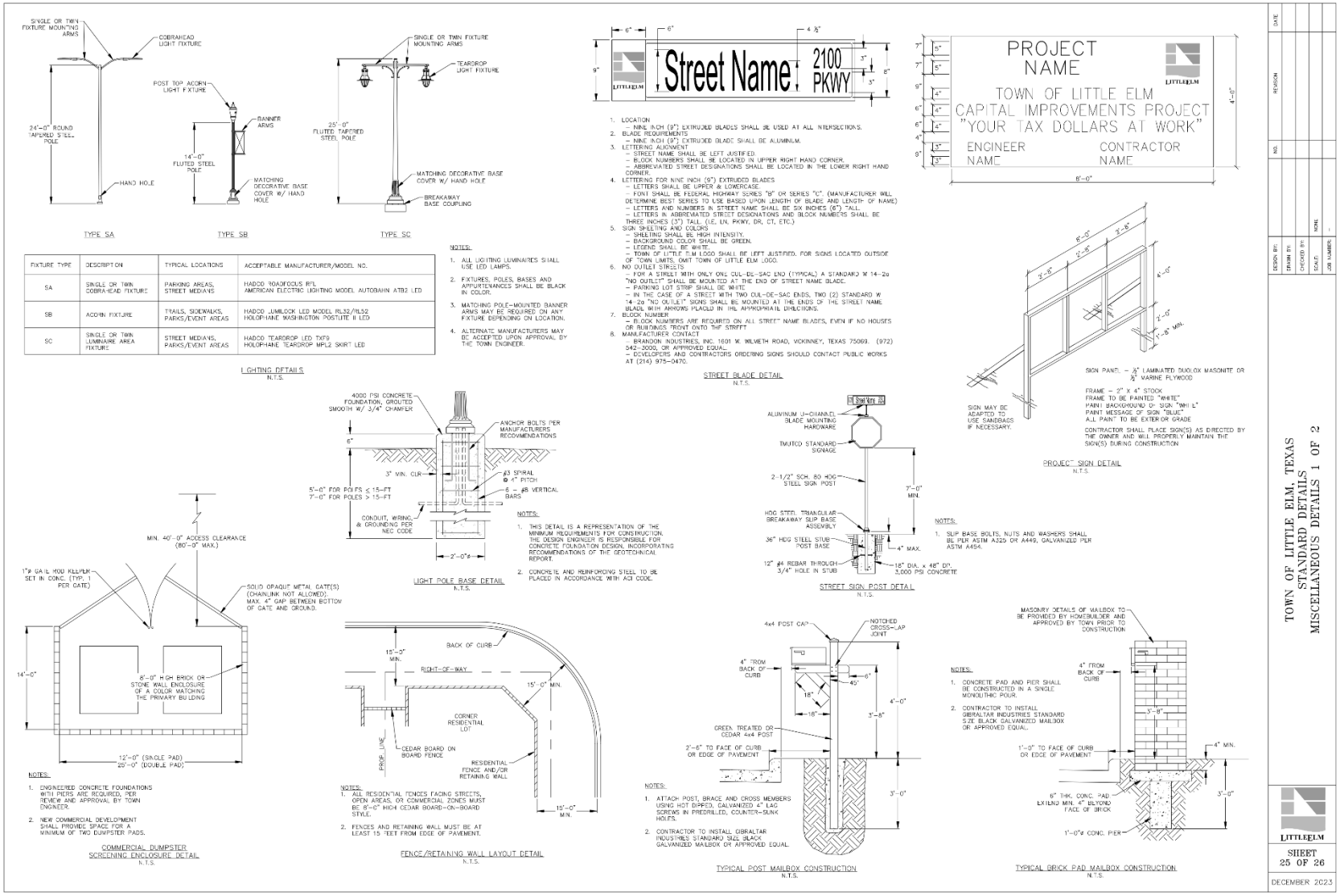
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
EROSION CONTROL DETAILS 1 OF 2

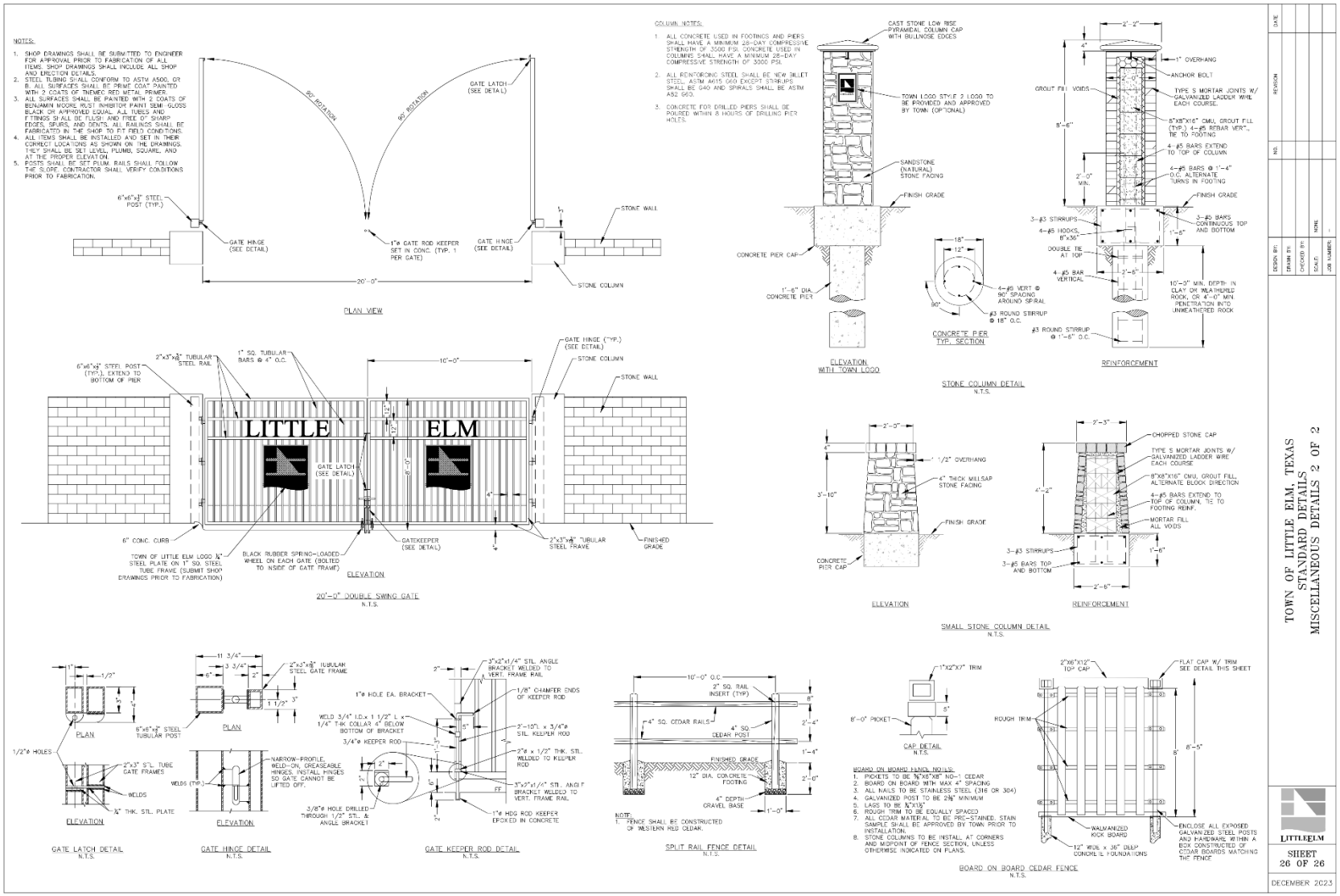
LITTLE ELM

SHEET
23 OF 26

DECEMBER 2023


UNCONCENTRATED SHEET FLOW
LENGTH FOR PAYMENT
TOE OF SLOPE
4" MIN.
NATIVE ROCK OR OTHER SUITABLE MATERIAL
OPTIONAL SANDBAGS (SEE USAGE GUIDELINES)
FILTER DAM AT TOE OF SLOPE
N.T.S.
EXCAVATION (IF SHOWN ON CONST. DWGS.)
SLOPE
STABILIZED EARTH EMBANKMENT
A "V" SHAPE MAY BE USED FOR HIGHER VELOCITY FLOWS. (SEE "V" SHAPE PLAN BELOW)
FILTER DAM AT SEDIMENT TRAP
N.T.S.
RFD1 OR RFD2
TYPE 1 OR TYPE 2
WIDTH FOR PAYMENT
GALVANIZED WOVEN WIRE MESH (FOR TYPES 2 & 3)
SEE NOTE 6
FILTER DAM AT CHANNEL SECTIONS
N.T.S.
RFD1 OR RFD2 OR RFD3
TYPE 1 OR TYPE 2
RFD1
TYPE 1
SACK GABIONS
DIRECTION OF FLOW
PLAN VIEW
3/4" DIA. REBAR STAKES
SECTION B-B
3:1 MAX.
3:1 MAX.
DITCH FLOW
"V" SHAPE
(PLAN VIEW)
3', 6' OR 9'
GALVANIZED STEEL WIRE MESH
TYPE 4 (SACK GABIONS)
GALVANIZED STEEL WIRE MESH
2' DIA.
SECTION A-A
SACK GABIONS
N.T.S.
WIDTH FOR PAYMENT
2' MIN.
LEVEL CRESTED WEIR
WEIR LENGTH
1' MIN.
4" MIN.
PROFILE
GALVANIZED WOVEN WIRE MESH (FOR TYPES 2 & 3)
2' MIN.
OPEN GRADED ROCK
TYPES 1 & 2 = 18"
TYPE 3 = 36"
4" MIN.
* STONE SIDE SLOPES SHOULD BE 2:1 OR FLATTER; DAMS WITHIN THE SAFETY ZONE SHALL HAVE SIDE SLOPES OF 6:1 OR FLATTER.
SECTION C-C
ROCK FILTER DAM
N.T.S.
PLANS SHEET LEGEND
TYPE 1 ROCK FILTER DAM RFD1
TYPE 2 ROCK FILTER DAM RFD2
TYPE 3 ROCK FILTER DAM RFD3
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
NONE
JOB NUMBER
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
EROSION CONTROL DETAILS 2 OF 2
LITTLE ELM
SHEET
24 OF 26
DECEMBER 2023


SINGLE OR TWIN FIXTURE MOUNTING ARMS
COBRAHEAD LIGHT FIXTURE
24'-0" ROUND TAPERED STEEL POLE
HAND HOLE
TYPE SA
POST TOP ACORN LIGHT FIXTURE
BANNER ARMS
14'-0" FLUTED STEEL POLE
MATCHING DECORATIVE BASE COVER W/ HAND HOLE
TYPE SB
SINGLE OR TWIN FIXTURE MOUNTING ARMS
TEARDROP LIGHT FIXTURE
25'-0" FLUTED TAPERED STEEL POLE
MATCHING DECORATIVE BASE COVER W/ HAND HOLE
BREAKAWAY BASE COUPLING
TYPE SC
FIXTURE TYPE | DESCRIPTION | TYPICAL LOCATIONS | ACCEPTABLE MANUFACTURER/MODEL NO.
SA | SINGLE OR TWIN COBRA-HEAD FIXTURE | PARKING AREAS, STREET MEDIANS | HADCO ROADFOCUS RFL AMERICAN ELECTRIC LIGHTING MODEL AUTOBAHN ATB2 LED
SB | ACORN FIXTURE | TRAILS, SIDEWALKS, PARKS/EVENT AREAS | HADCO JUMILOCK LED MODEL RLS2/RLS2 HOLOPHANE WASHINGTON POSTLITE II LED
SC | SINGLE OR TWIN LUMINAIRE AREA FIXTURE | STREET MEDIANS, PARKS/EVENT AREAS | HADCO TEARDROP LED TXF9 HOLOPHANE TEARDROP MPL2 SKIRT LED
NOTES:
1. ALL LIGHTING LUMINAIRES SHALL USE LED LAMPS.
2. FIXTURES, POLES, BASES AND APPURTENANCES SHALL BE BLACK IN COLOR.
3. MATCHING POLE-MOUNTED BANNER ARMS MAY BE REQUIRED ON ANY FIXTURE DEPENDING ON LOCATION.
4. ALTERNATE MANUFACTURERS MAY BE ACCEPTED UPON APPROVAL BY THE TOWN ENGINEER.
LIGHTING DETAILS
N.T.S.
6"
6"
4 ½"
9"
Street Name
2100
PKWY
3"
6"
3"
LITTLEELM
1. LOCATION
– NINE INCH (9") EXTRUDED BLADES SHALL BE USED AT ALL INTERSECTIONS.
2. BLADE REQUIREMENTS
– NINE INCH (9") EXTRUDED BLADE SHALL BE ALUMINUM.
3. LETTERING ALIGNMENT
– STREET NAME SHALL BE LEFT JUSTIFIED.
– BLOCK NUMBERS SHALL BE LOCATED IN UPPER RIGHT HAND CORNER.
– ABBREVIATED STREET DESIGNATIONS SHALL BE LOCATED IN THE LOWER RIGHT HAND CORNER.
4. LETTERING FOR NINE INCH (9") EXTRUDED BLADES
– LETTERS SHALL BE UPPER & LOWERCASE.
– FONT SHALL BE FEDERAL HIGHWAY SERIES "B" OR SERIES "C" (MANUFACTURER WILL DETERMINE BEST SERIES TO USE BASED UPON LENGTH OF BLADE AND LENGTH OF NAME)
– LETTERS AND NUMBERS IN STREET NAME SHALL BE SIX INCHES (6") TALL.
– LETTERS IN ABBREVIATED STREET DESIGNATIONS AND BLOCK NUMBERS SHALL BE THREE INCHES (3") TALL (I.E. LN, PKWY, DR, CT, ETC.)
5. SIGN SHEETING AND COLORS
– SHEETING SHALL BE HIGH INTENSITY.
– BACKGROUND COLOR SHALL BE GREEN.
– LEGEND SHALL BE WHITE.
– TOWN OF LITTLE ELM LOGO SHALL BE LEFT JUSTIFIED. FOR SIGNS LOCATED OUTSIDE OF TOWN LIMITS, OMIT TOWN OF LITTLE ELM LOGO.
6. NO OUTLET STREETS
– FOR A STREET WITH ONLY ONE CUL-DE-SAC END (TYPICAL) A STANDARD W 14-2a "NO OUTLET" SHALL BE MOUNTED AT THE END OF STREET NAME BLADE.
– PARKING LOT STRIP SHALL BE WHITE
– IN THE CASE OF A STREET WITH TWO CUL-DE-SAC ENDS, TWO (2) STANDARD W 14-2a "NO OUTLET" SIGNS SHALL BE MOUNTED AT THE ENDS OF THE STREET NAME BLADE WITH ARROWS PLACED IN THE APPROPRIATE DIRECTIONS.
7. BLOCK NUMBER
– BLOCK NUMBERS ARE REQUIRED ON ALL STREET NAME BLADES, EVEN IF NO HOUSES OR BUILDINGS FRONT ONTO THE STREET.
8. MANUFACTURER CONTACT
– BRANDON INDUSTRIES, INC. 1601 W. WILMETH ROAD, VICKINNEY, TEXAS 75069. (972) 542-3000, OR APPROVED EQUAL.
– DEVELOPERS AND CONTRACTORS ORDERING SIGNS SHOULD CONTACT PUBLIC WORKS AT (214) 975-0470.
STREET BLADE DETAIL
N.T.S.
PROJECT NAME
LITTLEELM
TOWN OF LITTLE ELM
CAPITAL IMPROVEMENTS PROJECT
"YOUR TAX DOLLARS AT WORK"
ENGINEER NAME
CONTRACTOR NAME
7"
5"
7"
5"
9"
4"
6"
4"
6"
4"
4"
3"
3"
9"
4'-0"
6'-0"
6'-0"
2'-6"
2'-6"
2'-6"
2'-0"
2'-0" MIN.
SIGN MAY BE ADAPTED TO USE SANDBAGS IF NECESSARY.
SIGN PANEL – ¾" LAMINATED DUOLOX MASONITE OR ½" MARINE PLYWOOD
FRAME – 2" X 4" STOCK
FRAME TO BE PAINTED "WHITE"
PAINT BACKGROUND OF SIGN "WHITE"
PAINT MESSAGE OF SIGN "BLUE"
ALL PAINT TO BE EXTERIOR GRADE
CONTRACTOR SHALL PLACE SIGN(S) AS DIRECTED BY THE OWNER AND WILL PROPERLY MAINTAIN THE SIGN(S) DURING CONSTRUCTION
PROJECT SIGN DETAIL
N.T.S.
4000 PSI CONCRETE FOUNDATION, GROUTED SMOOTH W/ 3/4" CHAMFER
ANCHOR BOLTS PER MANUFACTURERS RECOMMENDATIONS
6"
3" MIN. CLR
#3 SPIRAL @ 4" PITCH
6 – #8 VERTICAL BARS
5'-0" FOR POLES ≤ 15-FT
7'-0" FOR POLES > 15-FT
CONDUIT, WIRING & GROUNDING PER NEC CODE
2'-0"ø
NOTES:
1. THIS DETAIL IS A REPRESENTATION OF THE MINIMUM REQUIREMENTS FOR CONSTRUCTION. THE DESIGN ENGINEER IS RESPONSIBLE FOR CONCRETE FOUNDATION DESIGN, INCORPORATING RECOMMENDATIONS OF THE GEOTECHNICAL REPORT.
2. CONCRETE AND REINFORCING STEEL TO BE PLACED IN ACCORDANCE WITH ACI CODE.
LIGHT POLE BASE DETAIL
N.T.S.
ALUMINUM U-CHANNEL BLADE MOUNTING HARDWARE
TMUTCD STANDARD SIGNAGE
2-1/2" SCH. 80 HDG STEEL SIGN POST
7'-0" MIN.
HDG STEEL TRIANGULAR BREAKAWAY SLIP BASE ASSEMBLY
36" HDG STEEL STUB POST BASE
4" MAX.
12" #4 REBAR THROUGH 3/4" HOLE IN STUB
18" DIA. x 48" DP. 3,000 PSI CONCRETE
NOTES:
1. SLIP BASE BOLTS, NUTS AND WASHERS SHALL BE PER ASTM A325 OR A449, GALVANIZED PER ASTM A454.
STREET SIGN POST DETAIL
N.T.S.
MIN. 40'-0" ACCESS CLEARANCE (80'-0" MAX.)
1"ø GATE HOD KEEPER SET IN CONC. (TYP. 1 PER GATE)
SOLID OPAQUE METAL GATE(S) (CHAINLINK NOT ALLOWED) MAX. 4" GAP BETWEEN BOTTOM OF GATE AND GROUND.
14'-0"
8'-0" HIGH BRICK OR STONE WALL ENCLOSURE OF A COLOR MATCHING THE PRIMARY BUILDING
12'-0" (SINGLE PAD) 29'-0" (DOUBLE PAD)
NOTES:
1. ENGINEERED CONCRETE FOUNDATIONS WITH PIERS ARE REQUIRED, PER REVIEW AND APPROVAL BY TOWN ENGINEER.
2. NEW COMMERCIAL DEVELOPMENT SHALL PROVIDE SPACE FOR A MINIMUM OF TWO DUMPSTER PADS.
COMMERCIAL DUMPSTER SCREENING ENCLOSURE DETAIL
N.T.S.
BACK OF CURB
15'-0" MIN.
RIGHT-OF-WAY
15'-0" MIN.
CORNER RESIDENTIAL LOT
PROP. LINE
CEDAR BOARD ON BOARD FENCE
RESIDENTIAL FENCE AND/OR RETAINING WALL
15'-0" MIN.
NOTES:
1. ALL RESIDENTIAL FENCES FACING STREETS, OPEN AREAS, OR COMMERCIAL ZONES MUST BE 6'-0" HIGH CEDAR BOARD-ON-BOARD STYLE.
2. FENCES AND RETAINING WALL MUST BE AT LEAST 15 FEET FROM EDGE OF PAVEMENT.
FENCE/RETAINING WALL LAYOUT DETAIL
N.T.S.
4x4 POST CAP
NOTCHED CROSS-LAP JOINT
4" FROM BACK OF CURB
6"
4'-0"
18"
18"
3'-8"
GREEN TREATED OR CEDAR 4x4 POST
2'-6" TO FACE OF CURB OR EDGE OF PAVEMENT
3'-0"
NOTES:
1. ATTACH POST, BRACE AND CROSS MEMBERS USING HOT DIPPED, GALVANIZED 4" LAG SCREWS IN PREDRILLED, COUNTER-SUNK HOLES.
2. CONTRACTOR TO INSTALL GIBRALTAR INDUSTRIES STANDARD SIZE BLACK GALVANIZED MAILBOX OR APPROVED EQUAL.
TYPICAL POST MAILBOX CONSTRUCTION
N.T.S.
MASONRY DETAILS OF MAILBOX TO BE PROVIDED BY HOMEBUILDER AND APPROVED BY TOWN PRIOR TO CONSTRUCTION
4" FROM BACK OF CURB
3'-8"
1'-0" TO FACE OF CURB OR EDGE OF PAVEMENT
4" MIN.
6" THK. CONC. PAD EXTEND MIN. 4" BEYOND FACE OF BRICK
3'-0"
1'-0"ø CONC. PIER
NOTES:
1. CONCRETE PAD AND PIER SHALL BE CONSTRUCTED IN A SINGLE MONOLITHIC POUR.
2. CONTRACTOR TO INSTALL GIBRALTAR INDUSTRIES STANDARD SIZE BLACK GALVANIZED MAILBOX OR APPROVED EQUAL.
TYPICAL BRICK PAD MAILBOX CONSTRUCTION
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE: NONE
JOB NUMBER: -
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
MISCELLANEOUS DETAILS 1 OF 2
LITTLEELM
SHEET
25 OF 26
DECEMBER 2023


NOTES:
1. SHOP DRAWINGS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO FABRICATION OF ALL ITEMS. SHOP DRAWINGS SHALL INCLUDE ALL SHOP AND ERECTION DETAILS.
2. STEEL TUBING SHALL CONFORM TO ASTM A500, GR B. ALL SURFACES SHALL BE PRIME COAT PAINTED WITH 2 COATS OF TNEMEC RED METAL PRIMER.
3. ALL SURFACES SHALL BE PAINTED WITH 2 COATS OF BENJAMIN MOORE RUST INHIBITOR PAINT SEMI-GLOSS BLACK OR APPROVED EQUAL. ALL TUBES AND FITTINGS SHALL BE FLUSH AND FREE OF SHARP EDGES, SPURS, AND DENTS. ALL RAILINGS SHALL BE FABRICATED IN THE SHOP TO FIT FIELD CONDITIONS.
4. ALL ITEMS SHALL BE INSTALLED AND SET IN THEIR CORRECT LOCATIONS AS SHOWN ON THE DRAWINGS. THEY SHALL BE SET LEVEL, PLUMB, SQUARE, AND AT THE PROPER ELEVATION.
5. POSTS SHALL BE SET PLUM. RAILS SHALL FOLLOW THE SLOPE. CONTRACTOR SHALL VERIFY CONDITIONS PRIOR TO FABRICATION.
90° ROTATION
90° ROTATION
GATE LATCH (SEE DETAIL)
6"x6"x¼" STEEL POST (TYP.)
GATE HINGE (SEE DETAIL)
1"ø GATE ROD KEEPER SET IN CONC. (TYP. 1 PER GATE)
GATE HINGE (SEE DETAIL)
STONE WALL
STONE COLUMN
20'-0"
PLAN VIEW
COLUMN NOTES:
1. ALL CONCRETE USED IN FOOTINGS AND PIERS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3500 PSI. CONCRETE USED IN COLUMNS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI.
2. ALL REINFORCING STEEL SHALL BE NEW BILLET STEEL, ASTM A615 GR.60 EXCEPT STIRRUPS SHALL BE GR.40 AND SPIRALS SHALL BE ASTM A82 GR.60.
3. CONCRETE FOR DRILLED PIERS SHALL BE POURED WITHIN 8 HOURS OF DRILLING PIER HOLES.
CAST STONE LOW RISE PYRAMIDAL COLUMN CAP WITH BULLNOSE EDGES
TOWN LOGO STYLE 2 LOGO TO BE PROVIDED AND APPROVED BY TOWN (OPTIONAL)
SANDSTONE (NATURAL) STONE FACING
FINISH GRADE
CONCRETE PIER CAP
1'-6" DIA. CONCRETE PIER
ELEVATION WITH TOWN LOGO
18"
12"
90°
4-#5 VERT @ 90° SPACING AROUND SPIRAL
#3 ROUND STIRRUP @ 18" O.C.
CONCRETE PIER TYP. SECTION
2'-2"
4"
1" OVERHANG
ANCHOR BOLT
GROUT FILL VOIDS
TYPE S MORTAR JOINTS W/ GALVANIZED LADDER WIRE EACH COURSE.
8"x8"x16" CMU, GROUT FILL (TYP.) 4-#5 REBAR VERT., TIE TO FOOTING
8'-6"
4-#5 BARS EXTEND TO TOP OF COLUMN
2'-0" MIN.
4-#5 BARS @ 1'-6" O.C. ALTERNATE TURNS IN FOOTING
FINISH GRADE
3-#3 STIRRUPS
4-#5 HOOKS, 8"x36"
3-#5 BARS CONTINUOUS TOP AND BOTTOM
1'-6"
DOUBLE TIE AT TOP
4-#5 BAR VERTICAL
2'-6"
10'-0" MIN. DEPTH IN CLAY OR WEATHERED ROCK, OR 4'-0" MIN. PENETRATION INTO UNWEATHERED ROCK
#3 ROUND STIRRUP @ 1'-6" O.C.
REINFORCEMENT
STONE COLUMN DETAIL
N.T.S.
6"x6"x¼" STEEL POST (TYP.), EXTEND TO BOTTOM OF PIER
2"x3"x¼" TUBULAR STEEL RAIL
1" SQ. TUBULAR BARS @ 4" O.C.
10'-0"
GATE HINGE (TYP.) (SEE DETAIL)
STONE COLUMN
STONE WALL
LITTLE ELM
GATE LATCH (SEE DETAIL)
6" CONC. CURB
TOWN OF LITTLE ELM LOGO ¼" STEEL PLATE ON 1" SQ. STEEL TUBE FRAME (SUBMIT SHOP DRAWINGS PRIOR TO FABRICATION)
BLACK RUBBER SPRING-LOADED WHEEL ON EACH GATE (BOLTED TO INSIDE OF GATE FRAME)
GATEKEEPER (SEE DETAIL)
2"x3"x¼" TUBULAR STEEL FRAME
FINISHED GRADE
ELEVATION
20'-0" DOUBLE SWING GATE
N.T.S.
2'-0"
4"
½" OVERHANG
4" THICK MILLSAP STONE FACING
3'-10"
FINISH GRADE
CONCRETE PIER CAP
ELEVATION
2'-3"
CHOPPED STONE CAP
TYPE S MORTAR JOINTS W/ GALVANIZED LADDER WIRE EACH COURSE
8"X8"X16" CMU, GROUT FILL, ALTERNATE BLOCK DIRECTION
4'-2"
4-#5 BARS EXTEND TO TOP OF COLUMN, TIE TO FOOTING REINF.
MORTAR FILL ALL VOIDS
3-#3 STIRRUPS
3-#5 BARS TOP AND BOTTOM
1'-6"
2'-6"
REINFORCEMENT
SMALL STONE COLUMN DETAIL
N.T.S.
1"
1/2"
PLAN
6"x6"x¼" STEEL TUBULAR POST
1/2"ø HOLES
2"x3" STL. TUBE GATE FRAMES
WELDS
¼" THK. STL. PLATE
ELEVATION
GATE LATCH DETAIL
N.T.S.
11 3/4"
3 3/4"
6"
2"
2"x3"x¼" TUBULAR STEEL GATE FRAME
1 1/2"
3"
PLAN
NARROW-PROFILE, WELD-ON, GREASEABLE HINGES. INSTALL HINGES SO GATE CANNOT BE LIFTED OFF.
WELDS (TYP.)
ELEVATION
GATE HINGE DETAIL
N.T.S.
3"x2"x1/4" STL. ANGLE BRACKET WELDED TO VERT. FRAME RAIL
1"ø HOLE EA. BRACKET
1/8" CHAMFER ENDS OF KEEPER ROD
WELD 3/4" I.D.x 1 1/2" L x 1/4" THK COLLAR 4" BELOW BOTTOM OF BRACKET
3/4"ø KEEPER ROD
2'-10½" L x 3/4"ø STL. KEEPER ROD
2"ø x 1/2" THK. STL. WELDED TO KEEPER ROD
3"x2"x1/4" STL. ANGLE BRACKET WELDED TO VERT. FRAME RAIL
3/8"ø HOLE DRILLED THROUGH 1/2" STL. & ANGLE BRACKET
1"ø HDG ROD KEEPER EPOXIED IN CONCRETE
GATE KEEPER ROD DETAIL
N.T.S.
10'-0" O.C.
2" SQ. RAIL INSERT (TYP.)
4" SQ. CEDAR RAILS
4" SQ. CEDAR POST
FINISHED GRADE
12" DIA. CONCRETE FOOTING
4" DEPTH GRAVEL BASE
1'-0"
NOTE:
1. FENCE SHALL BE CONSTRUCTED OF WESTERN RED CEDAR.
SPLIT RAIL FENCE DETAIL
N.T.S.
1"X2"X7" TRIM
8'-0" PICKET
5"
CAP DETAIL
N.T.S.
BOARD ON BOARD FENCE NOTES:
1. PICKETS TO BE ¾"x5"x8" NO.1 CEDAR
2. BOARD ON BOARD WITH MAX 4" SPACING
3. ALL NAILS TO BE STAINLESS STEEL (316 OR 304)
4. GALVANIZED POST TO BE 2⅜" MINIMUM
5. LAGS TO BE ¾"x1½"
6. ROUGH TRIM TO BE EQUALLY SPACED
7. ALL CEDAR MATERIAL TO BE PRE-STAINED. STAIN SAMPLE SHALL BE APPROVED BY TOWN PRIOR TO INSTALLATION.
8. STONE COLUMNS TO BE INSTALL AT CORNERS AND MIDPOINT OF FENCE SECTION, UNLESS OTHERWISE INDICATED ON PLANS.
2"X6"X12" TOP CAP
FLAT CAP W/ TRIM SEE DETAIL THIS SHEET
ROUGH TRIM
8'-5"
8'
GALVANIZED KICK BOARD
12" WIDE x 36" DEEP CONCRETE FOUNDATIONS
ENCLOSE ALL EXPOSED GALVANIZED STEEL POSTS AND HARDWARE WITHIN A BOX CONSTRUCTED OF CEDAR BOARDS MATCHING THE FENCE
BOARD ON BOARD CEDAR FENCE
N.T.S.
DATE
REVISION
NO.
DESIGN BY:
DRAWN BY:
CHECKED BY:
SCALE:
NONE
JOB NUMBER:
TOWN OF LITTLE ELM, TEXAS
STANDARD DETAILS
MISCELLANEOUS DETAILS 2 OF 2
LITTLEELM
SHEET
26 OF 26
DECEMBER 2023