ORDINANCE NO. 6-2021

AN ORDINANCE OF THE VILLAGE OF BONNEY, TEXAS, FOR THE PURPOSE OF ADOPTING THE BONNEY ENGINEERING DESIGN CRITERIA MANUAL; REQUIRING COMPLIANCE; PROVIDING FOR DENIAL OR REVOCATION OF APPROVAL AND PERMITS DUE TO NONCOMPLIANCE; PROVIDING FOR OTHER REGULATIONS AND REQUIREMENTS; PROVIDING THAT A VIOLATION IS A MISDEMEANOR PUNISHABLE BY A FINE OF UP TO $500 PER DAY; AND PROVIDING FOR OTHER PENALTIES AND REMEDIES, NONWAIVER BY NONENFORCEMENT, NONWAIVER OF IMMUNITY, NONLIABILITY OF THE VILLAGE, A SEVERANCE CLAUSE, AND AN EFFECTIVE DATE.

BE IT ORDAINED BY THE BOARD OF ALDERPERSONS OF THE VILLAGE OF BONNEY, TEXAS:

1. Adoption of Engineering Design Criteria Manual.

The attached Engineering Design Criteria Manual is hereby adopted and ordained, and the regulations and provisions therein are hereby established, and that attachment is incorporated herein in full. Any reference herein or in any other ordinance or source to the Engineering Design Criteria Manual or the Design Criteria Manual shall refer to this ordinance, also including the attachment hereto, as amended from time to time.

2. Compliance Required.

Any construction, planned construction, or plans for which a permit or approval from the Village of Bonney is required must be done in compliance with the Design Criteria Manual, according to its terms.

3. Denial or Revocation of Permits for Approval.

The failure of any plans, construction, or planned construction to comply with Design Criteria Manual shall be grounds for the Village to deny or revoke any approval or permit from the Village concerning such plans, construction, or planned construction.

4. Other Requirements.

The attached Engineering Design Criteria Manual is cumulative of all requirements from any other source and shall not authorize noncompliance with any other regulation or requirement from any source. In the event of any conflict in terms, the stricter requirement shall govern and control.

5. **Offenses, Penalties, and Remedies.**

a. Any person who participates in any violation of any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction, shall be fined in an amount not to exceed $500.00. Each day or portion of a day a violation continues, occurs, or recurs shall constitute a separate offense.

b. The Village shall have the right to enforce this ordinance by injunction and by other actions in a civil court and/or by any and all remedies from any and all sources.

c. All rights and remedies of the Village provided in this ordinance shall be cumulative of all other rights and remedies provided herein, by other ordinances, or by any source.

d. The exercise of any right or remedy by the Village shall not be construed as an election of remedies and shall not impair any other right or remedy of the Village. The Village may exercise any right or remedy herein either alone or together with any other right or remedy under this ordinance, any other ordinance, or any applicable law. Without limiting the generality of the foregoing, pursuing or receiving any civil remedy for any violation of this ordinance shall not preclude the pursuit or receipt of any criminal penalty for any violation hereof.

6. **Nonwaiver by Nonenforcement.**

The failure or omission of the Village, upon one or more occasions, to enforce any right, obligation, or remedy under this Ordinance or any other law concerning the subject matter hereof shall never be construed as a waiver of the Village's right to strictly enforce such right, obligation, or remedy, and the Village may resume such strict enforcement without advance notice.

7. **Nonwaiver of Immunity.**

Nothing in this Ordinance shall ever be construed as a full or partial waiver of governmental immunity, official immunity, or any other immunity of the Village or its officers, employees, agents, or representatives.

8. **Nonliability of Village.**

Neither the Village, nor its officers, employees, agents, or representatives shall be liable to any person, other than the Village, for any act, omission, or condition in any way concerning this ordinance or the subject matter hereof.

9. Severance Clause.

If any part of this ordinance, of whatever size, is ever declared invalid or unenforceable for any reason, the remainder of this ordinance shall remain in full force and effect.

10. Effective Date.

This ordinance shall be effective immediately upon its passage and approval.

PASSED AND APPROVED this 21st **day of** September, **2021.**

VILLAGE OF BONNEY

By: Raymond Cantu
RAYMOND CANTU,
MAYOR

ATTEST:

Kaylee Winans
KAYLEE WINANS,
CITY CLERK

CITY OF BONNEY TEXAS

BONNEY, TEXAS

ENGINEERING DESIGN CRITERIA MANUAL

Adopted by the Village of Bonney

City Council

Adopted: September 21, 2021

Ordinance No. 6 - 2021

Prepared by:

ADICO
CONSULTING ENGINEERS

VILLAGE OF BONNEY
ENGINEERING DESIGN CRITERIA MANUAL

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BONNEY, TEXAS

CHAPTER 1

GENERAL REQUIREMENTS

CHAPTER 1 – GENERAL REQUIREMENTS

1.1 GENERAL

1.1.1 This Manual describes the general requirements for the preparation of construction plans and the supporting documents required for submittal and approval by the Village of Bonney. Specific design requirements, in addition to these standards, may be required by the Village of Bonney.

1.1.2 Construction plans for public or private improvements within Village of Bonney city limits shall be approved by the Village of Bonney and applicable Drainage District. Construction plans for public or private improvements within the Village of Bonney extraterritorial jurisdiction (ETJ) shall be reviewed and approved by the Village of Bonney, Brazoria County Engineering Department, respective Municipal Utility Districts, and applicable Drainage District.

1.1.3 All projects that are required to conform to these Standards shall also comply with all applicable Village of Bonney ordinances.

1.1.4 All construction plans and supporting documentation shall conform to the requirements of these Standards and regulations of all Federal, State, County, and any other entities having jurisdiction.

1.2 PRELIMINARY RESEARCH

1.2.1 Personnel from the City will be available for preliminary meetings to discuss a proposed project with the project engineer and/or developer, if requested. This preliminary meeting between the City and the engineer/developer should be scheduled with the City Secretary before submittal of any documents for review.

1.2.2 Research of all existing utility and right-of-way information with City, County, State, and other public and private utility agencies shall be completed and documented prior to submittal of any plans to the City.

1.3 FEES

1.3.1 All plan review, plat review, and permit fees shall be paid to the City before beginning construction on a project. Please refer to the City's Official Fee Schedule.

1.4 DESIGN REVIEW REQUIREMENTS FOR PUBLIC OR PRIVATE IMPROVEMENTS

1.4.1 Submit one (1) copy of construction plans, one (1) digital copy (pdf) and supporting documentation to the City for review. Plans will be circulated to the appropriate departments for their review. Comments will be issued to the applicant in a timely manner.

1.4.2 Based on the trip estimates for the proposed development, a Traffic Impact Analysis may be required to determine any necessary traffic mitigation measures.

1.4.3 A Final Drainage plan must be approved and signed by the appropriate Drainage District prior to submitting to Village of Bonney for final plan approval.

1.4.4 After all comments have been adequately addressed, submit letter addressing the comments, including noting any revision to the plans and one copy of the revised construction plans and pdf to the City for final approval.

1.4.5 After final approval has been granted, submit original mylar sheets to the City for approval signatures, along with electronic files as per Section 2.2.4.

1.4.6 Submit two (2) copy and one (1) digital file (PDF) of the approved construction plans to the permit office at the time permitting for Engineering file and inspection.

1.4.7 All separate or special easements that may be required for construction shall be recorded with the plat prior to final approval. If platting is not required as part of the project, then record all easements prior to final approval.

1.5 CONSTRUCTION AND ACCEPTANCE REQUIREMENTS FOR PUBLIC INFRASTRUCTURE PROJECTS

1.5.1 Refer to the Village of Bonney's Construction, Inspection, Approval and Acceptance Procedures for Public Infrastructure.

1.6 APPROVALS AND VARIANCES

1.6.1 Approvals required in these Standards are the responsibility of the Owner. Failure to obtain appropriate approvals may be grounds for suspension of construction until appropriate approvals are granted. Items that do not conform to these Standards shall be submitted for a variance request.

1.6.2 Variances, as required by these Standards, shall be requested by the Owner prior to, or at the time of, submittal of review plans for the project. In order to be valid, all variance items must be granted by the City Administrator upon written recommendation by the City Engineer.

1.6.3 Construction work related to any variance item should not begin until the City has granted approval. Design engineer shall submit a Design Criteria Modification form for variance requests. Any work that proceeds without approval will be subject to removal and replacement, at no cost to the City, in accordance with these Standards.

BONNEY, TEXAS

CHAPTER 2

GRAPHIC REQUIREMENTS

CHAPTER 2 – GRAPHIC REQUIREMENTS

2.1 REQUIRED PLAN SHEETS

2.1.1 Cover Sheet

2.1.2 Plat (latest version of the plat shall be included in the drawings)

2.1.3 Construction Notes and Legend

2.1.4 Overall Layouts for Proposed Improvements (Water and Sewer, Drainage, Paving, etc.)

2.1.5 Drainage Area Map and Calculations

2.1.6 Lot Grading Plan

2.1.7 Plan and Profiles

2.1.8 Storm Water Pollution Prevention Plan

2.1.9 Specific Construction Details

2.1.10 Standard Village of Bonney Construction details

2.2 DRAWING REQUIREMENTS

2.2.1 Provide a cover sheet for all projects involving three or more drawings (including detail sheets). Plan sheet numbers and names shall be shown on the cover sheet. Include a vicinity map to identify project location within the City. Provide the Village of Bonney signature block for the City Engineer and Mayor with a note stating that approval is valid for 1 year only from date of signatures. Provide a signature block for the City Engineer on all internal sheets. Signature blocks is provided in Appendix "B".

2.2.2 Drawings shall be prepared on nominal 24 inch x 36 inch overall drawings.

2.2.3 Show service area on cover sheet or area map.

2.2.4 After final approval has been granted, submit drawings with mylars on India ink or produced by on mylars. The engineer shall also submit, at this time, electronic AutoCAD (.dwg) and digital file in (PDF) file(s) of all construction plan sheets on digital versatile disk (DVD).

2.2.5 Details of special structures (not covered by approved standard drawings, such as stream or gully crossings, special manholes, or junction boxes, etc.) shall be drawn with vertical and horizontal scales equal to each other.

2.2.6 Each set of construction drawings shall contain overall paving and utility layout drawings indexing specific plan and profile sheets. Show all lot lines, property lines, rights-of-way lines and easement lines. Standard City drawings, where applicable, shall be included. All sheets shall have standard title blocks.

2.2.7 Draw overall layouts to a scale of 1 inch = 50 feet, 60 feet, 100 feet, or 200 feet.

2.2.8 Plan stationing must run from left to right, except for short streets or lines originating from a major intersection, where the full length can be shown on one sheet.

2.2.9 A north arrow is required on all sheets and should be oriented either toward the top or to the right.

2.2.10 Standard scales permitted for plans and profiles of paving and utility construction drawings are as follows:

A. Major thoroughfares, streets with esplanades over 400 feet in length, or special intersections/situations:

a. 1 inch = 10 feet horizontal, 1 inch = 1 feet vertical

b. 1 inch = 20 feet horizontal, 1 inch = 2 feet vertical

B. Minor or residential single-family streets:

a. 1 inch = 20 feet horizontal, 1 inch = 2 feet vertical

b. 1 inch = 40 feet horizontal, 1 inch = 4 feet vertical

c. 1 inch = 50 feet horizontal, 1 inch = 5 feet vertical

2.2.11 Each sheet of the plans shall have a benchmark elevation and description, along with applicable flood plain information. Include Base Flood Elevation, FIRM panel number and flood zone designation. All files shall be designed to State Plane Coordinate System – South Central 4204, NAD 83.

2.2.12 The seal, date, and original signature of the Licensed Professional Engineer responsible for the drawings shall be required on each sheet developed by the engineer. The engineer may use a stamped or embossed imprint for his seal; however, the embossed imprint must be shaded such that it will reproduce on prints.

2.2.13 If a roadway exists where drawings are being prepared to improve or construct new pavement or a utility, label the existing roadway width, surface type, and thickness, if available without destruction of pavement. Pavement thickness can be ascertained by coring. The resultant void shall be grout-filled.

2.2.14 Show all streets and/or roadway alignments on all drawings.

2.2.15 Develop drawings to accurate scale showing proposed pavement, typical cross-sections, details, lines and grade, all existing topography within street right-of-way, and any easement adjacent to the right of way. At intersections, the cross-street details shall be shown at sufficient distance (20 feet minimum distance outside the primary roadway right-of-way) in each direction along the cross-street.

2.2.16 Match lines shall not be placed at cross-street intersection for roadway alignment.

2.2.17 Natural ground profiles shall be shown as follows:

A. For privately-funded projects, centerline profiles are satisfactory except where a difference of 0.50 feet or more exists from one right-of-way or easement line to the other, in which case, dual profiles are required.

B. For the Village of Bonney projects, provide natural ground profiles for each right- of-way line. Easement profiles shall also conform to this requirement.

2.2.18 Identify all lot lines, property lines, easements, right-of-way, and drainage outfalls.

2.2.19 Label each plan sheet as to street/easement widths, pavement widths, pavement thickness where applicable, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities (type and location), and any other pertinent feature affecting design.

2.2.20 Show all utility lines four inches or larger within the rights-of-way or construction easement in profile view. Show all utility lines, regardless of size, in the plan view, including fiber optic cables.

2.2.21 Graphically, show flowline elevations and direction of flow for all existing ditches.

2.2.22 Label proposed top of curb grades except at railroad crossings. Centerline grades are acceptable only for paving without curbs and gutters.

2.2.23 Curb return elevations for turnouts shall be shown in profiles.

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

2.2.25 Station all esplanade noses or the centerline of all esplanade openings with esplanade width shown - both existing and proposed.

2.2.26 The design of both roadways is required on all paving sections with an esplanade.

2.2.27 Station all point of curvatures (PC) and point of tangency (PT), radius returns, and grade change point of intersection (PI) in plan view. Station all radius returns and grade change PIs in profile with their respective elevations.

2.2.28 Standard City Details shall be included, when applicable.

2.2.29 All property ownership and easement recordation information shall be shown on the plans.

2.2.30 Provide stormwater pollution prevention plan, including details on all public and private projects.

2.3 EASEMENTS

2.3.1 All easements and recording information, existing and proposed, shall be shown on the construction plans.

2.3.2 Storm sewer, sanitary sewer, and water line easements shall be dedicated for the specific intended use. Easements for a specific facility shall be exclusive and shall not overlap other easements, except to cross the easements.

2.3.3 Dry Utility Easements shall be sixteen-feet (16').

2.4 UTILITY LOCATIONS

2.4.1 All utilities shall be underground with the exception of electric primary lines. The electric primary lines, defined as feeders or three phase lines, should be located around the subdivision perimeter whenever possible.

2.4.2 Water Line Location

A. All water lines shall be located within a public right-of-way or within dedicated water line easements. The location of water lines within a public street right-of-way is described in Section 3.3.3.

B. Water lines shall not be located in combination easements.

2.4.3 Sanitary Sewer Location

A. Sanitary sewers of twelve inches (12") or larger in diameter are usually located within a public right-of-way or an easement adjoining the right-of-way. Sanitary sewers may be located in exclusive or combination easements provided the easement widths comply with Section 2.3.

B. Sanitary sewers shall not be located in side lot easements.

C. Sanitary sewers should be located within the right-of-way between the property line

and the back of curb on the opposite side of the right-of-way from the water main.

2.4.4 Storm Sewers

A. Storm sewers shall be located in the public street right-of-way in accordance with Section 5.3.6.E.c.

B. All storm sewer lines shall be located within public rights-of-way or approved easements. Placement of a storm sewer in side lot and back lot easements is discouraged.

2.5 PRIVATE FACILITY LOCATIONS

2.5.1 Installation of private facilities, including utilities, in public road rights-of-way and their adjoining easements shall be approved by the Village of Bonney.

2.5.2 Private facilities shall not conflict with other facilities in the right-of-way and shall not be located in exclusive easements as required in these Standards. All structures within the public right-of-way require approval from the City Engineer and shall be located so as to not interfere with existing or proposed public facilities.

2.5.3 All facilities in the right-of-way shall be located at least two feet (2') behind the curb and all underground facilities in the right-of-way shall be located at least two and one-half feet (2.5') below the top of curb on a public street.

2.5.4 Private facilities shall be constructed in accordance with construction plans approved by the City Engineer.

2.5.5 Landscaping within the public right-of-way or adjoining easements shall not affect public utilities or traffic visibility.

2.6 CROSSINGS

2.6.1 Highway Crossings - All State and County Roads

A. State Highway crossings shall be constructed in conformance with the requirements of the Texas Department of Transportation.

B. A water main shall be encased in a steel pipe casing extending at least five feet (5') from outside edge of each service road or outside edge of pavement, across the right-of-way to a similar location on the other side of the highway. For highway or roadway crossing with open ditches, the casings shall extend from right-of-way to right-of-way.

C. County road crossing shall be constructed in accordance with Brazoria County requirements.

D. Where additional right-of-way has been acquired or will be required for future widening, the casing, where required, should be carried to within ten feet (10') of each future right-of-way line.

2.6.2 Street Crossings

A. All water main and sprinkler line crossings under major thoroughfare boulevards shall be encased. For all water mains, steel casing shall be used. For fire sprinkler lines, SDR 26 PVC or welded steel pipe shall be used.

B. Conduits and sewers that do not carry liquid under pressure may be bored and jacked or microtunneled into place without an encasement pipe.

C. Crossings under existing concrete streets shall be constructed by boring and jacking or microtunneling. PVC pipe shall be jacked into place using equipment designed for that purpose. Water may be used to facilitate the boring and jacking operations. Jetting the pipe main into the place will not be allowed. When conditions exist that warrant open cut across an existing street, specific approval by the City Engineer is required.

D. All street crossings shall be constructed in accordance with construction plans approved by the City. All street crossings shall be inspected by the City. All street crossings shall meet the requirements of these Standards.

2.6.3 Railroad and Pipeline Crossings

A. For railroad crossings, the carrier pipe shall be encased in steel pipe casing extending from right-of-way to right-of-way.

B. All construction within the railroad or pipeline right-of-way shall conform to minimum requirements set out in the agreement with the owner of the right-of-way.

2.6.4 Ditch and Stream Crossings

A. Aerial crossings attached to the vehicular bridge structure are preferred by the City.

B. Where existing or proposed bridges have sufficient space and structural capacity for installing water mains or conduits (twelve inches (12") or smaller) under the bridge, but above the top of the bent cap elevation, such installation will be permitted upon

specific approval of the construction plans. In all cases, the water main or conduit shall be above the bottom chord of the bridge and eighteen inches (18") above the 100-year water surface elevation. All conduits attached to a bridge shall be constructed using steel pipe and shall extend a minimum of ten feet (10') beyond the bridge bent or to the right-of-way line, whichever is greater. All conduit attached to a bridge shall be maintained by the owner of the conduit or will be subject to removal.

C. Separate, free-standing crossings across drainage ways are discouraged.

D. All stream or ditch crossings shall be constructed of steel pipe from right-of-way to right-of-way.

2.7 TRENCH SAFETY

2.7.1 Trench safety is required for all excavations greater than five feet (5') in depth, and shall conform to all applicable OSHA regulations.

2.8 BENCH MARKS

2.8.1 A permanent benchmark shall be set in each subdivision section or at a spacing of one mile, whichever is greater. The benchmark shall have an elevation based on the North American Vertical Datum of 1988 (NAVD 88), current adjustment.

2.8.2 The benchmark elevation and location shall be certified by a registered public surveyor as a Texas Society of Professional Surveyors (TSPS) Standard and Specifications for Category 8, TSPS Third Order Vertical Control Survey.

2.8.3 Accuracy of elevations for benchmarks shall be Texas Society of Professional Surveyors Category 8, Third Order.

2.8.4 All benchmark locations shall be provided with ties to existing monuments including coordinates based on the North American Datum of 1983 (NAD 83), Texas State Plane Coordinate System, South Central Zone.

2.8.5 Benchmarks shall be constructed of a brass disc set in concrete. The concrete footing for the bench mark shall be eight inches (8") in diameter and three feet (3') deep. Concrete shall be reinforced with two number four (2-#4) bars.

2.8.6 The construction plans shall clearly identify the location of the benchmark and shall include a complete description, coordinates and elevation, with adjustment date, of the benchmark.

2.9 RESIDENTIAL LOTS AND IMPROVEMENTS

2.9.1 All residential lots shall drain to a public right-of-way directly adjoining the lot. Drainage from a residential lot to a public right-of-way at the rear or side of a lot may be permitted provided the drainage system has been properly designed to accept the flow. Drainage from a residential lot to an adjoining greenbelt or golf course shall require a public easement for drainage purposes to be maintained by the homeowner's association or appropriate entity. Drainage to a private easement shall be noted on the recorded subdivision plat. Drainage to a drainage district easement shall be approved by applicable Drainage District.

2.9.2 A lot grading plan showing proposed minimum slab elevations shall be included in the construction plans. If slab elevations do not change, a notice of minimum elevation will suffice.

2.11 FLOOD PLAIN MANAGEMENT

2.10.1 The City Engineer is the acting flood plain manager for the Village of Bonney. All flood plain development within city limits or the ETJ shall be reviewed and approved by the City Engineer.

2.10.2 Amendments to the published flood insurance rate maps, map revisions and all requests for changes to the base flood elevation within Village of Bonney city limits or its ETJ shall be submitted to the City Engineer for review.

2.10.3 All data submitted shall be prepared under the supervision of a registered professional engineer and/or a registered public surveyor and shall comply with all requirements of the Federal Emergency Management Agency National Flood Insurance Program Regulations.

BONNEY, TEXAS

CHAPTER 3

WATER SYSTEM DESIGN CRITERIA

CHAPTER 3 – WATER SYSTEM DESIGN

3.1 WATER SYSTEM DESIGN GENERAL

3.1.1 Criteria for the design of water service and water distribution lines are herein established. All water lines constructed within the Village of Bonney or its Extraterritorial Jurisdiction (ETJ) shall follow these criteria.

3.1.2 Design, construction and sizing of all water mains and appurtenances shall meet or exceed the requirements of the Texas Commission of Environmental Quality (TCEQ) as per 30 TAC Chapter 290 and the Texas Board of Insurance (TBI).

3.1.3 The public water system shall not extend beyond the individual water meter. All water line construction in public rights-of-way up to and including construction to the water meter shall conform to these standards.

3.1.4 Design and construction shall conform to the Village of Bonney standard details and specifications.

3.1.5 For developments with multiple phases, consultant shall provide an overall general plan of the proposed water distribution system prior to approval of the first phase of development.

3.2 DEFINITIONS

3.2.1 Water line – Closed conduit designed to distribute potable water to various locations for human consumption, and to provide fire protection. Line size and fire protection accessory locations are dependent on distance from primary source and quantity of demand.

3.3 DESIGN REQUIREMENTS

3.3.1 Easements: The following minimum easements are required when facilities are not located within public street rights-of-way:

A. Fire hydrants located outside of public rights-of-way or water line easements shall be encompassed by a ten-foot by ten-foot (10’x10’), exclusive, easement. Fire hydrants shall not be located within any other type of easements.

B. Water meter easements shall be exclusive and should be located adjoining a public right-of-way or water line easement.

C. Two-inch (2”) and smaller meters serving non-residential and multi-family developments shall be located inside rights-of-way, water line easements, or in a

minimum 5-foot by 5-foot (5'x5') exclusive water meter easement.

D. Three-inch (3") and larger meters shall be set in a minimum of ten-foot by twenty-foot (10'x20') exclusive, water meter easements.

E. Water lines may be located in easements not adjacent to public street rights-of-way. These water lines shall be centered in a fifteen foot (15') wide exclusive easement restricted to water only.

F. For new construction, any water line, except at a fire hydrant, located less than five feet (5') from the right-of-way line and within the right-of-way shall have a water line easement adjoining the right-of-way. Water line easements adjoining a right-of-way shall have a minimum width of five feet (10').

G. Water lines should be located at the center of a ten-foot (10') water line easement, provided the easement adjoins the public right-of-way.

3.3.2 Water Lines:

A. Locate water lines within street rights-of-way, public utility easements, or dedicated water line easements:

a. No less than a 4-inch water line is allowed.

b. A dead end 4-inch line may supply a maximum of 10 lots, shall not exceed 400 feet in length, and shall terminate with a blow off or loop back. Fire hydrants are not allowed on a 4-inch line.

c. Six-inch interconnected/looped mains shall be a maximum of 800 feet long, and shall be supported on both ends by an 8-inch main or larger. Dead end 6-inch lines shall not be more than six hundred feet (600') in length and shall terminate with a blow-off valve. Only one fire hydrant or flushing valve is allowed on any length of 6-inch diameter line.

d. Except when 4-inch and 6-inch diameter lines are permitted under the above criteria, all water lines shall have a minimum diameter of 8-inches.

e. Ten inch diameter water line is not permitted.

f. Pipe with a minimum 12-inch diameter should be used for lines greater than 2000 feet in length as determined by the Professional Engineer of Record and the Village of Bonney.

g. Dead-end lines:

(1) Dead-end lines should be avoided whenever possible, and may only be considered when a looped or interconnected water main system is not nearby.

(2) The design of all water distribution systems should include the opportunity for future looping or interconnect of any approved or proposed dead-end line. Waterline line shall be extended to the boundary of the development along public right-of-way as required for future connection.

(3) Dead-end lines within public right-of-way:

(a) On permanent dead-end lines not serving residential cul-de-sacs, the line shall be 8 inches in diameter and shall not exceed more than 700 feet in length from the closest interconnection main line and shall terminate with a fire hydrant, flushing valve or blow-off valve.

(b) In temporary dead-end situations or if the possibility for future extension of the water line exists, do not reduce pipe sizes successively. Carry 8-inch diameter pipe to the last appurtenance or the plug. Place the last service as near as possible to the end and install a standard blow off valve and box at the end of the 8-inch diameter line. The maximum length of such a line shall be 700 feet.

(c) In unavoidable permanent dead-end situations, reduce the sizes of pipe successively. Carry a 6-inch pipe to the last fire hydrant, then use 4-inch pipe to the end of the line (400' maximum). Install a 2-inch blow-off valve at the end of the 4-inch diameter line.

(4) Water lines located in a public easement on private property in multi-family residential applications with 1 or more fire hydrants or flushing valves shall be 8-inch diameter with an interconnection to at least 2 supply sources when possible.

(a) Appropriately sized domestic service shall be taken from the 8-inch lines.

(b) If requested, the design engineer shall submit water/hydraulic modeling data to the City Engineer demonstrating that adequate water pressures can be maintained given projected water demand in non-single family residential applications.

(c) The design engineer shall submit water/hydraulic-modeling data to the City Engineer demonstrating that fire flow capacity is available for the non-single family residential applications.

h. Side lot water line placement is discouraged. Where side lot water line placement is unavoidable, install water line in continuous steel casing pipe, centered in a 20-foot wide dedicated water line easement. Extend the casing uninterrupted from right-of-way to right-of-way. No horizontal or vertical deflections are allowed. Construct encased water line of ductile iron or restrained joint bell and spigot pipe to prevent lateral movement. Provide and install casing spacers and end seals. This item shall only apply to publicly maintained lines.

B. Layout and size of all water lines shall be consistent with the overall layout and phasing plan of the City's water system. The overall water system shall be designed to maintain adequate operating pressure throughout the system.

C. Chlorination: All newly installed water lines shall have to pass bacteriological testing before being accepted for maintenance by the Village of Bonney. All costs associated with the testing shall be the responsibility of the owner.

D. Pressure Testing: All newly installed water lines shall be flushed and pressure tested before being accepted for maintenance by the Village of Bonney. All costs associated with the testing shall be the responsibility of the owner.

3.3.3 Location

A. Locate water lines within street rights-of-way.

B. Boulevard streets: Water lines shall not be located within the esplanade.

C. Locations within an easement: Locate water lines in the center of exclusive dedicated water line easements.

D. When a water line is placed parallel to any other proposed or existing utility line, other than a sanitary sewer, the water line shall have a minimum of 4 feet horizontal clearance from the outside wall of the existing utility to the outside wall of the proposed water line.

E. A minimum distance of 4 feet shall be maintained from the right-of-way or easement line to the outside edge of the water line.

3.3.4 Depth of Cover (See Table 3.1)

A. Provide the minimum depths of cover shown in Table 3.1 from the top of finished grade behind the curb for curb-and-gutter streets, or from the lowest elevation of the nearby ditch bottom for roadside ditch street sections, whichever is applicable.

B. Whenever possible, changes in grade or alignment to clear utilities or underground features should be accomplished by deflecting pipe joints. The maximum designed deflection shall be ½ of the manufacturer's allowable deflection. The use of regular bends for any change of grade shall not be allowed.

C. If a depth greater than 8 feet or less than 4 feet to the top of the pipe is proposed, use restrained joint pipe, ductile iron, or other comparable high hoop strength material pipe, and continue for all areas where the depth of cover exceeds 8 feet or is less than 4 feet.

a. All transitions from ductile iron pipe to other water line material shall be constructed using electrically isolated flange joints.

b. Ductile iron or other comparable high hoop strength material pipe shall be pressure class 350.

Table 3.1 DEPTH OF COVER FOR WATER LINES

SIZE OF LINE	DEPTH OF COVER*	
	TOP-OF-CURB	OPEN-DITCH
8-INCH & SMALLER	4 FEET	4 FEET below ultimate flow line
12-INCH & LARGER	5 FEET	5 FEET below ultimate flow line

*When crossing easements whose owning or governing agency has stricter depth of cover criteria than that shown in Table 3.1, the more stringent of the two shall apply.

3.3.5 Appurtenances

A. Do not place appurtenances in pavement when the appurtenance would be covered in whole or in part by pavement. Gate valves may be placed in sidewalks provided that the top of the valve box is flush with the finished elevation with 24"x 24" blockout.

B. All water system valves shall conform with AWWA standards and shall include:

a. Cast iron valve boxes are required on all valves less than or equal to 16 inches. Valve vaults are required on all valves 20 inches and larger.

b. All valves shall be sized to equal the size of the water main on which it is located.

c. All valves shall have 24" X 24" concentric collar per detail.

C. Valves

a. Spacing – set at maximum distances along the water line as follows:

(1) 8” & Smaller – 1000 feet.

(2) 12” & Larger – 2000 feet.

(3) The total number of valves at any water line intersection shall equal the total number of lines leading out from the intersection point minus one.

(4) Refer to standard specifications for tapping sleeve & valve.

b. Location

(1) Valves must be located at street intersections along the street right-of-way lines projected across the water line where possible. Tapping sleeve and valves are excluded from this requirement.

(2) Isolate fire hydrants and flushing valves from the service main with a valve located in the fire hydrant or flushing valve lead. This valve should not be located in the slope or flow line of roadside ditches.

(3) Intermediate valves, not located on the projection of the right-of-way line, shall be located on lot lines or 5 feet from fire hydrants, but shall not be set in a driveway.

(4) Locate valves a minimum of 10 feet horizontally away (either direction) from any sanitary sewer crossing.

(5) Valves located near reducers shall be located on the smaller diameter pipe.

(6) All water mains shall be valved within the street right-of-way or dedicated water line easement. Valves shall not be placed under or within 2 feet of ultimate pavement, when it is known that the street will be widened in the future.

(7) Valves shall be placed at the end of all water mains that are to be extended in the future and the main shall be extended a minimum of two pipe joint past the valve.

c. Valve Type

(1) 16” & smaller – Gate Valve

(2) 20” & larger – Butterfly Valve

D. Fire Hydrants

a. Spacing

(1) Single family residential development – 500 foot maximum spacing.

(2) All other development – 300 foot spacing.

b. Location in or along street right-of-way

(1) Locate fire hydrants primarily at or near street intersections.

(2) Locate fire hydrants at the end of a curb radius of a street intersection, 3 feet behind back of curb or projected future curb in a curb & gutter road construction.

(3) On streets with roadside ditches, set the fire hydrants within 5 feet of rights-of-way lines. Fire hydrant lead valves should not be located in the slopes or flow lines of ditches.

(4) Set fire hydrants not located at intersections or block corners at mid-lot or on lot lines, as extended to pavement, when located between right-of-way intersections. These locations may be adjusted 5 feet either way to avoid driveways or obstructions. In either case, do not locate fire hydrants closer than 5 feet from driveways.

(5) Fire hydrants are not allowed in esplanades of streets.

(6) On all Texas Department Transportation (TXDOT) rights-of-way, the fire hydrant and flushing valve set-backs from the edge of right-of-way shall adhere to TXDOT criteria.

c. Location of fire hydrants or flushing valves outside street rights-of-way and in public easements:

(1) City review and approval is required for all submitted locations of fire hydrants and flushing valves in all developments within the Village of Bonney and its ETJ.

(2) Locate fire hydrant and flushing valves in protected, easily accessible areas behind curb lines.

(3) For fire hydrants or flushing valves that are located adjacent to water lines constructed in 10 foot wide water line easements, the fire hydrant or flushing valve shall be centered in a minimum 10 foot by 10 foot separate easement.

(4) For non-residential developments in the Village of Bonney, provide isolation valves at each end of fire loops requiring on-site fire hydrants.

d. Fire hydrant leads shall be designed to have a minimum 4 foot bury where possible. Bends may be used on the fire hydrant branch to maintain a 4 foot bury or a 3 foot back of curb set-back.

e. Do not install fire hydrants within 10 feet vertically or horizontally of sanitary sewers and force mains.

E. Fittings

a. Fittings shall be Ductile Iron.

b. Use plugs with retention clamps and carrying the designation "plug and clamp." Thrust blocking is required for dead-end lines that are plugged.

c. Concrete thrust blocking shall be required on all bends, tees, plugs, and combinations thereof.

d. All fittings and fire hydrants to be tied together with ¾ inch stainless steel all threads and I-bolts or with restrained joint fittings.

e. All water main joints shall be push on joints. Mechanical joints may be used for above ground water line installations.

f. All fittings are to be double wrapped in 6 mil plastic.

F. Ductile Iron Pipe

a. Ductile iron pipe shall be provided with polyethylene encasement. Provide minimum 2 wraps of 8-mil polyethylene, or

b. Polyethylene tube encasement shall conform with the minimum requirements of "Polyethylene Encasement for Gray and Ductile Cast Iron Piping for Water and other Liquids," ANSI/AWWA C-105, current revision. Soils within the project shall be tested to adequately determine the requirements of the encasement. Appendix A of ANSI/AWWA C-105 shall be consulted where

questions regarding soil conditions and encasement arise.

3.3.6 Water Meter Service

A. All water meters shall be installed by private contractors and inspected by the Village of Bonney.

B. A water meter permit must be obtained from the Village of Bonney prior to installation.

C. Stub outs for future water service are not allowed except where part of a preapproved master plan, site plan development plan or tract development plan.

D. In new residential developments, water service lines shall be provided for all lots on the opposite side of the street. Services shall normally be at lot lines with a ¾ inch minimum size to serve a single lot and 1 inch minimum for two lots. Lines shall be SDR-9 polyethylene. The Village of Bonney Building Inspector should be consulted to ensure the properly sized meter is selected for any proposed service.

E. Water service leads from the water main to the water meter shall be placed at a minimum 4 foot below final paving elevations.

F. Water Meter Service for Lines in or Along Rights-Of-Way

a. Meters 2 inches and smaller: Locate inside rights-of-way, water line easements, or in a minimum 5-foot by 5-foot exclusive water meter easement. Provide concrete meter boxes for meters located in sidewalks. Meters shall be located in areas with easy access and protection from traffic.

b. Meters 3 inches and larger: Locate in minimum 10'x20' separate water meter easement:

(1) Meters shall be located in areas with easy access and protection from traffic, and adjacent to rights-of-way whenever possible.

(2) Meters shall not be located in areas enclosed by fences.

c. Separate taps and service leads shall be designed for each meter. Meter, line size, and appurtenances shall conform to the latest edition of the Uniform Plumbing Code.

G. Meter boxes shall be located just within the public right-of-way if possible. Location of meters in the ditch of open ditch streets shall be avoided. Meter boxes shall be installed no more than 2 inches above grade.

H. For proposed multi-family developments, provide one master meter sized for the entire development. An above-ground, reduced pressure, zone-type backflow preventer shall be installed on the water line downstream from the meter.

I. For commercial developments with private on-site water mains for fire protection (i.e. not in a dedicated water line easement), provide fire service meters adjacent to the public right-of-way. If a dual (fire and domestic) feed is desired, both feeds shall be metered. An above-ground, reduced pressure, zone-type backflow preventer shall be installed on the water lines downstream from the meters.

3.3.7 Water Line Crossings within the Village of Bonney

A. Public and private utility crossings other than sanitary sewer: Where a water line crosses another utility other than a sanitary sewer, a minimum of 12 inches of clearance must be maintained between the outside wall of the water line and the outside wall of the utility.

B. Stream or ditch crossings

a. Elevated crossings

(1) Water lines shall be steel, ductile iron pipe, or other comparable high hoop strength material and shall extend a minimum of 15 feet beyond the last bend or to the right of way line, whichever is greater.

(2) Elevated crossings are preferred to underground crossings.

(3) Crossings attached to vehicular bridges are preferred to separate elevated water line structures.

(4) For new vehicular bridge construction, include provisions for attaching a water line.

(a) Adequate structural capacity shall have been calculated and provided for, including considerations for pipe deflection and all applicable loading.

(b) Clearance for maintenance purposes above bent cap elevation shall be provided where elevated water lines are to be run under bridges.

(5) For new water line crossings near existing vehicular bridges, a separate elevated water line structure shall be constructed.

(6) Design all elevated crossings with the elevation of the bottom of the

water line 2 feet above the 100-year water surface elevation in the channel.

(7) Create a high point in the elevated stream or ditch crossing and provide an air release valve at that highest point of the water line.

(8) Provide sufficient span length to accommodate the cross section of future widening of the stream or ditch to ultimate cross section.

(9) Base the columns' support designs on soil capacity, spacing, loading, and all pertinent structural requirements.

(10) Spacing of supports shall consider effect of support on channel hydraulics and be subject to city approval.

(11) Provide pedestrian pipe guards on elevated crossings.

b. Underground Crossings

(1) Provide a minimum 5 foot clearance from the top of the pipeline to the ultimate flow line of the ditch.

(2) Provide sufficient length to exceed the ultimate future development of the stream or ditch.

(3) Water lines shall be Class 150, C-900 or ductile iron pipe and shall extend a minimum of 40 feet beyond the last bend or to the right of way line, whichever is greater.

(4) Restrained Joints shall be used.

(5) Locate valves on each side of the crossing.

(6) Where other agencies have review authority or jurisdiction and have different underground crossing requirements, the more stringent of the two shall apply.

C. State Highway and County Road Crossings

a. Extend steel carrier pipe from 5' on each side beyond the edge of pavement.

b. The approval of the design by the appropriate governmental agency shall be demonstrated to the Village of Bonney before plans will be approved.

c. Where additional right-of-way has been acquired for future widening, the casing shall extend to the future right-of-way line.

D. Railroad Crossings

a. For main line and spur line railroad crossings, the water line shall meet the requirements of the governing agency and such requirements shall be followed from 5 feet beyond each right-of-way line and across the right-of-way itself. Any deviation must be approved by the railroad companies.

b. Where there is no railroad but a railroad owned easement or right-of-way, as a minimum, extend a steel casing from right-of-way to right-of-way line.

c. The approval of the design concept by the railroad involved must be obtained and demonstrated to the Village of Bonney before plans will be approved.

E. Additional Requirements

a. Use isolated flange joints for transitions between two dissimilar metallic pipes. Isolate water lines from casing with spacers and supports.

b. The carrier pipeline shall extend a minimum of 1-foot beyond the end of the casing to allow flanged joints to be constructed if necessary.

F. Oil and Gas Pipeline Crossings

Use PVC pipe when crossing a non-service transmission pipeline regardless of depth. All non-service transmission pipeline crossings must have the approval of the company whose lines are being crossed. Maintain a minimum 2 foot vertical separation between the pipeline and the water line.

G. Fire flow Water line Loops within Non-Residential Developments

For non-residential developments inside the Village of Bonney requesting on- site water mains, comply with the following requirements to allow maintenance and future repair operations if the Village of Bonney will be the entity maintaining the water main:

a. Avoid laying any new water lines under proposed or existing pavement, but where unavoidable, provide minimum 10 foot expansion joints (free joints) in the easement over the water line.

b. Fire flow water line loops within non-residential developments that are to be maintained by the Village of Bonney shall be placed in a 20-foot wide water line easement that shall be dedicated to the City.

c. There shall be no structures or equipment pads constructed over a publicly maintained water line.

3.3.8 Auger Construction: Use the following general criteria for establishing auger, bore and jack, or microtunneling sections when site conditions require their use. Identify the sections on the construction drawings.

A. Improved streets – Use auger or microtunneling construction to cross a street regardless of surface. Auger or microtunneling length shall be computed as roadway width at the proposed bore location plus a minimum of 10 feet to either side of roadway.

B. Driveways – Use auger or microtunneling construction to cross improved driveways. Bore and jack, auger or microtunneling length shall be a minimum of the driveway's width.

3.3.9 Circulation and Flushing for Water Quality: The layout of the water distribution system shall provide for maximum circulation of water.

A. Provide a source of fresh water at each end or at multiple points of a subdivision or development. Provide ways to create circulation and place valves and fire hydrants to allow simple flushing of lines.

B. Where stubs are provided for future extensions, isolate the stubs with a valve and no service connections will be allowed beyond the valve before the line is extended. Place two full joint of pipe between the valve and the plug.

3.3.10 New Water Lines Constructed Near Sanitary Sewers, Force Mains and Manholes

A. New Water Lines Parallel to Sanitary Sewer and Force Mains: Locate water lines a minimum of 10 feet horizontally, outside wall to outside wall, when parallel to sanitary sewers and force mains. Use the following procedure when site conditions prohibit achieving 10 feet of separation:

a. When a new water line is to parallel an existing sanitary sewer force main or gravity sewer and the 10 foot minimum separation cannot be achieved, the existing sanitary sewer shall be replaced with lined ductile iron pipe, SDR-26 with pressure gaskets, or PVC C-900 150 psi pipe or better and equipped with pressure type joints.

b. The water lines and sanitary sewer shall be separated by a minimum vertical distance of 2 feet and at least 4 feet horizontally (per 30 TAC 290.44)

measured between the nearest outside walls of the pipes, where the water line shall always be located above the sewer.

B. New Water Lines Crossing New and Existing Sanitary Sewers and Force Mains

a. No protection is required if the sanitary sewer is 10 feet below the water line.

b. Use the protective requirements given in Table 3.2 and 3.3 for sanitary sewer crossings not 10 feet below the water line.

C. Sanitary Sewer Manholes: Provide a minimum 10 foot horizontal clearance from outside wall of existing or proposed manholes, make manholes and connecting sewers watertight and test for leakage. If a 10 foot clearance cannot be obtained, the water line may be located closer to the manhole when prior approval has been obtained from the City Engineer by using one of the procedures below; however, in no case shall the clearance be less than 4 feet.

a. The Village of Bonney may require the water line to be encased when site conditions dictate or when the water line is within 5 feet of a manhole. The carrier pipe shall be a minimum of 1 joint of 150 psi pressure class pipe at least 20 feet long and two nominal sizes larger than the water conveyance pipe.

b. The water line may be augured, bore & jacked, or microtunneled past the manhole with at least one 20 foot section of 150 psi pressure pipe installed centered about the existing sanitary manhole with pressure grouting of the annular space using a bentonite/clay mixture or other commercial grouts.

Table 3.2 WATER LINE – SANITARY SEWER CROSSINGS

PRIMARY CONDITION	**PROPOSED WATER EXISTING SANITARY**				**PROPOSED WATER PROPOSED SANITARY OR EXISTING WATER PROPOSED SANITARY**			
SECONDARY CONDITIONS	WATER OVER SANITARY		WATER UNDER SANITARY		WATER OVER SANITARY		WATER UNDER SANITARY	
IF THE CLEARANCE IS	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’
*Protection Requirement	1	2	3	4a or 4b	5	6a	3	6b & 6c

*PROTECTION REQUIREMENTS FOR SANITARY SEWER CROSSINGS (All clearances shall be measured from outside wall to outside wall)

1. One 20-foot joint of C-900 or C-905 PVC, 150 psi centered over sanitary sewer; 12-inch minimum clearance.
2. If no evidence of sanitary sewer leakage, center one joint of water line over sanitary sewer; 24-inch minimum clearance. If the sewer line is leaking, the sewer line shall be replaced with 150 psi lined ductile iron pipe or other approved pressure pipe with appropriate adapters on all portions of the sanitary sewer within 10 feet of the water line.
3. Not allowed.
4. a. Auger, bore & jack or microtunnel 10 feet minimum each side of sanitary sewer. Place one 20-foot joint of C-900 or C905, 150 psi, centered under sanitary sewer. Fill bore hole with bentonite/clay mixture or grout; 2 foot minimum clearance. OR
   b. Replace the existing sanitary sewer with 150 psi lined ductile iron pipe, C-900 or other approved pressure pipe with appropriate adapters on all portions of the sanitary sewer within 10 feet of the water line.
5. Minimum 20 foot joint of sanitary sewer, 150 psi lined ductile iron pipe, C-900 or other approved pressure pipe centered at the water line, 6 inch minimum clearance. Also center an 20 foot joint of water line over the sanitary sewer line. The sanitary sewer line shall be embedded in cement stabilized sand for one pipe segment plus 1 foot beyond each joint.
6. a. Center a minimum 20 foot joint of sanitary sewer, 150 psi, lined ductile iron pipe, C-900 or other approved pressure pipe on water line.
   b. Use cement stabilized sand backfill for all portions of the sewer within 10 feet of the water line, as measured perpendicularly from any point on the water pipe to the wastewater pipe (minimum 2.5 sacks cement per cubic yard of sand). The cement-stabilized sand bedding shall start at a point 6 inches below the bottom of the sanitary sewer to 6 inches above the top of the sanitary sewer and one quarter of the pipe diameter on either side of the sewer.
   c. Center a minimum 20 foot joint of water line on the sanitary sewer line.

Table 3.3 PROTECTION REQUIREMENTS AT WATER LINE – FORCE MAIN CROSSINGS

PRIMARY CONDITION	**PROPOSED WATER EXISTING FORCE MAIN**				**PROPOSED WATER PROPOSED FORCE MAIN OR EXISTING WATER PROPOSED FORCE MAIN**			
SECONDARY CONDITIONS	WATER OVER FORCE MAIN		WATER UNDER FORCE MAIN		WATER OVER FORCE MAIN		WATER UNDER FORCE MAIN	
IF THE CLEARANCE IS	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’	Less than 2’	Greater than 2’ but less than 10’
*Protection Requirement	1	2	3	4a or 4b	5	6a	3	6a & 6b

*PROTECTION REQUIREMENTS FOR FORCE MAIN CROSSINGS (All clearances shall be measured from outside wall to outside wall)

1. Construct water line with a 20-foot ductile iron section with all related appurtenances centered above the force main; 6-inch minimum clearance.

2. Construct water line with one 20 foot joint of C-900 or C-905 150 psi PVC centered above the force main.

3. Not allowed.

4. a. Auger, bore & jack or microtunnel 10 feet minimum each side of force main. Place one 20-foot joint of C-900 or C905, 150 psi, centered under sanitary sewer. Fill bore hole with bentonite/clay mixture or grout; 2 foot minimum clearance. OR

   b. Replace the existing force main with 150 psi lined ductile iron pipe with appropriate adapters on all portions of the force main within 10 feet of the water line.

5. Center a minimum 20 foot joint of force main, 150 psi lined ductile iron pipe under water line and use cement-stabilized sand backfill for all portions of the sanitary sewer force main with 10 feet of the water line as measured perpendicularly from any point on the water pipe to the sanitary sewer force main pipe (minimum 2.5 sacks cement per cubic yard of sand). The cement-stabilized sand bedding shall be from a point 6 inches below the bottom of the sanitary sewer force main to 6 inches above the top of the sanitary sewer force main and one quarter of the pipe diameter of the sanitary sewer force main on either side of the sanitary sewer force main.

6. Minimum 20 foot of sanitary sewer force main, 150 psi lined ductile iron pipe centered at the water line.

3.4 QUALITY ASSURANCE

3.4.1 Prepare calculations and drawings prepared under the supervision of a Texas Professional Engineer trained and licensed under the disciplines required by the nature of the drawings. The final design drawings, must be sealed, signed and dated by the Professional Engineer responsible for development of the drawings.

3.4.2 For Elevated Stream and Ditch Crossings: Prepare design calculations for support columns and column spacing.

3.5 RECLAIMED WATER

3.5.1 Reclaimed water facilities shall meet or exceed the requirements of the TCEQ, as per 30 TAC Chapter 321, Subchapter P.

BONNEY, TEXAS

CHAPTER 4

SANITARY SEWER DESIGN CRITERIA

CHAPTER 4 – SANITARY SEWER DESIGN

4.1 SANITARY SEWER DESIGN GENERAL

4.1.1 Criteria for the design of sanitary sewer service and collection lines are herein established. All sanitary sewer lines constructed within the Village of Bonney or its Extraterritorial Jurisdiction (ETJ) shall follow these criteria and be in agreement with the Village of Bonney Comprehensive Plan.

4.1.2 Design, construction and sizing of all sanitary sewer systems shall meet or exceed the requirements of the Texas Commission of Environmental Quality (TCEQ) as per 30 TAC Chapter 217.

4.1.3 The "Village of Bonney" for the purposes of these criteria shall consist of all land within the city limits, and land located within the City's ETJ.

4.1.4 Design and construction shall conform to the Village of Bonney construction details and construction specifications.

4.1.5 This chapter addresses the design of the sanitary sewer systems to be located within the public right-of-way or a dedicated public easement. Sanitary sewers located on private property that are not in a dedicated public easement shall not be considered part of the publicly maintained sanitary sewer system.

4.1.6 The approving authority for the Village of Bonney with respect to the sanitary sewer system design criteria shall be the City Engineer.

4.1.7 For developments with multiple phases, consultant shall provide an overall general plan of the proposed wastewater collection system, including location of proposed lift station prior to approval of the first phase of development.

4.1.8 Wastewater collection system shall be designed to minimize the need for lift stations.

4.2 DEFINITIONS

4.2.1 Public Sanitary Sewer - Sewers that are maintained by the Village of Bonney and located in dedicated public easements or street rights-of-way, including pre-existing sanitary sewer lines that are serving the public at the time of the adoption of these regulations, and new public sanitary sewers that are installed in accordance with these standards.

4.2.2 Private Sewer – Sewers that are constructed and maintained by a private entity. Private sewers shall be located on private property. Private sewers are subject to the design and construction requirements of the Plumbing Code.

4.2.3 Sanitary Sewer Main – A sewer which receives the flow from one or more lateral sewers.

4.2.4 Lateral Sewer – A sewer running laterally down a street, alley or easement which receives flow from abutting property.

4.2.5 Service Lead – A sewer which branches off of a public sewer and extends to the limits of the public right-of-way. It shall be construed as having reference to a public sewer branching off from a main or lateral sewer to serve one or more houses, single family lots, or other types of small land tracts situated in the same block, but not directly adjacent to the main or lateral sewer. A service lead shall never exceed 100 feet in perpendicular length from the intersecting sewer main or lateral. If the sewer is designed to serve more than two houses, or the equivalent of two single family residences along a street, a lateral sewer as defined above shall be constructed.

4.2.6 Stack - A riser pipe constructed on main or lateral sewers which are deeper than 6 feet to facilitate construction of service leads or service connections.

4.2.7 Force Main - A pressure-rated conduit (i.e. ductile iron pipe, pressure-rated PVC, etc.) which conveys wastewater from a pump station to a discharge point.

4.3 DESIGN REQUIREMENTS

4.3.1 Easements: Sanitary Sewer Easements – the following minimum easements are required when facilities are not located within public street rights-of-way:

A. The width of all exclusive sanitary sewer easements shall be equal to the depth of the sewer from finished grade plus two (2) pipe diameters, rounded up to the nearest multiple of 5-feet. Sewer shall be located in the center of the easement. The minimum width of a sanitary easement shall be twenty (20') when not adjacent to public street rights-of-way.

B. Exclusive sanitary sewer easement adjoining a public right-of-way shall be a minimum of ten feet (10').

C. Exclusive easements for force mains of all sizes shall have a minimum width easement of fifteen feet (15') for a single force main where the force main is not located adjacent to a public right-of-way. Where the force main is located in an easement adjacent to public rights-of-way, the force main may be located at the center of a ten-foot (10') easement. Where the force main is located less than five feet (5') from the right-of-way line within the public right-of-way, the minimum easement width shall be ten feet (10') adjacent to the right-of-way.

D. Combined storm and sanitary sewer easements shall have minimum widths as required in Section 2.3.6 for storm sewer easements. Additionally, the sanitary sewer main, trunk or force main shall be located such that the centerline of the pipe shall be

located in at least half the width of the easement, as defined in Section 2.3.5.C, but not less than seven and one-half feet (7.5'), from the edge of the easement.

E. For combined storm and sanitary sewer easements located adjacent to public rights-of-way where the sanitary sewer is located along the outside of the easement, the centerline of the sanitary sewer pipe shall be located in at least half the width of the easement defined in Section 2.3.5.C, but not less than seven and one-half feet (7.5') from the outside edge of the easement.

F. Where sanitary sewers or force mains are installed in easements separated from public rights-of-way by other private or utility company easements, the sanitary sewer easement should be extended along or across the private utility company easement to provide access for maintenance of the sewer or force main.

4.3.2 Drawings to be Furnished

A. Before any sanitary sewer main or lateral sewer is constructed and before the City will approve any proposed sanitary sewer for construction, plan-and-profile sheets of the proposed sanitary sewer shall be prepared and submitted to the City for approval.

B. These drawings shall become the property of the Village of Bonney.

C. Drawings shall include at a minimum layout sheets with contours, plan-and-profile sheets, and details sheets for special items.

D. The construction drawings shall show at a minimum the exact location of the proposed sanitary sewer in the right-of-way, alley, or public easement with respect to the edge of the particular right-of-way, survey base line, any nearby utilities, 100-year floodplain elevation within the project area, major landscaping, and other structures (above ground and below ground) within the construction site.

4.3.3 Sanitary Sewer Mains and Lateral Sewers

A. Sanitary sewers shall be identified by number, letter, or other identification as shown on the sanitary sewer layout sheet and manholes shall be identified by letter or number.

B. Sanitary sewers must be shown in both plan and profile views.

C. The profile shall show other underground and surface utilities and facilities, both in parallel and at crossings; the size, grade, and type of pipe of the proposed line, the elevations of the proposed line to the hundredths of a foot at manholes, changes of grade and clean outs where allowed; and the proposed finished grade over the sewer

with elevations. Where proposed fill or cut is contemplated, the proposed new natural ground line should be shown as a separate line from the pre-existing natural ground line. Type of pipe, bedding and backfill shall comply with Village of Bonney standard specifications and standard details, or if not available, shall comply with the City of Houston standard specifications and standard details.

D. The construction drawings shall show the existing natural ground line at either the right-of-way or edge of easement when the proposed sanitary sewer is to be placed:

a. Between the existing pavement and the right-of-way line.

b. Between existing pavement and an existing or proposed easement.

E. When a sanitary sewer is located under existing pavement, then the finished elevations of the pavement shall be shown on the construction drawings.

4.3.4 Plan and Profile Required for Sewer Mains

A. Sanitary sewer overall layout sheets for single family residential subdivisions should use a standard engineering scale large enough to show the entire project on preferably one, but no more than two, standard 24”x36” sheets. In all cases, the following information must be shown on the layout.

a. All easements containing or buffering sanitary sewers, including corresponding recording information, if recorded by separate instrument.

b. Sanitary sewer sizes are shown at points of size change and between all manholes.

c. All manhole locations.

d. The sanitary sewer alignment shall accurately reflect in the plan and profile sheets the location of the sanitary sewer as shown on the detailed plan view. Alignment shall be stationed with 100-ft. stations.

e. Service leads that cross street pavement or serve adjacent property are to be shown on the overall layout.

f. The number, size, and layout of the lots depicted on both the overall sanitary sewer layout sheet and the individual plan-and-profile sheets shall match the number and size of the lots depicted on the final plat after recordation.

g. The direction of flow for existing and proposed sanitary sewers shall be shown on the overall sanitary sewer layout sheet.

h. The location of the proposed sanitary sewer within either the public right-of-way or a dedicated public easement.

i. The overall sanitary sewer layout sheet shall show the area, in acres or in number of lots plus any acreage outside the project area, which the proposed sewer is designed to serve. Include a vicinity map which references the project or lots to nearby major thoroughfares.

B. Commercial sanitary sewer layouts shall follow the same overall layout sheet format.

C. Horizontal and vertical scales for the detailed plan-and-profile views shall be confined to standard engineering scales.

D. The plan view shall show, at a minimum, all of the following information for the project area:

a. Topographical features.

b. Stationing for the proposed sewers.

c. All existing utilities including gas, power, telephone, fiber optic, cable etc.

d. Any significant landscaping or other structures which might impact construction or construction-related activities.

e. The width and type of existing and/or proposed easements.

f. Proposed service leads.

g. The limits of any proposed bore and jack, microtunnel, or auger operations.

h. Locations where pressure pipe is to be installed for water line crossings.

i. The proposed sanitary sewer with pipe diameter, length, material type, and grade clearly labeled.

E. The profile view shall show, at a minimum, all of the following information for the project area:

a. Underground and surface utilities/facilities which are either parallel to the proposed sanitary sewer or cross the proposed sanitary sewer within the construction site.

b. The proposed sanitary sewer's diameter, grade, length, and material type for each section between manholes. This shall be labeled on every applicable page and identified as "proposed."

c. The flowline elevation and centerline station for every sanitary sewer at every manhole.

d. The top of rim elevation of affected existing and proposed manholes.

e. The flowline elevation and centerline station at each sheet break.

f. The type of pipe bedding and backfill shall comply with Village of Bonney standard specifications and standard details where applicable.

g. The finished grade for proposed and existing pavement. Where cut and fill are proposed, the proposed new natural ground line should be shown as a separate line from the existing natural ground line.

h. The existing natural ground line at the centerline of the sanitary sewer when a sewer is to be placed between the edge of pavement and the public right-of-way. In the cases where roadside ditches exist, the centerline elevations of the roadside ditch shall be shown.

i. The existing ground line at the centerline of the proposed sanitary sewer where a sanitary sewer is to be placed within an existing easement. Show any proposed cut and fill as described above.

j. The limits of any proposed bore and jack, microtunnel, or auger operations.

k. Locations and limits of where pressure pipe is to be installed for water line crossings.

l. The location of special backfill and any proposed stacks shall be identified by stations indicated on the design plans.

m. Avoid vertical breaks in profiles. Use alternate scale for all profile sheets if all of proposed sanitary sewer cannot be shown on any one profile section for the station run indicated in plan view for that sheet.

F. All construction drawings for new sanitary sewers shall show the proposed location, by stations and offsets, of all service leads, and service connection risers.

4.3.5 Service Lead Construction for Residential and Commercial Developments

A. Space the location of service leads so as to limit the number of service lead taps to the lateral sewer or sewer main. Service leads should be spaced at every other property line between two adjoining residential lots unless there is an odd number of lots. The City reserves the right to direct the engineer to relocate any proposed service lead upon reviewing any submitted plans. A single 6-inch service lead located at the property line between two adjoining residential lots would serve two single-family residences with a wye placed at the end of the service lead. The wyes shall be located at the private property line.

   a. Near side double sewer service leads shall not exceed 5 feet in length, shall terminate at the property line, and shall be located within the public right-of-way or public easement.

   b. In cases where the sanitary trunk main is further than 5 feet from edge of the right-of-way, a single 6-inch service shall be run from the sewer main to the edge of the right-of-way whereupon a wye shall be placed as described above. This shall apply to residential sanitary service leads and not to commercial service taps.

B. Any far side service lead of more than 150 feet perpendicular to the street right-of-way shall be treated as a lateral sewer.

C. Service leads for single-family developments should connect to the manhole whenever practical. Commercial or industrial service leads expected to discharge more than 5000 gallons-per-day shall discharge directly into a proposed or existing sanitary sewer manhole. Where the flowline of the service lead is 30 inches or greater above the flow line of the manhole, provide a standard drop manhole.

   a. Service leads shall be provided to serve each lot or parcel within a proposed residential, commercial or industrial development. The detail for a typical near-side and far-side service leads shall be included with the construction drawings.

   b. Service leads shall be a minimum of 6 inches in diameter where two or more lots or parcels are served. If the perpendicular length of a service lead exceeds 100 feet, it shall be considered a lateral sewer, the minimum diameter shall be 8 inches, it shall end in a manhole, and a manhole shall be utilized for connection to the public sewer.

   c. In such cases where a service lead is proposed to run diagonally across the street, prior approval from the City Engineer must be obtained.

   d. Service leads with a diameter of 6 inches shall utilize full body fittings be they extruded or factory-fabricated for connection to a proposed public sewer

or an approved saddle-type connector for connection to an existing public sewer.

e. PVC saddle-type connectors with gasket and stainless steel straps shall be installed with the stub oriented 45 degrees from the springline. Tees may be oriented the in the same manner.

f. The service lead shall be placed so as to minimize the use of bends as site conditions permit.

g. For existing residential lots (which are not served in accordance with these guidelines) that need a service lead, if the distance to the nearest existing sanitary sewer is less than 60 feet, the service lead shall be a 6 inch service tap if only one lot or parcel is to be served. Commercial and industrial lots and parcels shall have a minimum 6 inch service tap under the same conditions.

h. The location where the service lead or wye meets the property line shall be shown on the plans and as-builts, and marked in the field as shown on the standard details. There shall be a riser placed where the service lead meets the property line so that the service lead stub-out can be recovered at the time that the connection to the service lead is made.

i. All service leads shall be installed at the time of the construction of the sanitary sewer in new residential subdivisions.

4.3.6 General Requirements

A. A licensed plumber shall be responsible for connecting private residential sanitary sewer service to the public sanitary sewer system, to wyes and/or tees or to lateral sewers as indicated on the plans. Said licensed plumber shall be responsible for a properly installed and watertight private residential service connection.

B. Commercial service connections to the public sanitary sewer shall be made at manholes.

C. Materials and construction shall conform to the Village of Bonney Standard Specifications and Standard Details where applicable.

D. All constructed sanitary sewer lines shall be air tested for leaks and a mandrel pulled for structural defects. All sanitary sewer testing shall comply with or exceed the procedures and qualifications listed in Texas Administrative Code, Chapter 217.57. Manhole testing shall comply with or exceed the procedures and qualifications listed in Texas Administrative Code, Chapter 217.58.

E. All public sanitary sewers and service leads shall have bedding and backfill that shall comply with or exceed Village of Bonney Standard Specifications and Details. Those sanitary sewers that are bore and jacked, microtunneled, augured, or encased in a steel pipe may require special bedding and backfill.

F. Backfill shall be in accordance with Standard Details.

G. Public sanitary sewers and force mains shall be located in either the public right-of-way or public easements. Side lot and back lot easements are not allowed. The location of the sanitary sewer within a dedicated public easement shall be along the centerline of the proposed public easement or as close to the centerline as can be designed. In those instances where the public easement is adjacent to the public right-of-way, the lateral location of the sanitary sewer shall be at the discretion of the Design Engineer with City approval.

H. The drawings of the sanitary sewer shall show the location of any existing pipe or duct that might interfere with the construction of the sanitary sewer and call to the attention of the City any known obstacles that might be encountered in constructing the sanitary sewer in any location under consideration. The Professional Engineer of Record shall determine the existence of pipes, ducts, obstacles and other utilities (i.e. gas, telephone, electric, fiber optic, cable, etc.) from a visual survey on the ground plus research of the public records and private records when available.

I. Sanitary sewers within the Village of Bonney's jurisdiction shall be designed and installed at such a size and depth as to allow for orderly expansion of the system, so as to avoid duplication in the future.

J. Sanitary sewers shall be separated from water lines by a minimum of 9 feet of horizontal clearance. See Chapter 3 Water System Design for water and sanitary sewer crossing design criteria.

K. Sanitary sewers shall be separated from storm sewer lines by a minimum of 4 feet of horizontal clearance and the storm sewer line shall be above the sanitary line where possible.

L. For sanitary sewers crossing utilities other than water or storm sewer (i.e. gas, telephone, electric, fiber optic, cable, etc.) a minimum of 12 inches of horizontal clearance shall be maintained as measured from outside wall to outside wall.

4.3.7 Line Size

A. The minimum pipe diameter for a public sanitary sewer main or lateral sewer other than a service lead shall be 8 inches.

B. Service leads 6 inches in diameter shall not serve more than the equivalent of 2 single family lots or other equivalent types of small land tracts. Four inch service leads are not allowed.

C. Service leads for single family residential lots shall have a recommended grade of 0.70% and a minimum grade of 0.50% for a 6 inch line.

D. For commercial service leads such as street bores, the required size of the line shall be established from the plumbing drawings. Commercial, industrial, and office areas shall be designed for an average daily flow that can be anticipated from the contributing service area.

E. Commercial sewer service leads shall be 6 inch pipe or larger. A single 6 inch commercial service connection shall not serve more than one commercial lot or parcel. Four inch service leads for commercial developments are not allowed.

F. Sewer mains and lateral sewers shall meet at a manhole. Sewer mains and lateral sewers shall end in a manhole.

G. The City Engineer shall have final review and approval authority as to the size and depths required for sanitary sewer mains and lateral sewers.

4.3.8 Line Depth

A. The sanitary sewer should be laid with the top of the pipe a minimum of 4 feet below the surface of the natural ground or finished grade.

B. Sanitary sewers laid in street rights-of-way with a curb and gutter section shall have a minimum cover of 4 feet from the top of the pipe to the flowline elevation of the gutter in the street at all locations. The Professional Engineer of Record shall account for any anticipated future sanitary sewer extension whereas the future sanitary sewer extension shall have a minimum 4 feet of cover from the top of the pipe to the flowline of the gutter of the street. The Professional Engineer of Record shall adjust the depth of the proposed pipe accordingly. The Village of Bonney reserves the right to require greater depth where the need is perceived by the City.

C. Sanitary sewers laid in street rights-of-way with crowned roads and roadside ditches shall have a minimum depth of 5 feet from the crown of the road to the top of the pipe and an absolute minimum cover of 4 feet below the flowline of a roadside ditch when non- rigid pipes of low hoop strength are used. The Village of Bonney shall have final determination on any deviation from these criteria.

D. Where the cover over the pipe is less than 4 feet, the sanitary sewer shall be laid with

Class 150 pressure pipe, steel pipe or ductile iron pipe. Class 150 pressure pipe must be backfill with cement stabilized sand in accordance with the Standard Details. Ductile iron pipe may be used but shall be lined with either a polyethylene or polyurethane coating with manufacturer recommendation and applied by the pipe manufacturer. The minimum liner thickness shall be 40 mil. Other rigid pipe or pressure pipe will be considered for approval on a case-by-case basis.

E. Maximum depth for 8-12 inch diameter collection lines shall be 20 feet from average ground surface to sanitary sewer invert. Depths greater than 20 feet shall require the use of Class 150 pressure pipe with backfill in accordance with the Standard Details. Ductile iron pipe may be used but shall be lined with either a polyethylene or polyurethane coating with manufacturer recommendation and applied by the pipe manufacturer. The minimum liner thickness shall be 40 mil.

4.3.9 Line Grades

A. The following table lists the minimum grade for 6-inch to 27-inch diameter public sanitary sewers. The recommended velocity for a sanitary sewer flowing full shall be 2.3 feet per second (fps). The minimum velocity for a sanitary sewer flowing full shall be 2.0 feet per second (fps). The maximum recommended grade shall be calculated by the Professional Engineer of Record for a maximum velocity of 4.5 fps based on a Manning equation for full flow with the Manning's "n" equal to 0.013.

PIPE SIZE (I.D., In.)	MINIMUM GRADE (PERCENT)
6	0.70
8	0.44
10	0.33
12	0.26
15	0.19
18	0.15
21	0.13
24	0.11
27	0.087

B. For sewers larger than 27 inches in diameter, the Professional Engineer of Record shall determine the appropriate grade utilizing Manning's Formula, using a minimum full pipe velocity of 2.fps.

4.3.10 Gravity sanitary sewers shall be laid in straight alignment with uniform grade between manholes. Non-uniform grade change without the use of manholes at the grade change is not allowed.

4.3.11 Manholes

A. Type: Manholes shall be precast concrete manholes in accordance with the standard

detail. All sanitary sewer manholes shall be Corrosion Resistant Manholes per city detail. It shall be the responsibility of the Professional Engineer of Record to ensure that the precast manholes conform to the latest ASTM requirements. Manhole covers shall have the Village of Bonney logo on them. All manholes shall be installed with stainless steel manhole inserts with 1/8 inch vents, strap handles and bolts .

B. Location: Manholes shall be placed at changes in alignment, changes in grade, changes in size of sanitary sewers, at the intersection of sanitary sewers, junction points, and either at street, alley, or easement intersections.

a. The maximum distance between manholes shall be determined from the following table for 8 inch to 48 inch pipe diameters. Spacing for manholes on sewer mains with diameters larger than 48 inches shall be recommended on an individual basis by the Professional Engineer of Record subject to Village of Bonney approval.

PIPE DIAMETER IN INCHES	MANHOLE MAXIMUM SPACING IN FEET
8-15	400
18-48	800
>48	Per PE of Record, subject to Village of Bonney Approval

b. Place manholes at the dead-end of sewer mains and lateral sewers.

c. Manhole covers shall be cast iron, traffic bearing type ring and cover.

d. Manholes shall not be located within handicap ramps and sidewalks if possible. Provide 5’ X 5’ blockout if necessary.

e. Criteria for Manhole Junctures

(1) Connections between public sanitary sewers and the manhole shall adhere to the following criteria.

(a) The elevation of the crown of the discharging sanitary sewer shall match the elevation of the crown of the receiving sanitary sewer for both equal and unequal pipe diameters.

(b) Drop manholes are allowed. A drop connection or drop manhole is required when the difference in elevation between the effluent flowline and the influent flowline is greater than 30 inches.

C. Manholes should be located as to minimize or eliminate the inflow of stormwater into the sanitary sewer. The top of manhole rim shall be set a minimum of 3 inches above the surrounding finished grade when the manhole is not in a paved roadway. Sealed manholes

are required on all newly constructed manholes within the 100-year flood plain. Under no circumstances shall the elevation of the top of rim of a sanitary sewer manhole be below the 100-year base flood elevation for the area in which it is built.

4.3.12 Manholes shall be constructed in accordance with the Standard Details where applicable. All manholes shall include rubber seals precast into the manhole for pipe inserts (no cement or grout). Precast manholes shall incorporate a boot-type connector for sanitary sewer diameters up to 24 inches. For sanitary sewer diameters greater than 24 inches, utilize either the boot-type connector (if available) or an integral gasket.

4.3.13 Steps in manholes are not allowed.

4.3.14 All manhole adjustments shall be made with precast concrete rings when an additional precast vertical section is too large. No brick manholes are allowed.

4.3.15 All manholes shall be tested by the construction contractor and results provided to the Village of Bonney before being accepted by the city for maintenance. The Village of Bonney reserves the right to require retesting of manholes if there is reason to question the results. All manhole testing shall comply with or exceed the procedures and qualifications listed in Texas Administrative Code, Chapter 217.58.

4.3.16 Lift Stations

A. Lift station design and construction drawings as well as design requirements and pertinent data shall be sealed by a Professional Engineer registered in the State of Texas and submitted with the construction drawings for review by the City. Lift stations shall comply with Texas Administrative Code, Chapter 217.59-217.63.

B. Lift Stations should be considered only when a gravity system cannot be achieved from both an engineering and an economic standpoint. Lift stations should only be considered with prior approval from the Village of Bonney or where the lift station is designed to be temporary in nature.

C. Operation and maintenance should be considered in the design of the lift station and the location of the lift station.

D. Wet Wells

a. Provide adequate clearance between pumps so as to easily facilitate retrieval of a pump (refer to manufacturer's recommendations). A minimum of 2 feet of clearance shall be provided between pumps and walls.

b. Wet well working volume shall be sized to allow for the following minimum pump cycle times:

Pump Horsepower (largest pump)	Minimum Cycle Time (minutes)
Less than 50	6
50-100	10
Over 100	15

c. Tie reinforcing steel in lift station base to walls to provide watertight wet well (includes caisson construction).

d. The below grade wet well and valve vaults are subject to buoyant forces. Include buoyancy calculations to ensure that the structure weight (include walls and slab only) will be sufficient to offset these forces.

E. Lift Station Site

a. Site shall have a minimum size of 60 feet by 60 feet.

b. Site access shall be provided by a minimum 20-foot wide public right-of-way or permanent access easement.

c. Provide a 20-foot wide concrete vehicular access road to the site. Drive shall terminate adjacent to the station with a parking space such that a truck mounted hoist can remove pumps. Lift Station located within or adjacent to a residential subdivision shall be required to have a concrete driveway.

d. Wet well or dry well structures shall be a minimum of 20 feet from outside walls of structure to site boundary fencing.

e. Indicate method of drainage of site on site plan. Internal drainage, sheet flow, and valley gutter driveways are acceptable. Drain to street or storm sewer, never onto adjacent private property.

F. Site Security

a. Lift station shall be enclosed in a building or fenced in such a way to deter unauthorized operation, vandalism, or terrorism.

b. Fence shall be constructed of masonry, with steel gate and posts set in concrete. Fence shall be at minimum 8 feet high.

c. Fence shall be located completely inside the site boundary.

G. The design of the lift station, including all electrical and mechanical equipment, must

be designed to withstand and operate during a 100-year flood event. The lift station's control panel shall be located a minimum of 2 feet above the nearest base flood elevation. The top of concrete of the lift station's wet well shall be a minimum of 2 feet above the nearest base flood elevation.

H. Pumps shall be sized to operate at optimum efficiency. Minimum acceptable efficiency at the operating point shall be 60%. Include pump and system head curves and pump information summary chart on plans.

I. A peak factor of 4 shall be used for Lift Station design.

J. Low water level shall be at least 6 inches above impeller, higher if required by manufacturer. Complete immersion of submersible pump motor at low water level is preferred.

K. Vent pipe shall be 8 inches minimum diameter, made of stainless steel and shall be equipped with odor control system.

L. Nuts, bolts, chains, and all other metal components within wet well shall be stainless steel, not carbon steel.

M. Dual stainless steel guide rails (or other pump removal method that avoids entering wet well) are required for submersible pumps.

N. Bedding for PVC force main is bank sand, a minimum of 6 inches on all sides of pipe.

O. PVC force mains shall be Pressure Class 150 or DIP bedded in bank sand and polyethylene wrapped.

P. The velocity in the force main and riser pipes shall be less than 8 fps and greater than 2 fps.

Q. Backfill structural excavations (wet well, etc.) with cement stabilized sand.

R. Lift station site plans shall be submitted in scales of 1 inch = 5 feet or 1 inch = 10 feet.

S. Provide a protective coating to interior walls of wet well. The City Engineer shall approve coating or additive used.

T. Lift station shall be equipped with a telephone dialer and a red alarm light, approved by City. A transducer system shall be installed and shall be connected to telemetry system to monitor the status of the lift station. Floats will be utilized as back up to the transducer.

U. Power supply to lift station shall be 3 phase and 480 volts where possible.

V. A system of transducer with floats as backup shall be provided to control pumps.

W. A tee, plug valve, and blind flange assembly are required on the force main on the downstream side of the discharge valves and header. This is required so truck- mounted pumps can bypass the lift station pumps and piping while emergency repair or maintenance work is being done.

X. Lift station must be equipped with automatic transfer switch properly sized to connect to an on-site generator.

Y. All lift station shall be required to have on-Site Generators. Generators must be sized to operate the lift station at its firm pumping capacity or at the average daily flow, if the peak flow can be stored in the collection system.

Z. All sanitary sewer lift stations and WWTP design shall include provision for SCADA control system. Specifications shall be based on City of Houston criteria.

AA. Provide O&M Manual as part of the approval/acceptance of infrastructure.

4.3.18 Design Analysis

A. Calculations of design flows for the overall development or project shall be approved by the Village of Bonney.

4.4 QUALITY ASSURANCE

4.4.1 Prepare calculations and construction drawings under the supervision of a Professional Engineer trained and licensed under the disciplines required by the drawing. The final construction drawings must be sealed, signed, and dated by the Professional Engineer responsible for the development of the drawings. If more than one Professional Engineer was responsible for the development of the design/construction drawings, then the appropriate Professional Engineer should seal the drawings he is responsible for.

4.4.2 Post Construction TV Inspection of Sanitary Sewer System -

A. Contractor shall provide post construction CCTV surveys and assessments conducted after, and only after, all major construction has been completed and the line segment or manhole has passed all required post construction testing. Any line segment or manhole that has been televised or assessed prior to the full completion or testing of any newly constructed or rehabilitated sewer appurtenance will be rejected.

4.5 UNSEWERED BUILDING SITES AND SEPTIC TANKS

4.5.1 It is the responsibility of the land owner to contact the City to determine if a site has sanitary sewer service available.

4.5.2 If a lot or parcel is within 500 feet of an existing sanitary sewer then the site shall tie-on to the existing sanitary sewer. The owner/developer must pay for all materials, installation, and testing before the city will accept the sewer for maintenance.

4.5.3 Building sites proposing On-Site Sewage Facilities (OSSF) (i.e. septic tanks) shall obtain approval and applicable permits from the Brazoria County Department of Environmental Health. A copy of the permit shall be provided to the Village of Bonney prior to OSSF installation.

BONNEY, TEXAS

CHAPTER 5

STORM WATER DRAINAGE DESIGN CRITERIA

CHAPTER 5 – STORM WATER DRAINAGE DESIGN

5.1 STORM WATER DRAINAGE DESIGN GENERAL

5.1.1 The following sections include criteria for the design of storm water drainage improvements for the Village of Bonney and its Extraterritorial Jurisdiction (ETJ). These Storm Water Drainage Design Requirements are based on the Brazoria County Drainage Criteria Manual, dated November 2003, which is incorporated herein by reference. Refer to the Drainage Criteria Manual for complete methodologies, descriptions, tables and charts.

5.1.2 Drainage approval by the Village of Bonney is required for all development within city limits and within its extraterritorial jurisdiction. All drainage facilities proposed within these limits are to adhere to these criteria.

5.1.3 Development within the Village of Bonney or its extraterritorial jurisdiction will also require the approval of the applicable Drainage District. Brazoria County Drainage District No. 5 is the Drainage District responsible for the majority of drainage district oversight within Village of Bonney. Brazoria Drainage District No. 4 is responsible for certain northwest portions of the City. Although the Village of Bonney is not actually located within the boundary of Brazoria County Conservation and Reclamation District No. 3, a portion of the outfall drainage from the City enters C&R No. 3 channels and, therefore, their criteria and standards are to be considered where applicable.

5.1.4 All outfall pipes, ditches, and structures that enter Drainage District Channels or Facilities shall be designed according to requirements of the applicable Drainage District. If there is a discrepancy in the drainage criteria requirements between the City and applicable Drainage District, the City Engineer shall determine which criteria to apply.

5.1.5 Development and drainage shall comply with all applicable Village of Bonney Ordinances, including, but not limited to, the Floodplain Ordinance (No. 2006-10) and the Culvert Ordinance (No. 2002-9).

5.1.6 The goal for these criteria is to provide protection in a 100-year storm event. This is accomplished with the application of various drainage enhancements such as storm sewers, roadside ditches, open channels, detention, and overland (sheet) runoff. The combined system is intended to prevent structural flooding from extreme events up to a 100-year storm. In order to protect existing properties, water levels, due to runoff, shall not be increased upstream or downstream of a development due to the improvement.

A. Street Drainage: Street ponding of short duration in significant storms is anticipated and designed to contribute to the overall drainage capability of the system. Storm sewers and roadside ditch conduits are designed as a balance of capacity and economics. These conduits are designed to convey less intense, more frequent 5 year storms with the intent of allowing for traffic movement during these events. When rainfall events exceed the

capacity of storm sewer system, the additional runoff is intended to be stored or conveyed overland in a manner that reduces the threat of flooding to structures.

B. Flood Control: The Village of Bonney is a participant in the National Flood Insurance Program. The intent of the flood insurance program is to make insurance available at low cost by providing for measures that reduce the likelihood of structural flooding.

C. Relationship to the Permitting Process: Approval of storm drainage is a part of the review process for platting and permitting of the new development. All plans for plats and proposed new construction shall include drainage improvements in the plans submitted to the City Engineer.

5.2 DEFINITIONS

5.2.1 Conduit: Any open or closed device for conveying flowing water.

5.2.2 C&R No. 3: Brazoria County Conservation & Reclamation District No. 3

5.2.3 Drainage Area Map: Area map of watershed which is subdivided to show each area served by each subsystem.

5.2.4 DD No. 4: Brazoria Drainage District No. 4.

5.2.5 DD No. 5: Brazoria County Drainage District No. 5.

5.2.6 FEMA: Federal Emergency Management Agency.

5.2.7 Hydraulic Grade Line: A line representing the pressure head available at any given point within the drainage system.

5.2.8 In-Fill Development: Development of open tracts of land in areas where the storm drainage infrastructure is already in place and takes advantage of the existing infrastructure as a drainage outlet.

5.2.9 Public Storm Sewers: Defined as sewers and appurtenances that provide drainage for a public right-of-way, or more than one private tract, and are located in public right-of-way or easement and officially accepted by the City for maintenance. Private storm sewer connections public storm sewers shall occur at a manhole or at the back of an inlet, as approved by the City. All private storm sewers shall be constructed in conformance with these standards.

5.2.10 Rational Formula: A method for calculating the peak runoff for a storm drain system.

5.2.11 Redevelopment: A change in land use that alters the impervious cover from one type of development of either the same type or another type, and takes advantage of the existing infrastructure in place as drainage outlet.

5.2.12 Sheet Flow: Overland storm runoff that is not conveyed in a defined conduit, and is typically in excess of the capacity of the conduit.

5.3 DESIGN REQUIREMENTS

5.3.1 Storm Sewer Easements – the following minimum easements are required when facilities are not located within public street rights-of-way:

A. When not adjacent to public street rights-of-way, the minimum width shall be twenty feet (20') with the storm sewer centered in an exclusive easement.

B. For storm sewers greater than eight feet (8') and less than or equal to twelve feet (12') in diameter or width, the minimum width of an exclusive easement shall be twenty-five feet (25').

C. For storm sewer greater than twelve feet (12') in diameter or width, the minimum width of an exclusive easement shall be determined by the City Engineer.

D. For storm sewers whose depth to flow line is greater than fifteen feet (15'), add five feet (5') to the minimum easement widths specified in Sections 2.3.6.A and 2.3.6.B.

E. For all easements specified in Section 2.3.6, a minimum distance of five feet (5') must be maintained from the easement line to the outside edge of the storm sewer.

F. Where approvals are granted for a special use or combination easement located along side lot or back lot, the minimum width shall be twenty-five feet (25'). The easement width shall meet or exceed all other easement requirements.

G. For specifically approved storm sewers located in an exclusive easement adjacent to public rights-of-way, the minimum easement width shall be ten feet (10'). The easement width shall meet or exceed all other easement requirements.

5.3.2 All projects shall be tied to National Geodetic Survey (NGS) Datum Adjustment which matches the Federal Emergency Management Agency (FEMA) rate maps or the most current NGVD which matches the FEMA rate maps. At least two references to bench marks relating to the FEMA rate maps must be identified. Equations may be used to translate other datum adjustments to the required adjustment.

5.3.3 Plan sets will include a drainage area map which shall contain all storm sewer drainage calculations.

5.3.4 All drainage systems for curb and gutter pavements shall be underground closed conduits; individual residential lot drainage is exempt. Drainage systems for pavements without curb and

gutter shall be roadside open-ditch sections.

5.3.5 Plan sets shall include the 5 year Hydraulic Grade Line for storm sewers and roadside ditches on the plan and profile sheets.

5.3.6 The quantity of storm water runoff (peak discharge) shall be determined for each inlet, pipe, roadside ditch, channel, bridge, culvert, outfall, or other designated design point by using the following criteria:

A. Determination of Runoff:

Design storm Events - All drainage improvements shall be designed for the following storm frequencies:

Roadside Ditches	5 years
Storm Sewers	5 years
Open Drainage Channels serving less than 100 acres	25 years
Secondary Arterials	25 years
Bridges	100-years
Creeks/Channels	100-years
Detention Facilities	100-years

B. Intensity-Duration Curves: Table 2-1 of the Brazoria County Drainage Criteria Manual provides intensity-duration values to be used for storm sewer and roadside ditch design in the Village of Bonney. These intensities are derived from the formula:

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

Values are as listed below:

Rainfall Frequency						
Duration	**2-yr.**	**5-yr.**	**10-yr.**	**25-yr.**	**50-yr.**	**100-yr.**
5 minute	0.57	0.64	0.69	0.78	0.84	0.91
15 minute	1.21	1.38	1.51	1.71	1.86	2.02
60 minute	2.35	2.87	3.24	3.78	4.20	4.62
2 hour	2.85	3.75	4.35	5.00	5.60	6.20
3 hour	3.30	4.10	4.90	5.60	6.30	7.15
6 hour	3.70	5.00	5.85	6.85	7.80	8.75
12 hour	4.40	6.00	7.25	8.50	9.60	10.75
24 hour	5.10	7.00	8.55	9.95	11.50	13.00

C. The Rational Method shall be used for determining the peak flow rate in the sizing of all local drainage improvements with drainage areas less than 100 acres.

D. Coefficients for the Rational Method:

a. Run-Off Coefficient: The following values for the run-off coefficient "C" in the Rational Method formula will vary based on the land use. Land use types and "C" values which are to be used in Village of Bonney are as follows:

Land Use Type	Run-Off Coefficient
Raw Undeveloped Acres	0.20
Improved Undeveloped Acres (i.e. mowed filled, regraded, etc.)	0.30
Park Land	0.20
Residential:	
Single Family Lots greater than 0.75 acre	0.35
Single Family Lots 0.25 acre to 0.75 acre	0.45
Single Family Lots less than 0.25 acre	0.55
Townhomes/Patio Homes	0.65
Commercial	0.80
Multifamily	0.80
Industrial	
50% impervious	0.65
75% impervious	0.75
95% impervious	0.85
Pond (detention and amenity)	1.00

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

E. Design Frequency:

a. Design Frequency:

(1) Newly Developed Areas: The design storm event for sizing storm sewers in newly developing areas will be a 5-year rainfall. Detention shall be provided and in accordance with Section 5.3.6 J. Calculations shall show that water surface elevations are not increased upstream or downstream of the tract.

(2) Redevelopment or In-Fill Development: The existing storm drain will be evaluated using a 5 year storm, assuming no development takes place. The storm drain will then be evaluated with the development in place.

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

(b) If the impervious cover is increased, detention shall be provided in accordance with Section 5.3.6 J.

(2) Private Drainage Systems: Storm sewers for private drainage systems shall conform to the requirements of public drainage systems.

b. Velocity Considerations:

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

(2) Design velocities shall be a minimum of 2 feet per second (fps) with the pipe flowing full.

(3) Maximum velocities should not exceed 7 feet per second.

(4) Minimum Storm Sewer Pipe Slopes:

Pipe Diameter	% Slope
24	0.07
30	0.05
36	0.04
42	0.032
48	0.027
54	0.023
60	0.020

For pipe sizes not listed above, the minimum slope should be determined utilizing a design velocity of 2 fps.

c. Pipe Sizes and Placement:

(1) Use the storm sewer and inlet leads with at least 24 inch inside diameter or equivalent cross-section. Box culverts shall be at least 2'x2'. Closed conduits, circular, elliptical, or box, shall be selected based on hydraulic principals and economy of size and shape.

(2) Larger pipes upstream should not flow into smaller pipes downstream unless the upstream system is intended for use in detention.

(3) Match crowns of pipe at any size change.

(4) Locate public storm sewers in public street rights-of-way or in dedicated drainage easements. Side and back lot easements are discouraged. If unavoidable, the easement shall be at least 20 feet wide with the storm sewer centered in the easement.

(5) Follow the alignment of the right-of-way or easement when designing cast-in-place concrete storm sewer easements.

(6) A straight line shall be used for inlet leads and storm sewers.

(7) Center storm sewer in side-lot storm sewer easements.

(8) Provide 5 feet minimum from edge of pipe to edge of easement.

d. Starting Water Surface and Hydraulic Gradient:

(1) The hydraulic gradient shall be calculated assuming the top of the outfall pipe as the starting water surface.

(2) At drops in pipe invert, should the upstream pipe be higher than the hydraulic grade line, then the hydraulic grade line shall be recalculated assuming the starting water surface to be at the top of pipe at that point.

(3) For the design storm, the hydraulic gradient shall at all times be below the gutter line for all newly developed areas.

e. Manhole Locations:

(1) Use manholes for precast conduits at the following locations:

(a) Size or cross-section changes.

(b) Inlet and conduit intersections.

(c) Changes in pipe grade.

(d) A maximum spacing of 500 feet measured along the conduit run.

(e) Manholes shall be placed so as not to be located in driveways.

f. Inlets:

(1) Locate inlets at all low points in gutters.

(2) Valley gutters across intersections are not permitted.

(3) Inlet spacing is generally a function of gutter slope. For minimum gutter slopes, the maximum spacing of inlets shall result from a gutter run of 500 feet from high point in pavement or the adjacent inlet on a continuously graded street section, with a maximum of 1000 feet of pavement draining towards any one inlet location.

(4) Use only Standard Inlets:

Inlet	General Application	Capacity
Type A	Parking Lots/Small Areas	2.5 cfs
Type B-B	Residential	5.0 cfs
Type C	Streets	5.0 cfs
Type C-1	Commercial	10.0 cfs
Type D	Parking Lots	2.0 cfs
Type E	Roadside Ditches	20.0 cfs

(5) Beehive grate inlets or other specialty inlets are not allowed.

(6) Do not use grate top inlets in an unlined roadside ditch.

(7) Place inlets at the end of the proposed pavement, if drainage will enter or leave pavement.

(8) Do not locate inlets adjacent to esplanade openings.

(9) Place inlets on side streets intersecting major streets, unless special conditions warrant otherwise.

F. Consideration of Overland Flow:

a. Design Frequency: The design frequency for consideration of overland sheet flow will consider extreme storm events which exceed the capacity of the underground storm sewer system resulting in ponding and overland sheet flow through the development to the primary outlet.

b. Relationship of Structure to Street: All structures will be at least 24 inches higher than the highest level of ponding anticipated resulting from the 100-year event analysis.

c. Calculation of Flow:

(1) Streets will be designed so that consecutive high points in the street will provide for a gravity flow of drainage to the ultimate outlet.

(2) The maximum depth of ponding will be 12 inches above the curb gutter, or 6 inches above the centerline of roads without curb, during the 100-year storm event.

(3) Sheet flow between lots can be provided only through a dedicated drainage easement.

(4) A map shall be provided to delineate extreme event flow direction through a proposed development and how this flow is discharged to the primary drainage outlet.

In areas where ponding occurs and no sheet flow path exists, then calculations showing that run-off from the 100-year event can be conveyed through inlets to the storm system and/or detention pond must be provided.

d. Overland flow shall enter the drainage facilities (channels or detention pond) through a storm sewer sized to convey the 100-year event. Calculations shall be submitted for sizing the storm sewer and determining that adequate inlet capacity exists.

G. Design of Open Channels:

a. Design Frequency:

(1) Open channels shall be designed according to the Brazoria County Drainage Criteria Manual, or the applicable Drainage District, whichever is more stringent.

(2) Design standards for channel construction should follow the requirements specified in the corresponding Criteria Manual.

b. Determination of Water Surface Elevation:

(1) Water surface elevations shall be calculated using Manning's Equation and the Continuity Equation.

(2) For the design storm event, the water surface should be calculated to remain within banks and below freeboard.

c. Design of Culvert Crossings for Open Channels:

(1) Head losses in culverts shall conform to TxDOT Design Division Hydraulics Manual, Chapter 7 - Culverts.

(2) Culverts shall be Class III RCP conforming to ASTM C-76 or smooth interior dual wall corrugated polyethylene pipe conforming to AASHTO M294.

d. Channels shall be seeded or sodded and a permanent stand of grass obtained prior to project acceptance.

H. Design of Roadside Ditches:

a. Design Frequency:

(1) Roadside ditch design is permissible only for single family residential lots having widths larger than, or equal to, 120 feet.

(2) Design capacity for a roadside ditch shall be to 0.5 feet below the edge of pavement or the natural ground at the right-of-way line, whichever is lower.

(3) The design must include an extreme event analysis to indicate that structures will not be flooded.

b. Velocity Considerations:

(1) A grass lined or unimproved roadside ditch shall have side slopes no steeper than 3:1.

(2) Minimum grades for roadside ditches shall be 0.1 foot per 100 feet.

(3) Calculation of velocity will use a Manning's roughness coefficient of 0.040 for earthen sections and 0.025 for ditches with paved inverts.

(4) Use erosion control methods acceptable to the City when design velocities are expected to be greater than 4 feet per second.

c. Culverts:

(1) Culverts will be placed at all driveway and roadway crossings, and other locations where appropriate. Permanent low water crossings are not permitted.

(2) Culverts will be designed assuming outlet control.

(3) Roadside culverts are to be sized based on drainage area. Calculations are to be provided for each block based on drainage design criteria presented in this manual.

(4) Cross open channels with roadside culverts no smaller than 18 inches in diameter. The size of culvert used shall not create a head loss of more than 0.20 feet greater than the normal water surface profile without the culvert.

(5) Flow from roadside ditches must be conveyed to the drainage channel through a roadside ditch interceptor structure and pipe.

(6) Culvert installation shall adhere to Village of Bonney Ordinance 2002- 9 and as amended

d. Depth and Size Limitations:

(1) All roadside ditches shall be fully contained in the right-of-way or a recorded drainage easement.

(2) The maximum depth in residential areas shall not exceed 3 feet from the edge of pavement.

(3) Ditches in adjoining and parallel easements shall have the top of bank not less than 2 feet from the outside easement line.

(4) Roadside ditch bottoms should be at least 2 feet wide.

(5) Roadside ditch side slopes shall not exceed 3:1.

I. Design of Outfalls

a. Outfall design shall conform to the applicable Drainage District's Design Criteria Manual.

b. Outfalls shall be placed one foot above the receiving waterway.

c. Wet detention ponds may be connected by a submerged pipe. Storm sewers discharging into wet detention ponds may be submerged from the last manhole to the outfall.

d. Outfalls must have a means to control erosion and washouts (i.e. concrete paving, interlocking blocks). Rip-rap is not acceptable.

J. Storm Water Detention:

a. Application of Detention:

(1) As a normal consideration, storm water detention is required. The use of on-site detention is required in order to mitigate potential damage to existing structures unless participation in regional detention facilities is available that will provide equivalent protection to downstream property owners.

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

(3) All calculations shall be sealed, signed, and dated by a registered professional engineer.

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

(5) All detention basins shall be maintained by the property owners except regional detention facilities that are owned and operated by the Village of Bonney, C&R District No. 3, DD No. 4, or DD No. 5.

b. Calculation of Detention Volume:

(1) For developments with drainage areas of more than 100 acres, a detailed hydrologic analysis utilizing the HEC-HMS and HEC-RAS Flood Hydrograph method will be required following the procedure outlined the Brazoria County Drainage Criteria Manual, or applicable drainage district if more stringent.

(2) For developments with drainage areas 100 acres or less, the acre-feet of flood control storage, S, to be provided by the facility for the 100-year storm event is:

$$S = I^{½} \times A$$

Where I = the average percent imperviousness of the area draining into the facility (÷ 100), and A = the drainage area of the facility in acres.

(3) Detention storage shall not be less than 0.65 acre-ft/acre of the parent tract.

(4) Detention shall not be required for single-family lot improvements with increase in impervious area of less 1,000 SF.

c. Calculation of Outlet Size:

(1) The minimum outflow pipe for a detention facility is 24 inches. When further flow restriction is necessary, a restriction should be placed at the entrance to the outfall pipe. Locate the restrictor to facilitate inspection and debris removal. Calculate the allowable outflow orifice size using the following equation:

$$Q = CA\sqrt{2gH}$$

Where:

Q = allowable discharge in cubic feet per second
C = coefficient of discharge
- 0.8 for short segments of pipe
- 0.6 for openings in plates or standpipes
A = maximum allowable area of orifice in square feet
g = acceleration due to gravity (32.2 feet/second^2)
H = head difference between entrance and exit in feet when orifice is fully submerged, or the difference between the water surface elevation at the entrance and the centroid of the orifice in feet when orifice is partially submerged.

Determine H by establishing a maximum ponding level in the detention facility during the 100-year storm and assuming a tailwater at the top of the downstream end of the outlet pipe, or at a depth in the outlet channel associated with the maximum release flow rate, whichever is higher. In addition to a pipe outlet, the detention basin shall provide an extreme event emergency overflow spillway that will protect structures from flooding should the detention basin be overtopped.

(2) Corrugated Metal Pipe (CMP) is not allowed for outfall structures.

d. Detention Pond Structural Requirements:

(1) Side slopes shall not exceed a slope of 4 feet horizontally to one 1 vertically (4:1).

(2) Dry detention ponds exceeding 60 feet in any direction shall have concrete pilot channels to aid drainage. Unlined detention pond bottom shall have a minimum slope of 1%.

(3) Concrete pilot channels shall have a minimum width of 6 feet and a minimum thickness of 4 inches with #3 rebar spaced at 12 inches or #4 rebar spaced at 24 inches on center each way. The concrete channels shall be constructed of 5 sack cement concrete with a minimum compressive strength of 3000 psi at 28 days. Provide a 1 inch minimum depression per every 1 foot of transverse slope with redwood headers

spaced every 40 feet.

(4) Appropriate covering (grass, slope paving, etc.) shall be established on side slopes and pond bottom to prevent erosion during periods of maximum water velocity.

(5) A concrete or articulated block spillway, set at the maximum ponding elevation, shall be provided near the detention pond outfall structure, starting at the detention pond top of bank and extending to the toe of slope of the receiving channel.

e. Ownership and Access:

(1) Private Facilities:

(a) Detention facilities which rely on gravity to discharge storm water are preferred by the City.

(b) Responsibility for maintenance of the detention facility must be indicated on the plat and construction plans.

(c) All private properties being served shall have drainage access to the pond.

(d) A recorded maintenance agreement with a specific responsible party shall be provided when multiple tracts are being served.

(e) The maintenance berms shall be at least 20 feet wide surrounding the top of bank of the detention area.

(2) Public Facilities:

(a) Facilities may be accepted for maintenance by the City but only in cases where public drainage is being provided.

(b) The City will require a maintenance work area 30 feet wide surrounding the top of bank of the detention area. Public rights-of-way or permanent access easements may be included as a portion of this 30 feet width.

(c) A dedication of the maintenance easement or reserve must be provided by plat.

(d) Proper dedication of public access to the detention pond must be shown on the plat or by separate instrument. This includes permanent access easements with overlapping public utility easements.

f. Pumped Detention:

Pumped detention systems will not be maintained by the Village of Bonney under any circumstances and will be considered for approval only under the following conditions:

(1) A gravity system is not feasible from an engineering standpoint.

(2) The percentage of pumped volume must not exceed 75% of the total volume of the basin, the remaining volume must be able to drain from the basin by gravity.

(3) The selected outfall rate shall not increase the elevation or the flow within the receiving system.

(4) The total time to empty the pumped volume may not exceed 72 hours after the gravity portion has vacated.

(5) The discharge delivery system shall not have peak discharge and/or peak stages that exceed the predeveloped values at any point in time for the 5-year, 10-year, and 100-year design storm events.

(6) At least two pumps are provided, each of which is sized to pump the design flow rate; if a three-pump system is used, any two of the three pumps must be capable of pumping the design flow rate.

(7) Pumping from detention ponds into an existing storm sewer is prohibited unless the pre-developed land already drains into that system and that system has capacity for those undeveloped flows.

(8) The selected design outflow rate must not aggravate downstream flooding. Example: A pump station designed to discharge at the existing 100-year flow rate each time the system comes on-line could aggravate flooding for more frequent storm events.

(9) Sensors must be placed so that the pumps would remain off during a rain event.

(10) Sensors must be placed so that pumping will not occur when the level of water in the receiving system is at or above ¼ of its full depth.

(11) Fencing of the control panel is provided to prevent unauthorized operation and vandalism.

(12) An on-site emergency generator capable of operating the pump station for the amount of time required to vacate the pumped volume must be

provided.

(13) The City shall have the right to enter the property and inspect the operation of the system at any time for any reason.

(14) The pump station must be accessible by an all-weather road. Access driveways within subdivisions shall be concrete paved.

(15) A recorded maintenance agreement with a specific responsible party shall be provided to ensure that the system will be operated and maintained on a continuous basis.

(16) Detention volume for pump detention shall be minimum 1.0 acre-ft/acre.

If a pumped system is proposed, it is strongly recommended that preliminary conceptual design be submitted to the City Engineer and applicable Drainage District for review before any detailed engineering is performed.

The use of a pumped detention system must be approved by the City Engineer prior to the Drainage Plan being submitted.

5.4 SUBMITTALS

5.4.1 All preliminary drainage plan submittals shall comply with and fully follow the procedures outlined in the Village of Bonney's Subdivision Ordinance.

5.4.2 Preliminary Submittals: Submit for review and comment:

A. Lot and street layout.

B. The approximate drainage areas for each system.

C. The proposed drainage system.

D. The proposed pipe diameters.

E. Proposed detention areas with approximate volumes and depths.

F. Any proposed drainage easements.

G. Floodplain boundary, if applicable.

H. Floodway boundary, if applicable.

I. Base Flood Elevation.

5.4.3 Final Design: Submit the following for approval:

A. Copies of any documents which show approval of exceptions to the City design criteria.

B. Design calculations for storm line sizes and grades and for detention facilities.

C. Design calculations for the hydraulic grade line of each line or ditch, and for detention facilities. Calculations shall show that the water surface elevations will not be increased upstream or downstream of the property on a 5 year and 100-year event.

D. Contour map of the project and drainage area map for the project and the upstream.

E. Plan and profile sheets showing storm water design.

F. Projects located within a flood plain boundary or within a flood plain management area shall:

a. Show the flood plain boundary or flood plain area, as appropriate, on the drainage area map.

b. Show the floodway boundary, if applicable.

5.4.4 Additional Submittals: Submit the following for approval:

A. Previous review prints.

B. Revised drawings.

C. Storm water detention maintenance agreement letters.

D. Pipeline company agreements.

E. Any and all applicable permits and agreements.

5.5 QUALITY ASSURANCE

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

5.5.2 A geotechnical report shall be performed by, or under the supervision of, a currently registered Professional Engineer in the State of Texas, pertaining to the Drainage Design requirements contained within this section. All reports and documents shall be sealed, dated, and signed by the Engineer responsible for the preparation thereof.

BONNEY, TEXAS

CHAPTER 6

PAVING DESIGN CRITERIA

CHAPTER 6 – PAVING DESIGN

6.1 PAVING DESIGN GENERAL

6.1.1 Criteria for the geometric design guidelines for streets, street paving requirements, and standard paving notes for drawing call-outs are herein established.

6.2 DEFINITIONS

6.2.1 AASHTO - American Association of State Highway and Transportation Officials.

6.2.2 ACI - American Concrete Institute.

6.2.3 ASTM - American Society for Testing Materials.

6.2.4 Curb Sections: Full width concrete pavement with doweled-on 6 inch high vertical curbs or 4"x12" curbs. Curb and gutter sections require inlets and underground storm sewers.

6.2.5 Geotechnical Engineer: An engineer certified by the American Association for Laboratory Accreditation (AALA).

6.2.6 HMAC: Hot Mix Asphaltic Concrete.

6.2.7 Roadway Ditch Sections: Ditch sections adjacent to either full width reinforced concrete pavement or asphaltic pavement. Roadside ditch sections do not require underground storm sewers; however, the ditch sections must be designed to accommodate a 5-year storm runoff.

6.2.8 TxMUTCD - Texas Manual on Uniform Traffic Control Devices.

6.3 DESIGN REQUIREMENTS

6.3.1 The following design requirements are applicable to all pavement within right-of-way limits within the Village of Bonney and its ETJ:

A. All paving and construction plans shall be approved by the Village of Bonney for all streets.

B. Street design should conform to all applicable planning tools, such as the Texas Manual on Uniform Traffic Control Devices, major thoroughfare plans, and master plans. Other considerations for design should include street function, street capacity, service levels, traffic safety, pedestrian safety, and utility locations. These additional considerations may affect the minimum requirements set forth herein. Refer to the City Thoroughfare Plan.

C. Design shall conform to the Village of Bonney's Construction Details where applicable, or if not available, the standards of the City of Houston.

D. Minimum Right-of-Way Width, Paving Section, and Maximum Design Speed Requirements for:

a. Marginal Access Streets: Minimum 50 feet right-of-way, 2 lanes undivided without median. Maximum design speed 30 MPH.

b. Local: Minimum 60 feet right-of-way, 2 lanes undivided without median. . Maximum design speed 30 MPH

c. Minor Collector Streets: Minimum 80 feet right-of-way, 4 lanes undivided without median. Maximum design speed 30 MPH

d. Major Collector Streets: Minimum 80 feet right-of-way, 4 lanes divided with raised median, minimum 12 feet wide, Maximum design speed 35 MPH.

e. Minor Arterial: Minimum 120 feet right-of-way, 4 lanes divided with raised median, minimum 32 feet wide, Maximum design speed 45 MPH.

f. Major Arterial Streets: Minimum 120 feet right-of-way, 4 to 6 lanes divided with raised median, minimum 32 feet wide, Maximum design speed 45 MPH.

g. Super Arterial: As required by TxDOT

E. Minimum Width Requirements and Paving:

a. Curb and Gutter sections for low-density residential developments: 28 feet back-to-back of curb (B/B).

b. Pavement for open ditch sections for low density residential developments: 26 feet edge-to-edge of pavement, with a 6-foot shoulder on either side of the pavement:

(1) Reinforced Concrete: A thickened edge is required for this type of pavement. The thickened edge should be 8 inches decreasing to 6 inches at a point 4 feet from the edge of the pavement. Use only when approved by the City in large lot residential developments.

(2) Asphalt: 2 inch thick HMAC with 8 inch thick crushed limestone or crushed concrete base. Use only when approved by the City in large lot residential developments.

c. Curb and gutter sections of medium density residential, industrial, and commercial development secondary and collector streets: 38 feet B/B of curb minimum.

d. Pavement of major arterials and thoroughfares: Two divided traffic lanes, each way, of 25 feet B/B four (4) lane divided roadways or 34 feet B/B of curb for six (6) lane divided roadways.

F. Minimum Thickness and Reinforcement Requirements for Concrete Pavements: The following requirements are the minimum allowable. Pavement thickness and reinforcement shall be designed by the Professional Engineer responsible for the project based on a current soils analysis and recommendations by a qualified geotechnical engineer. All concrete shall have a minimum compression strength of 4,000psi. The design requirements in special cases may dictate a greater strength. Pavement design based on soils analysis, use, loading, and life span may require greater thickness and more reinforcement than the following minimums:

a. For pavement widths less than or equal to 28 feet B/B of curb (for marginal and local streets):

(1) Minimum concrete slab thickness shall be 6 inches with F_c = 4,000 psi and reinforcement shall be Grade 60, f_y = 60,000 psi, #4 deformed reinforcing bars spaced at 18 inches center-to-center both ways and minimum lap lengths of 18 inches.

(2) Expansion joints shall be placed at the end of each curb return and at a maximum spacing of 40 feet 6 inches. Expansion joints shall include a ¾ inch redwood header, ¾ smooth dowel bar (18 inches length) and a 26 gauge hard plastic tube. The expansion joint shall include a standard steel wing plate.

(3) Minimum stabilized subgrade thickness shall be 8 inches.

b. For pavement widths greater than 28 feet B/B and for minor and major collectors

(1) Minimum concrete slab thickness shall be 7 inches with f_c = 4,000 psi and reinforcement shall be Grade 60, f_y = 60,000 psi, #4 deformed reinforcing bars spaced at 18 inches center-to-center both ways and minimum lap lengths of 18 inches.

(2) Expansion joints shall be placed at the end of each curb return and at a maximum spacing of 40 feet 6 inches. Expansion joints shall include a ¾ inch redwood header, ¾ smooth dowel bar (18 inches length) and a 26 gauge hard plastic tube. The expansion joint shall include a standard steel wing plate.

(3) Minimum stabilized subgrade thickness shall be 8 inches.

c. For pavement minor and major and arterials:

(1) Minimum concrete slab thickness shall be 8 inches with f_c = 4,500 psi and reinforcement shall be Grade 60, f_y = 60,000 psi, #5 deformed

reinforcing bars spaced at 16 inches center-to-center both ways and minimum lap lengths of 18 inches.

(2) Expansion joints shall be placed at the end of each curb return and at a maximum spacing of 40 feet 6 inches. Expansion joints shall include a ¾ inch redwood header, ¾ smooth dowel bar (18 inches length) and a 26 gauge hard plastic tube. The expansion joint shall include a standard steel wing plate.

(3) Minimum stabilized subgrade thickness shall be 12 inches.

G. Subgrade Treatment: The Geotechnical Engineer shall base depth of subgrade stabilization on structural number (SN) in conjunction with pavement thickness design. Following is a general guidance for subgrade treatment:

a. For subgrade soil conditions with a plasticity index (PI) of 10 or more, the subgrade shall be stabilized with lime and compacted to 95% standard proctor density. Subgrade shall be stabilized with the recommended percent of lime (6% min.) by weight as determined by the Geotechnical Engineer.

b. For subgrade soil conditions containing a clean sand with no clay content, the subgrade shall be stabilized with cement.

c. For subgrade soil conditions containing silt, the subgrade shall be stabilized with lime-fly ash.

H. Requirements for Intersections, Turnouts, Transitions, and Thoroughfares:

a. At a "T" intersection with a street that has not been improved to its ultimate width, concrete pavement should be stopped either at the right-of-way line or at the end of the curb return, whichever would require less concrete removal at a future date.

b. For roadway turnouts placed at an existing street intersection, the turnout should be designed to fit the ultimate pavement width of the intersecting cross-street and then transitioned to the existing roadway.

c. The usual transition length for meeting an open ditch street is 50 feet for street widths less than or equal to 28 feet B/B; 75 feet for up to 38 feet B/B width, and 100 feet for 41 feet B/B width.

(1) Streets other than concrete shall have transitions of a minimum thickness of 8 inches of lime stabilized subgrade, 6 inches of hot-mix asphaltic concrete base, or approved equal, with 2 inches of hot-mix asphaltic surfacing.

(2) Concrete streets shall have transitions of a minimum thickness of 6 inches of stabilized subgrade and 6 inches of concrete pavement.

d. When paving only one roadway of a proposed two roadway thoroughfare

(boulevard section) all left turn lanes and esplanade crossovers shall be paved to the centerline of the street right-of-way.

I. Requirements for Roadway Pavement with Open Ditch Sections (large lot residential subdivisions only):

a. Minimum grade on ditches shall be 0.20 percent.

b. Ditch capacity shall be designed to accommodate a 5-year storm runoff event.

c. Maximum side slopes of ditches shall be 3 feet horizontally to 1 foot vertically (3:1). Sides may be sloped to 4:1 or 5:1 for easier maintenance by property owner.

d. Culverts for roadside ditches only shall be designed to carry ditch discharge but not less than 18 inches diameter. Culverts shall be Class III RCP conforming to ASTM C-76 or smooth interior dual wall corrugated polyethylene pipe conforming to AASHTO M294.

e. The minimum paving radius for cul-de-sac shall be 40 feet in a 50-foot radius right of way if the cul-de-sac is located on the interior of a residential subdivision, and is 600 feet or less in length. If the cul-de-sac opens onto a thoroughfare or exceeds 600 feet in length, the minimum pavement radius shall be 45 feet in a 50-foot radius right of way.

J. Requirements for Roadway Pavement with Curb and Gutter Sections:

a. Minimum gutter gradient shall be 0.30 percent.

b. Maximum cut from finished grade at property line to top of curb shall be 1.75 feet. The desired slope for driveways is 2% to 8%.

c. Minimum grade shall be 0.70 percent fall around intersection turnout for a maximum radius of 25 feet. Grades for larger radius shall be determined on an individual basis.

d. Vertical curves shall be installed when algebraic differences in grades exceed 1 percent. Elevations shall be shown at 10 feet intervals through vertical curves. Maintain a minimum of 0.02 feet elevation change at 10 feet intervals by altering the calculated elevations.

e. When a curb and gutter intersects a drainage ditch, the grade of gutter shall be above the designed water surface of the ditch.

f. The maximum travel distance of water in the street gutter to a curb inlet shall be 300 feet on a major thoroughfare and in commercial areas. The maximum travel distance of water in the street gutter to a curb inlet in a single-family residential area shall be 500 feet.

g. All new residential and local streets poured with a curb and gutter shall have a

minimum of a 4 inch rollover, lay down curb. All new collector and thoroughfare streets shall have the standard 6 inch stand up curb. A standard 6 inch curb shall be used adjacent to all storm sewer inlets; 4 inch rollover curbs shall be transitioned to a 6 inch curb near the inlet.

h. Major thoroughfares shall be super-elevated in accordance with AASHTO whenever the centerline radius of lanes or right-of-way is less than 2,000 feet.

i. The amount of cross-slope over the pavement section shall be 2% sloping away from the crown of road or centerline.

j. A minimum gradient of 0.70 percent around the longest radius is required on an L-Type street intersection or cul-de-sac.

k. Fill lines shall be shown on the drawings. If this type of fill is required and the pavement is adjacent to a nonparticipating property owner, fill easements shall be obtained from the property owner and recorded. A copy of the easements shall accompany the final drawings. Construction of this nature will require back-slope drainage design to prevent trapping storm runoff.

l. Grades should be labeled for all tops of curb. Centerline grades are acceptable for open-ditch sections only.

m. The minimum paving radius for cul-de-sac shall be 40 feet in a 50-foot radius right of way if the cul-de-sac is located on the interior of a residential subdivision, and is 600 feet or less in length. Islands within cul-de-sacs are allowed provided that the minimum fire apparatus turning radius requirements are met. If the cul-de-sac opens onto a thoroughfare or exceeds 600 feet in length, the minimum pavement radius shall be 45 feet in a 50-foot radius right of way.

K. Requirements for Curbs and Sidewalks:

a. Standard height of a curb is 4 inches and 12 inches wide for curbs located along residential streets. Curb height for streets other than residential shall be 6 inches. The curb height for all esplanades shall be 6 inches.

b. Sidewalk wheelchair ramps shall be required at all intersections and driveways. The design and installation of ramps shall comply with Texas Accessibility Standards Architectural Barriers requirements.

c. All sidewalks are to be a minimum 5 feet in width and are to be constructed in accordance with the Village of Bonney standard details.

d. Sidewalks are required along all curb and gutter streets. The developer, prior to the City's final one-year acceptance of the public infrastructure, must install sidewalks along right of way and reserves.

e. The location of all proposed and existing sidewalks shall be shown on the construction drawings.

L. Requirements for Driveways

a. Driveways shall be asphalt or reinforced concrete, and shall be installed from the existing pavement to the right-of-way line (property line), minimum.

This applies to all types of new construction. It does not apply to property being actively used for agricultural purposes and designated with the agricultural-use exemption.

b. Refer to Bonney Standard Construction Details (Paving) for various driveway configurations.

M. Requirements for Miscellaneous Items:

a. The type and amount of subgrade treatment shall be shown on the drawings.

b. Paving headers shall be placed at the end of all concrete pavements.

c. All concrete to be removed shall be removed either to an existing joint or to a sawed joint.

d. Sight distance requirements based on the design speed of the roadway shall be used for determining lengths of crest vertical curves for all pavements except boulevard sections, which shall be designed for 45 mph.

e. Standard Type III City barricades shall be placed at the end of all dead-end streets not terminating in a cul-de-sac.

f. A letter of agreement from the affected pipeline company approving the construction plan crossing is required when paving is placed or construction work occurs over a transmission pipeline.

g. When meeting existing concrete pavement, horizontal dowels shall be used if no exposed reinforcing steel for interconnection with new pavement exists. Horizontal dowels shall be Grade 60, #6 rebars, 24 inches long, drilled and embedded 12 inches into the center of the existing slap and epoxied. Dowels shall be 18 inches center-to-center, unless otherwise specified.

h. When concrete is removed for interconnections, the pavement shall be saw cut and existing concrete removed to expose a minimum of 15 inches of reinforcing steel. If no reinforcing steel exists, use horizontal dowels as previously described.

i. Dead-end streets or ends of concrete slabs designed to be extended in the future shall have paving headers and 15 inches of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap or paving headers and dowel type expansion joint for future pavement tie.

j. Pavement extensions shall connect to the existing pavement with a pavement undercut and a minimum steel overlap of 18 inches.

k. Concrete pavement thickness design is required for all pavement within industrial areas and on major thoroughfares. Concrete pavement thickness design shall be based on AASHTO design procedures for rigid pavements.

l. Adjust manhole frames and covers within the limits of the pavement to meet the proposed final top of slab.

m. Adjust manhole frames and covers outside the limits of the pavement to conform to the final grading plan.

n. No more than one shrinkage crack shall be allowed in each forty foot header section. A shrinkage crack is defined as extending less than one half depth of the concrete (i.e. 3" or less on 6" thick concrete) appearing within one year of the final concrete placement. If two or more shrinkage cracks appear in one header section, the entire section shall be removed and replaced at contractor's expense.

o. If shrinkage cracks are less than one-half the full depth of the concrete, then a recommendation letter and data sheets are required from the testing laboratory as to the type of sealant which will be used to seal the shrinkage cracks. This recommendation shall be approved by the City Engineer before application of sealant. Cracks shall be sealed at contractor's expense.

p. Core samples for the sections will be taken no sooner than the 28 day break of the original concrete pour sample.

q. All signage posts shall be galvanized black powder coated.

6.4 QUALITY ASSURANCE

6.4.1 All construction drawings and specifications shall be prepared by or under the supervision of a currently Registered Professional Engineer of the State of Texas, and all documents shall be sealed, dated, and signed by the engineer responsible for the preparation.

6.4.2 A geotechnical report shall be performed by or under the supervision of a currently Registered Professional Engineer of the State of Texas disciplined in the science of soils analysis. All reports and documents shall be sealed, dated, and signed by the engineer responsible for the preparation.

6.4.3 All pavement design shall be supported by calculations to establish the required thickness and reinforcement.

6.4.4 The current soils report shall be the basis for design considering the use, loading, and life span of the proposed pavement.

BONNEY, TEXAS

CHAPTER 7

STREET LIGHTING

BONNEY, TEXAS

CHAPTER 8

TRAFFIC IMPACT ANALYSIS AND ACCESS MANAGEMENT REQUIREMENTS

CHAPTER 8 - TRAFFIC IMPACT ANALYSIS AND ACCESS MANAGEMENT REQUIREMENTS

8.1 REFERENCES

A. AASHTO - American Association of State Highway and Transportation Officials

B. ITE - Institute of Transportation Engineers

C. TRB - Transportation Research Board

D. TxDOT - Texas Department of Transportation

E. Trip Generation, Current Edition (An ITE Informational Report, Institute of Transportation Engineers, Washington, D.C.)

8.2 DEFINITIONS

A. Access Management is the systematic control of the location, spacing, design and operation of driveways, median openings, intersections, and auxiliary lanes.

B. Average daily traffic (ADT) volume. ADT is total two-way traffic on a street for some period less than a year, divided by the total number of days it represents, and includes both weekday and weekend traffic. ADT may be adjusted for day of week, seasonal variations, and/or vehicle classifications.

C. Auxiliary Lane is a lane striped for use as an acceleration lane, deceleration lane, right-turn lane or left-turn lane, but not for through traffic use.

D. City Engineer is the Village of Bonney's designated staff person with authority to determine scope of TIA, assess and judge appropriate TIA methodologies, review Developer TIA's and make determinations on the suitability of TIA results, recommendations, and resulting required mitigation.

E. Connection Spacing is the distance between connections, measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection.

F. Corner Clearance is the distance along the edge of the traveled way from the closest edge of pavement of an intersecting public or private street to the closet edge of pavement of the nearest driveway.

G. Design Exception shall mean any City Engineer approved variation from the requirements of this chapter.

H. Driveway is an access connection constructed within the public right-of-way, used to connect a public or private street with adjacent property.

I. Driveway Permit. A Driveway Permit is issued by the City Engineer. Driveway permits for access to State of Texas right-of-way, including but not limited to Freeways, Highways,

Frontage Roads, Tollways and Farm to Market Roads are to be approved by the State and issued by the Village of Bonney.

J. Intersection Limits shall mean the functional portion of the intersection and shall be defined as the extent or limit of turning bays located at the intersection, or the limits as defined by the City Engineer.

K. Intersection Sight Distance – Provides an unobstructed line of sight in each direction at intersections. The unobstructed line of sight allows for vehicles on side streets to observe approaching traffic on the main roadway and to safely enter an intersection from a side street. The unobstructed line of sight allows for vehicles on the main roadway sufficient distance to observe vehicles entering from side streets.

L. Joint Access. See "Shared Access".

M. Median - a portion of a divided street separating opposing traffic flows. A median may be traversable or non-traversable.

N. Shared Access is a single connection serving two or more adjoining lots or parcels.

O. Sight Distance is the distance visible to the driver of a passenger vehicle measured along the normal travel path of a street from a designated vehicle location and to a specified height above the street when the view is unobstructed by traffic. Refer to AASHTO, Geometric Design of Highways and Streets (Current Edition), for application to specific design needs such as stopping sight distance, other sight requirements.

P. Storage Length is the portion of an auxiliary lane required to store the number of vehicles expected to accumulate in the lane (for the 95th percentile queue).

Q. Throat Depth is the distance from the edge of traveled way (curb or painted edge line) to the nearest full access point within a private development.

8.3 TRAFFIC STUDIES

A. Applicability

1. Two levels of traffic study may be used depending on specific site location conditions, adjacent street configurations/capacities and traffic generation rates for proposed development:

   a. *TIA Threshold Worksheet*
   b. *Traffic Impact Analysis (TIA)*.

2. For each proposed development or redevelopment, a TIA Threshold Worksheet must be submitted. The TIA Threshold Worksheet provides general property information and an initial estimate of traffic volumes associated with the property. Specific conditions regarding a particular project may warrant more detailed calculations using ITE Trip Generation processes.

B. Exceptions to the requirements for the submittal of a TIA Threshold Worksheet include:

1. Construction, reconstruction, remodel or additions to a single-family residence.

2. Reconstruction or remodel of commercial developments with no change in use.

C. In addition to submitting the TIA Threshold Worksheet, a Traffic Impact Analysis may be required:

1. If the proposed development or redevelopment generates 100 or more new peak hour trips (PHT), and/or 750 or more new daily trips, the developer's Traffic Engineer should meet with the City Engineer to determine the requirements of a TIA. A TIA may be required of any development at the discretion of the City Engineer, even if below the trip thresholds above.

2. If after discussion with the City, a TIA is required, the extent of the area to be studied will be determined with city staff.

3. If an applicant submits a development plat application or building permit application for new development or redevelopment, the applicant may voluntarily submit a TIA to support the trip generation rates and access management needs to the adjacent street system for the proposed project.

D. A full TIA may not be required if:

1. No safety or capacity problems exist in the immediate vicinity of development.

2. A previous TIA prepared for a site within 1,000 feet indicates that build-out of vacant tracts will not create capacity or safety problems on the adjacent street network.

3. The proposed development or land use produces less than 50 trips during the peak hour of either the traffic generator or of the adjacent roadway.

4. The proposed development is a reuse of an existing building and the new use produces trips of the same nature that are less than 120% of the trips generated by the prior use and if no safety or capacity problems exist.

E. Process. Figure 8.3-1 provides an overview of the submittal and review process.

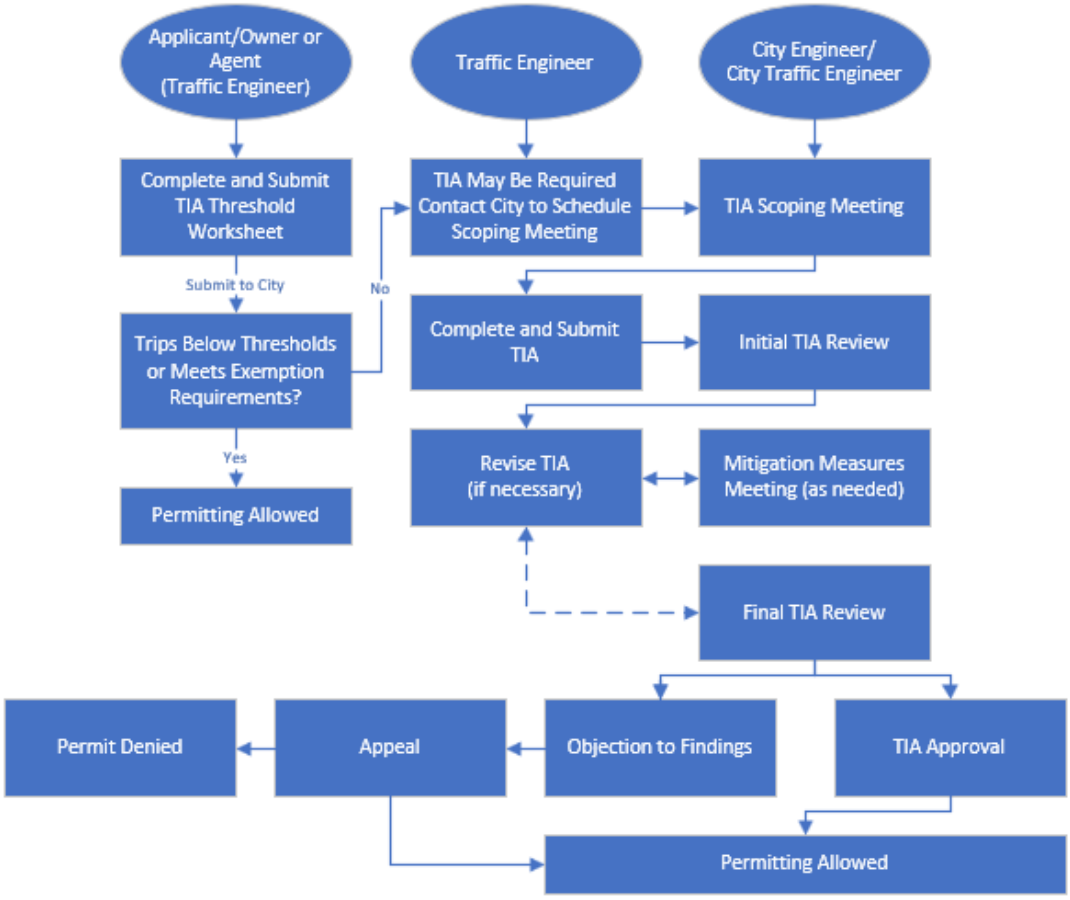


Figure 8.3-1. TIA Submittal and Review Process.

F. TIA Threshold Worksheet. For each proposed development or redevelopment, a TIA Threshold Worksheet must be submitted.

Village of Bonney
Traffic Impact Analysis Threshold Worksheet

Complete this form and submit to the City Engineer

Project Name:	
Project Address:	or Project Legal Description:
Key Map Page No.	

Applicant/Owner Name:	
Agent Name/Firm:	
Contact Phone:	Email:

Application Type:	□ Zoning (CUP/PD)	□ Site Plan	□ Plat	□ Other:

Trip Generation Calculations (or attach as necessary):

Land Use	Units*	ITE Code	ITE Trip Rates / Trips Generated			
			24-Hour	AM Peak Hr	PM Peak Hr	Weekend Hr
			/	/	/	/
			/	/	/	/
			/	/	/	/

*Units should be based on what is used for the trip generation rate (i.e., Gross Floor Area, Acreage, etc.). Specify in the box.

All Trips generated should be based on the latest edition of the ITE Trip Generation Manual.

All thresholds to determine when a TIA is necessary are contained in Chapter 8 of the Village of Bonney Infrastructure Design Manual.

This application will be considered incomplete without 1) a project location map, 2) site plan, and 3) site plan superimposed on an aerial image.

Applicant/Agents Signature: _____ Date: _____

8.4 TRAFFIC IMPACT ANALYSIS GUIDELINES (TIA)

A. General

1. Authorization to Perform a TIA

a. A TIA shall be prepared by an individual, group, firm, or corporation having demonstrated professional emphasis and experience in traffic engineering, and the preparation of similar analysis, hereinafter referred to as the "Engineer". The TIA document shall bear the seal and signature of a Texas Licensed Professional Engineer specializing in the branch of civil engineering.

i. The responsibility for assessing the traffic impacts associated with a proposed development/redevelopment, hereinafter referred to as the "Development," rests with the Applicant and the Engineer

ii. The City shall serve as the review and approval authority.

2. Purpose and Intent of TIA Guidelines

a. The purpose of the TIA is to identify the adequacy of the existing street right of way to accommodate any changes in trips generated from a proposed development/redevelopment. If impacts are identified, potential mitigation measures (on-site or off-site) can be proposed and evaluated. The traffic impact analysis will be used to decide whether driveway(s) being considered are necessary to provide reasonable access to the private property consistent with the safety and convenience of the public.

3. Goals of a TIA Completed Within the Village of Bonney

a. To identify potential adverse traffic impacts to the existing area street system, the surrounding community and to additional proposed developments.

b. To identify transportation improvements with the aim to cost effectively mitigate identified adverse traffic impacts to mobility within the study area/analysis area.

c. To assist public and private sector entities in identifying and resolving issues related to the location of driveways, median openings, turn lanes, traffic signals, and other transportation facilities.

4. Document Limitations

a. While this chapter contains guidelines and requirements necessary to complete a TIA for the City, the City does not intend this section to be a sole reference for the preparation of a TIA. For more specific information regarding the various aspects of TIA preparation, the City suggests that the reader obtain and refer to the Institute of Transportation Engineer's (ITE) current edition of Transportation Impact Analyses for Site Development (An ITE Proposed Recommended Practice).

B. The Traffic Impact Analysis Process

1. The TIA report shall bear the seal and signature of a Texas Licensed Professional Engineer specializing in the branch of civil engineering. The responsibility for assessing the traffic impacts associated with a proposed development or redevelopment rests with the applicant and the Engineer, while the City shall serve as the review and approval authority.

2. A TIA determines traffic impacts of a development/redevelopment on the surrounding street system. The City will use this information to assist in establishing immediate transportation infrastructure needs and potential transportation improvements.

3. It is a goal of the City that these guidelines will allow for the maximization of efficiency and safety associated with area development/redevelopment. The City emphasizes that the TIA process can begin when the Applicant initiates development planning (i.e. prior to plat preparation).

4. If a TIA is required, or the applicant chooses to prepare a TIA, the completed TIA may be submitted at any time between the preliminary plat submittal and final site plan approval.

5. Prior to submitting an application for development platting or a building permit the Applicant may be required to submit a revised TIA and obtain approval by the City if any changes have been made to the development (site plan) or original TIA assumptions related to:

    i. Land-use (revisions required only for an increase in trips),

    ii. Increase in the trip generation variable(s) (revisions required only for an increase in trips),

    iii. Intersection and street design, and

    iv. Access connections placement and design assumptions.

C. Proposal of TIA Scope and Initial Trip Generation Estimate

1. Using proposed development or redevelopment attributes (type, size, etc.), the Engineer shall determine, and the City shall confirm, a corresponding traffic impact analysis category for the Development by calculating the highest number of estimated new peak hour trips generated for an adjacent street (See Table 8.4-1). Typically, the peak hour will be the weekday AM or PM peak hour, but for some Developments this may be a weekend peak hour.

Table 8.4-1 Traffic Impact Analysis Categories

Traffic Impact Category	**Site Traffic Thresholds New Peak Hour Trips (PHT) on Adjacent Street(s)**
Category I	PHT < 100
Category II	100-499
Category III	500-999

Category IV	PHT ≥ 1000

2. The City requires that the Engineer generate site traffic using the methodologies found in the current edition of the ITE publication *Trip Generation Manual*. Any variance from the ITE procedures requires prior approval from city staff.

3. It is mandatory, regardless of traffic impact category (II, III, or IV), that the Engineer holds a TIA scoping meeting with the City Engineer. Using the resulting traffic impact category and the Boundaries and Horizons Guidelines in Table 8.4-2 as reference, the Engineer shall prepare and submit to the City Engineer a proposal of scope for the TIA.

Table 8.4-2 TIA Boundaries and Horizons Guidelines

Requirements		**Category I**	**Category II**	**Category III**	**Category IV**
General	TIA Threshold Worksheet	X	X	X	X
	Meeting with City Engineer		X	X	X
	TIA Scope Review		X	X	X
Horizon	Opening Year		X	X	X
	Full Build-Out Year		X	X	X
	Build-Out Year + 5-Years				X
Limits	Analysis Area (radius from development boundaries)		¼ mile	½ mile	½ to 1 mile
	All Site Access Driveways		X	X	X
	All Site Access Private Street Intersections		X	X	X
	All Adjacent Signalized Intersections		X	X	X
	All Adjacent Major Unsignalized Intersections		X	X	X
	All Analysis Area Signalized Intersections			X	X
	All Analysis Area Major Unsignalized Intersections			X	X
Note: Category II, III and IV studies should extend to first signalized intersection (at minimum) even if outside of Boundary and include any critical intersections between the development and the first signalized intersection. Intersections should be confirmed in the scoping meeting.					

D. Preparing the TIA

1. The TIA shall be prepared according to the requirements detailed in the sections titled TIA Submission Requirements and Technical Notes.

E. TIA Submission and Review

1. All TIA submittals should be addressed to the City Engineer. Paper copies should be submitted to the City Engineer through the City Secretary at the Bonney City Hall. Electronic copies should be emailed or electronically distributed directly to the City Engineer.

2. TIA Submittals.

   a. Initial submittal: The Applicant shall submit to the City two (2) paper copy of the TIA, one (1) electronic copy of the TIA (including appendices), and the TIA Review Fee payable to the Village of Bonney.

   b. Additional review submittals: The Applicant shall submit to the City one (1) paper copy of the TIA and one electronic copy of the TIA (including appendices).

   c. Final submittal: The Applicant shall submit to the City two (2) paper copies of the TIA and one electronic copy of the TIA (including appendices).

3. The City will make an initial review of the TIA to determine if the Engineer completed the TIA in accordance with the technical requirements and within the submission requirements of the analysis as outlined in this manual or as established at the preliminary scoping meeting or proposal of scope. The initial submittal should include, as available, electronics copies of traffic counts and other collected data (i.e., queuing, delay studies, etc.) as well as any traffic analysis models used and/or referenced in the TIA.

   a. If the City finds deviations from the technical requirements and/or the submission requirements of the study, the City will terminate the initial review until the Engineer has addressed said deficiencies.

   b. At such a time when the City identifies deficiencies, the City will develop a notice of deficiencies and submit the notice to the Engineer and Applicant.

4. All TIA submittals should include either an interim seal or a final seal, which is signed by a Licensed Professional Engineer in the State of Texas.

5. Upon the Applicant submitting a final TIA that meets the technical and submission requirements established in this document or at the preliminary scoping meeting or proposal of scope, the City will conduct a final review of the TIA.

6. Following the City's completion of the final review, the City will provide to the Engineer and Applicant written objection to the findings or adequacy of the proposed mitigation measures to address impacts. If no objections are noted, the City will interpose no objection to permitting for the proposed development. If the Applicant disagrees with the

objections made by the City, the Applicant may write an appeal to the City Council through the Mayor's Office.

7. Approval of a TIA will be considered to remain valid for a minimum of two years from the date of final TIA approval. Validity of an approved TIA beyond two years will be allowed by the City Engineer so long as the phased development is proceeding according to the approved plan and the schedule contained within such approved plan. The applicant may be required to update traffic data to address changes within the area and will meet with the City Engineer prior to the expiration of the two-year period in order that the City Engineer may determine if an updated TIA is required.

F. Mitigation Measures Requirements.

1. The TIA shall have identified significant adverse traffic impacts in order to trigger the need for mitigation. The need for mitigation is determined by using the qualitative measure Level-of-Service (LOS). The threshold of significance for transportation facilities on the area street system is LOS D.

2. Arterials - The Village of Bonney Thoroughfare Map establishes roadways classified as Arterials. Arterials are roadways designed to allow for access from large traffic trip generators and move traffic between adjacent activity centers. Projects in Traffic Impact Analysis Categories II, III and IV (see Table 8.4-1) along Arterials are expected and fostered because of the traffic carrying capacity.

   Where the existing, background or projected conditions are LOS E or F and existing physical conditions limit available mitigation measures, the Engineer shall meet with the City Engineer to review probable community impacts and possible mitigation measures if any.

3. Mitigation of LOS E and LOS F conditions.

   a. Prior to final approval/disapproval involving LOS E and LOS F, the Applicant will meet with City Engineer to review all aspects of proposed development and adjacent roadway conditions including intersection delays.

   b. For areas in the street system where the current LOS is E, the existing LOS must be maintained or improved after development. For example, if the LOS prior to the proposed development is E, then once the development is in place, the projected LOS must be at least E.

   c. For areas in the street system where the current LOS is F, the traffic impacts of the development on the streets and intersection within the analysis area shall be mitigated such that the LOS criteria do not deteriorate beyond Background Conditions.

4. Methodology for computing each type of MOE and determining corresponding LOS can be found in the Highway Capacity Manual (HCM).

5. Traffic signal retiming is not considered an acceptable mitigation measure unless it is first approved by the Village of Bonney.

a. Typically, an individual intersection cannot be re-optimized in the future if it is a part of coordinated street network. This may only be possible if the entire street network is re-timed to allow for system wide signal progression. If signal retiming is approved by the City as a mitigation measure, it should be included in the "Mitigation" scenario.

b. During conduct of a TIA, the Engineer should determine baseline MOE's using existing signal cycle lengths for existing conditions, projected without development, and projected with development conditions (by phase as necessary).

i. The Engineer may optimize splits within the existing cycle length to determine background and "with development" MOE's.

ii. In addition, to determine the impact of potential signal retiming, the Engineer may optimize traffic signal cycle lengths and splits and report those additional MOE's as part of the analysis of background and "with development" scenarios, but the Engineer must state the new cycle length in any summary table or discussion of the resulting MOE's in comparison to the existing cycle length.

G. Traffic Impact Analysis Submission Requirements

1. The Engineer must identify all of the required data and information in the appropriate sections of the report.

2. Text contained in the document shall be comprehensive and complete.

3. The report shall have an electronic copy of final submittals along with the bound copy.

4. The report shall contain a table of contents, lists of figures and list of tables. A typical TIA report outline is shown in the following sections.

a. ***Executive Summary***
   i. Site Location & Analysis Area
   ii. Development Description
   iii. Conclusions
   iv. Recommendations

b. ***Introduction***
   i. A statement about the purpose and objectives of the analysis.
   ii. A description of the existing and expected land use and intensity.
   ⇒ *If residential, number and type of dwelling units.*
   ⇒ *If commercial or industrial, square footage and type.*
   iii. If redevelopment, what is the expected trip generation differential
   iv. A vicinity map identifying major industrial and site access intersections and other approved projects near the development.
   v. A site plan for the development.
   vi. A description of development phasing and estimate year each phase will begin and end.

c. ***Area Conditions***
   i. A description of the analysis area.

ii. *A description of existing and future land uses within the analysis area. The description should include current land use, densities and occupancy, anticipated development, undeveloped properties, and current master plans.*
   - ⇒ *If residential, number and type of dwelling units.*
   - ⇒ *If commercial or industrial, square footage and type.*

iii. *A combination of narratives, tables and figures detailing area street system characteristics within the analysis area including:*
   - ⇒ *Programmed street improvements in the area (Village of Bonney and/or Brazoria County Capital Improvement Plans)*
   - ⇒ *Additional streets that may be impacted*
   - ⇒ *Functional Street Classifications (based upon City Thoroughfare Plan)*
   - ⇒ *Posted Speed Limits*
   - ⇒ *Distance, and alignments from existing streets, driveways, and/or median openings to development access (need to assess Access Management Standards)*
   - ⇒ *Traffic control devices (traffic signals and Stop signs)*
   - ⇒ *Signal locations and timings (offsets need to be shown if in coordination)*
   - ⇒ *Intersection layout, lane usage, and street configuration*
   - ⇒ *Street right-of-way widths*
   - ⇒ *Lane widths*
   - ⇒ *Current traffic volumes within the past 1 year to have been captured on a typical Tuesday, Wednesday, or Thursday for all streets in the analysis.*
     1. *Any traffic volumes older than 1 year may not be acceptable and will need to be justified.*
     2. *The Engineer should also make every reasonable effort to count traffic that accurately reflects a true "peak period' for the area, which includes any potential seasonal variations (i.e. schools, churches, etc.).*
     3. *Depending on the type of development, it may also be necessary to capture volumes on a typical weekend.*
     4. *24 hour counts at major intersection and site access intersections, or as necessary for all-way stop or traffic signal warrants.*
     5. *Vehicle, pedestrian and bicycle turning movement counts (2-Hour Peak Periods).*
     6. *Transit Service (If Applicable)*
        a. *Major Transit Stops*
        b. *Ridership (where applicable/when available)*
        c. *Routes and Service Intervals*

iv. *Crash Analysis (if Applicable) over the past three years, including number and types of crashes as well as severity of injuries.*

v. *Existing and proposed conditions sight distances: intersection and stopping sight distances, vertical and horizontal clearances per AASHTO "A Policy on Geometry Design of Highways and Streets", Latest Edition, using figures to determine any mitigation required.*

d. ***Required Tables***
   i. *Twenty-four hour approach volumes at major and site access intersections.*
   ii. *Peak hour approach volumes at major and site access intersections*

e. ***Required Figures***

i. *Major and site access intersection lane configuration diagrams with existing Twenty-four hour approach volumes, preferably overlaid onto aerial photography.*
ii. *Major and site access intersection lane configuration diagrams with existing AM and PM peak hour turning movement volumes. Preferably overlaid onto aerial photography.*
iii. *The Engineer may also use photographs (identifying location from where it was taken as well as the date and time stamp) to document existing conditions.*

f. ***VI. Projected Traffic***
i. *Sufficient details of calculations so that all calculations can be verified.*
ii. *Site generated traffic volumes (24-hour and peak periods) by corresponding development phase or year.*
iii. *Trip Generation - List of trip generation rates and/or sources of rates used for the study.*
iv. *Trip Distribution and Assignment - The gravity model or other acceptable trip distribution model used to estimate trip distribution. The Engineer can complete this task either manually or with applicable computer models.*
v. *Background traffic volumes (24-hour and peak periods) by corresponding development phase or year.*
vi. *Traffic Volumes should account for all approved developments in the analysis area as well as area growth beyond the analysis area. Contact the City for information about surrounding developments.*
⇒ *Pass-by and diverted traffic volume reduction rates, if applicable.*
⇒ *Pedestrian, bicycle and transit reduction rates, and supporting evidence, if applicable.*
⇒ *Internal capture reduction rates, if applicable.*
⇒ *Total project traffic volumes (24-hour and peak periods) by corresponding development phase or year. Future traffic as may be required for a development with multiple phases should also be included.*
vii. *Required Table(s)*
⇒ *Pass-by trip, internal capture, pedestrian, bicycles, and transit reduction rates used, if applicable.*
⇒ *Peak Hour approach volumes for background, pass-by, site generated, and total project traffic conditions at major and site access intersections and any additional transportation facilities specified by the City.*
viii. *Required Figure(s)*
⇒ *Peak hour turning movement volumes for background, pass-by, site generated, and total project traffic conditions overlaid onto major and site access intersections lane configuration diagrams. Preferably overlaid onto aerial photography.*
⇒ *Distribution and assignment rates for pass-by and site generated traffic volumes overlaid onto major and site access intersections lane configuration diagrams. Preferably overlaid onto aerial photography.*
⇒ *Distribution of site trips at each driveway, both entering and exiting, on a percentage and traffic volume basis for each peak hour studied.*

g. ***Traffic Analysis***
i. *Analyze existing, background and projected Traffic Conditions LOS and Delay at all major and site access intersections and determine MOEs of any additional*

transportation facilities within the analysis area as necessary or as specified by the City.

- ⇒ *Analysis must utilize existing traffic volumes, or adjusted as agreed upon in scoping meeting.*
- ⇒ *Analysis must utilize total projected traffic volumes which include site generated traffic and the background traffic to complete analyses for the required study limits and horizons as they correspond to the predetermined TIA category.*
- ⇒ *Analysis may be prepared manually or by using various software programs such as Highway Capacity Software, Synchro or as approved by the City.*
- ⇒ *Analysis must utilize the capacity analysis methodology found in the current edition of the Highway Capacity Manual, or control delay calculations from Synchro or other software as approved by the City, and/or delay calculations from micro-simulation of the complete street network (no individual intersections) to determine LOS.*
- ⇒ *Determination of necessary or specified MOEs should be completed using state-of-the-practice engineering methods.*
- ⇒ *In addition to LOS and delay, the Engineer should identify critical movements regarding capacity and potential locations of queue spillback.*
- ⇒ *The Engineer should perform a signal warrant analysis for unsignalized intersections (engineering judgment) using the Texas MUTCD signal warrant guidelines. Additionally, as part of the improvements analysis the Engineer should analyze any unsignalized intersections warranting a signal as a signalized intersection and discuss within the TIA report.*
- ⇒ *Tables of existing, background and project traffic conditions LOS and delay for each major and site access intersection and MOEs for any additional transportation facilities specified by the City, including critical movements and queue spillbacks.*

h. ***Additional Information (If Applicable)***

i. Site circulation and off-site parking requirements.
ii. Potential parking impact to adjacent neighborhoods and neighborhood parking
iii. Evaluation of potential need for traffic calming including bulb out, chicanes, roundabouts, or those elements found in Section 15.19 of this chapter.
iv. Others (If Applicable)

- ⇒ *Crash Analysis*
- ⇒ *Traffic control needs*
- ⇒ *Transit*
- ⇒ *Pedestrian and bicycle access*
- ⇒ *Delivery and service vehicles*
- ⇒ *Transportation demand management.*

i. ***Transportation Improvements Analysis (Mitigation Measures)***

i. A description and justification of needed transportation improvements to accommodate project traffic conditions
ii. LOS and Delay evaluation and comparison including review of critical movements and queue spillbacks
iii. MOE comparison for any additional transportation facilities specified by the City
iv. Table(s)

⇒ *LOS and Delay comparisons for improvements including critical movements and queue spillback*
⇒ *MOE comparisons for any additional transportation facilities improvements*

v. *Figure(s), including concept schematics of improvements including corresponding LOS and Delay values.*
vi. *Left Turn Deceleration/Storage Bays*
vii. *Right Turn Deceleration/Storage Bays*

j. ***Site Improvement Analysis***
   i. *A description of site circulation and recommendations for improvement.*
   ii. *A description of on-site parking and recommendations for improvement including shared parking, if applicable*
   iii. *A description of expected delivery and service vehicle operation and facility use and recommendations for improvement.*
   iv. *A description of expected site passenger loading characteristics and recommendations for improvement.*
   v. *A description of adherence to related access management concepts as can be found in the City's set of Access Management Standards including driveway design, access spacing, and turning movement treatments.*

k. ***Conclusions and Recommendations***
   i. *Traffic Impacts*
   ii. *Adjacent transportation improvements for each horizon year addressing, at a minimum, the following*
      ⇒ *Traffic control device(s) (modification or installation)*
      ⇒ *Additional capacity (left, right, or through lanes)*
      ⇒ *Need for acceleration or deceleration lanes*
      ⇒ *Critical movements*
      ⇒ *Length of storage bays*
      ⇒ *Implementation schedule*
   iii. *Offsite transportation improvements*
      ⇒ *Modification to existing traffic control device(s)*
      ⇒ *Additional traffic control device(s)*
      ⇒ *Additional capacity at major intersections*
      ⇒ *Additional street capacity*
      ⇒ *Other*
   iv. *Site transportation improvements*
      ⇒ *Access Management*
      ⇒ *Site circulation and parking*
   v. *Mitigation Measures: The TIA report shall identify the mitigation measures needed as a result of any traffic impacts of the proposed development or redevelopment. The TIA report should also identify who or what exactly caused the need for each mitigation measure. This information will be used when the Applicant meets with the City Engineer about the implementation and cost appropriations for mitigations measures.*

l. ***Appendices****: Appendices may be included as an attached CD having individual electronic file folders for each appendix and appropriately titled Adobe PDF files.*
   i. *Basic Trip Generation Worksheet*
   ii. *Capacity Analysis Worksheets or Modeling Software Output*

iii. Traffic Volumes (24-hour and peak hour turning movement counts)
iv. Selected Photographs

8.5 TECHNICAL NOTES

A. Traffic Data.

1. Traffic volume data may be available from the city. If acceptable data is not available, the applicant is responsible for obtaining all required data.

2. Traffic count data should be no older than one year or the city may require new counts be conducted. If, in the opinion of the City Engineer, traffic volumes have significantly increased due to changes in traffic patterns or development, new counts may be required.

3. If turning movement data is outdated or if there are locations without data, the Applicant is required to collect data at their expense.

4. Intersection traffic counts shall be completed using manual or video-based methods at no more than 15-minute intervals for two hours in each peak period. Counts should include pedestrians and trucks (e.g., more than three axles) counted separately.

5. Mainline traffic data (e.g., 24-hour tube counts or similar) should be collected at 15-minute intervals.

B. Background Trip Determination: Background or non-site traffic forecasts are necessary to determine the impact of the development in horizon years such as the projected year of opening, year of full build-out and five years after full build-out. Background traffic consists of all trips that do not begin or end in the analysis area and all attraction and production trips from existing development within the analysis area. Trips generated from existing development within the analysis area are important as the proposed development may influence existing traffic patterns and potentially generate new trips for existing developments. Background traffic volumes should also include trips generated from other proposed developments within the analysis area. The Engineer should check with the City to ensure that all approved developments have been included in background traffic determination.

C. Methodologies for Background Traffic Determination

1. There are three basic methodologies used to determine background traffic volumes: build-out, area transportation planning, and trending. Each of these methodologies has strengths and weaknesses. Some methods may be more appropriate depending on the category of the Development. The Engineer may use any of the three methods to determine background traffic volumes.

2. Trending or the use of growth rates is a common method used to generate background traffic. This method is particularly useful for smaller developments and studies having shorter horizon periods. Village of Bonney traffic volume growth rates are highly variable as different areas of the city grow. The Engineer should determine the acceptable background growth rate in conjunction with city staff during the TIA scoping meeting.

D. Site Trip Generation

1. The City requires that the Engineer generate site traffic using the methodologies found in the current edition of the ITE publication, Trip Generation Handbook.

2. The ITE publication suggests using rates from local studies as a preferred method for generating site traffic. If the Engineer utilizes local studies to determine appropriate rates, it is a requirement and the responsibility of the Engineer to reference these studies in the TIA report. The Engineer must make available copies of the referenced studies if requested by the City.

3. If local rates are not available, the Engineer shall use equations and rates from the current edition of the ITE Trip Generation report as long as it follows the ITE Recommended Procedure. Otherwise, the Engineer should consult with the City and local data may need to be collected.

E. Pass-by Trips / Internal Capture

1. The City Engineer shall approve all pass-by and internal capture reduction for use in the TIA. Guidance for pass-by percentage reductions for typical land uses are shown in Table 8.5-1 below.

Table 8.5-1. Pass-By Trip Reduction for Typical Land Uses

Land Use	Acceptable Pass-By Adjustment
Retail > 400,000 GLA	20%
Retail 100,000-400,000 GLA	25%
Retail < 100,000 GLA	35%
Quality/Sit-Down Restaurants	15%
Fast-Food Restaurants	35%
Convenience Stores/Gas Stations	40%
Banks	15%
Supermarket	20%
Discount Club/Warehouse Store	20%

2. Pass-by trips will have little impact on through movement traffic operations or be part of a potential change in travel demand requiring adjacent transportation infrastructure improvements. However, the City recognizes that pass-by trips can affect left- and right-turning movement frequency and may require installation of turn lanes or other forms of mitigation (i.e., exclusive phasing, timing optimization, capacity increase). The Engineer should redistribute pass-by trips from the through movement to the appropriate left- or right- turning movement for analysis purposes. The Engineer should provide and justify an expected reduction rate for pass-by trips in the proposal of scope for approval by the City.

3. Development access connections should still carry pass-by trips and the Engineer should consider those trips in calculating the total number of trips generated by the proposed development and for necessary adjacent street improvements due to these trips. The City also recommends that the Engineer account for pass-by trips in the trip assignment step to ensure appropriate left and right turning movement volumes as these added turning

vehicles may require the need for the installation of new or additional storage at existing left- and right-turn lanes.

4. Internal capture is the application of a percent reduction in generated trips (driveway trips) and is typically applicable to projects such as shopping centers with out-lots or pad sites. The Engineer shall confer with the City Engineer on the allowable rate of internal capture for mixed-use type developments.

F. Generating Trips for Redevelopment

1. For proposed redevelopment, the City allows the Engineer to subtract trips generated by the existing development from those the new development will generate.

2. If an Applicant proposes changes to only a portion of an existing development, the City allows the Engineer to subtract any trips associated with that portion of the existing development from the trip that the proposed redevelopment will generate.

G. Site Trip Distribution and Assignment

1. Site traffic distribution and assignment are very subjective tasks and requires the Engineer to exercise engineering judgment and to call on past experiences in transportation planning.

2. Trip Distribution

a. Trip distribution efforts, in general, take into consideration the Development as a whole. Determining how generated traffic will access the proposed development can vary greatly and depends on several factors:

i. Type of development
ii. Size of the development
iii. Where the development will draw or attract traffic from
iv. Competing developments in the area
v. Surrounding land uses
vi. Condition and capacity of the surrounding street system

b. The City recommends the Engineer refer to, or utilize previously determined trip distribution models, planning software, or other recognized and substantiated methods to distribute traffic.

c. It is a requirement and the responsibility of the Engineer to document the methodologies or references utilized in completing the task of trip distribution in the TIA report. The Engineer will also be responsible to provide copies of referenced studies or models if requested by the City.

H. Trip Assignment: Assigning trips determines the amount of traffic on routes within the street network and analysis area. The Engineer should assign trips after considering several area and street network characteristics such as logical routings, left-turn movements at unsignalized intersections and access connections, available capacity and existing travel times.

1. The Engineer should consider traffic conditions for each horizon year and adjust trip assignments accordingly.

2. The Engineer may also find it necessary to prepare different sets of trip assignments for site generated trips. This may especially be useful if there are a significant number of pass-by trips.

3. The Engineer may need to prepare several trip assignments to account for uncertainty in the routes from which trips to the site will use.

4. It is a requirement and the responsibility of the Engineer to detail and explain assumptions in the narrative portion of the TIA report.

I. Traffic Analysis

1. Capacity analyses shall be performed on the transportation facilities within the determined analysis area. The Engineer shall use the methodology of the HCM to complete any capacity analysis. The analyses may be prepared manually or by using various available software programs such as HCS, Synchro, or as approved by the City. In addition to capacity analyses, the Engineer should consider other factors including safety, circulation, traffic control needs, transit, neighborhood traffic impacts, pedestrian and bicycle access, delivery and service vehicles and transportation demand management.

2. For each analysis horizon, the Engineer shall utilize the total project traffic volume which includes site generated traffic and the background traffic. Background traffic shall include traffic from other proposed developments within the analysis area and horizon. The Engineer shall also complete capacity analyses for existing and background conditions to provide LOS comparisons.

3. The analysis and site plan of the Development are an iterative process necessary for each horizon year. The purpose is to show the relationship between the site, its circulation, and plan along with the existing area street system. Accomplishing this allows the Engineer to better determine deficiencies and develop alternatives for consideration. The Engineer should define and identify impacts, deficiencies, and need for improvement. The analysis of existing conditions is essential to determine pre-development deficiencies and need for improvements.

4. The Engineer shall tabulate and report LOS and Delay for the transportation facilities within the determined analysis area. The Engineer should tabulate overall intersection LOS and delay for each approach and individual movements. The City recognizes that left turning movements and, in many cases, the approach LOS may be less than desirable at stop-controlled facilities. Intersection capacity analysis shall include analysis of queue spillbacks and capacity of left and right turn lanes. The LOS for turning movements at all access connections (driveways and turning lanes) at the project site shall also be analyzed.

5. If the Applicant is proposing a traffic signal at an intersection or access connections, the Engineer shall use the warranting process prescribed by the Texas MUTCD.

6. All capacity analysis worksheets and modeling software outputs for the existing conditions and horizon years shall be included in the TIA report as an appendix. The City may also require the actual model to be submitted in electronic form.

J. Site Access and Off-Site Improvements

1. The Engineer should identify needs and deficiencies using the previously prepared analyses. In addition, the Engineer should develop alternatives to address these needs and should address both on- and off-site improvements, if applicable.

2. Mitigation measures can include, but are not limited to, median openings, turn lanes, traffic calming and traffic signals. The Engineer shall analyze proposed mitigation measures for capacity and other factors. The Engineer shall base capacity improvements on the LOS.

3. When it can be demonstrated that a development will only partially contribute to the need for additional off-site improvements, the city may require a pro-rated contribution according to the percentage of traffic added by the development.

K. Previously Proposed Transportation Improvements

1. The Engineer can factor proposed network improvements into the analysis and can use them as mitigation measures. For example, if the Applicant schedules a Development to open in three years, and the City has a capital project that will widen the street before that time, the Engineer can consider the proposed capital improvement in the analysis. Confirm all projects and schedules with the City Engineer before proceeding, and state assumptions made in the report.

L. Phased Developments

1. Phased Developments often present a challenge for the Applicant. In many cases, Phase I of the development is well defined while additional phases are vague and may change with market conditions.

2. It is acceptable to the City for an Applicant to submit a TIA for all phases of the Development including proposed improvements at the start of a project. However, if future phases of the Development change, generating more traffic than what the Applicant had previously submitted to the City, it will be necessary for an Engineer to update the existing TIA or prepare a new one. If the Applicant only submits to the City the first phase of the Development, the Applicant should be aware that conditions may change potentially requiring additional on- and off-site improvements. If a Development is to be completed in phases, the TIA can also propose phasing of mitigation. However, the Engineer must analyze any mitigation measures proposed for the appropriate horizon year.

M. On-Site Planning

1. An integral component of any TIA should include basic site planning. This includes the identification of access connections, internal circulation, service and delivery access connections and service bays including the use of turning templates as appropriate, and the identification of optimal building locations.

2. Access connections operate as intersections and the City treats them as such. They should have an appropriate number of lanes, adequate storage, pedestrian facilities and appropriate signing and pavement markings. Adequate storage for a larger Development's access connections is often a concern, and if not designed properly, will operate inefficiently creating the potential for traffic to back up onto the street system.

3. Joint access between adjoining properties is desirable; particularly where street frontages are short or internal volumes will be low. Driveways should be located near the property line if possible or the Applicant should make cross access agreements with adjoining property owners.

4. On-site circulation and street design should be consistent with off-site streets. The area street system has shaped driver behavior and expectations; violating these expectations provides potential for safety problems.

5. Consistency between off-site and on-site signage and pavement markings is desirable for managing drivers' expectations. To the extent practical, use of Texas Manual on Uniform Traffic Control Devices (TxMUTCD) approved signs and pavement markings is recommended. Site access connections shall conform to City of Village of Bonney Access Management Standards and the Applicant and the Engineer should consider the following principles:

    i. Locating proposed traffic signals to provide for progression along the intersecting street.
    ii. Providing the minimum number of access connections that can adequately serve all anticipated traffic traveling to the site.
    iii. Providing adequate capacity/storage at access connections to ensure that traffic accessing the site does not spill back onto adjacent streets.
    iv. Intersecting two-way driveways with streets as close to perpendicular as possible.
    v. Providing adequate capacity/storage at internal intersections, especially those adjacent to public street access connections, to ensure that traffic within the site does not spill back onto adjacent streets.
    vi. Providing adequate sight distance and appropriate safety measures at all access connections and internal intersections.
    vii. Locate site driveways across from existing public streets, driveways or existing median break locations, i.e., avoid offset driveways or access connections.

6. The Engineer should base storage lengths at access connections on the Village of Bonney Design Manual and Access Management Standards. For smaller developments, the Engineer should design parking and access connections to allow vehicles to align themselves perpendicularly to the adjacent street system. For larger developments, the Engineer should provide adequate storage to ensure that exiting traffic does not hinder internal circulation.

8.6 SCHOOL ZONE POLICIES

A. General

1. The Village of Bonney works with school principals or their designated representatives to develop a master plan for creating safe and efficient school zones which balance pedestrian safety and roadway mobility needs.

2. School speed zones are installed where students cross or are likely to cross roadways by themselves but may not have a level of mental cognizance to do so safely.

3. As the school's principal is in overall responsible charge for all activities associated with a school, the City does not respond specifically to requests from the community at large but do present any suggestions received to the principal for consideration.

4. All proposed changes or new school zone requests shall be referred to the City Engineer.

B. Design Requirements on Roadways with Existing School Zone

1. Description of Design/Review Process

a. Project Initiation

i. The Consultant shall meet with the City of Village of Bonney prior to beginning the school zone redesign/replacement to discuss the project in detail. At this meeting, typical and any specialty school zone issues within the project limits will be discussed. The meeting regarding school zone will generally occur as part of other project initiation meetings and will not require a separate meeting.

b. Collect School Zone Data and Design

i. Collect all data required to develop existing school zone items including but not limited to school zone beacons, designated school crossings, and school start time and dismissal time. Typically, school zone information will be included as part of the general existing condition data collection effort.

ii. The Consultant shall prepare a plan to maintain existing school zones in safe operational manner if school is in session during construction and replace existing school zones as implemented previously before start of construction or modification as recommended by City of Village of Bonney.

C. Existing School Zones During Construction

1. It is the responsibility of the Contractor performing the work to accommodate safe movement of school related activities during the entire duration of the construction period.

2. The Contractor may need to relocate school beacons, school zone signs temporarily during construction before implementation of school zone equipment per design plans at the Contractor's expense.

8.7 ACCESS MANAGEMENT STANDARDS

A. Applicability

1. The Access Management Standards contained in this section are applicable to each development, all or a portion, which is located within the defined corporate city limits of the Village of Bonney, Texas or its extra-territorial jurisdiction, as applicable.

2. The requirements contained within this section are design standards and will serve as a basis for development plat approvals and building permits. These standards should be used in conjunction with the Village of Bonney Code of Ordinances and other requirements set forth in the Engineering Design Criteria Manual.

B. General

1. The overall purpose of implementing the Village of Bonney Access Management Standards is to enhance the functionality of City streets. This enhancement will be accomplished through preservation and improvement of operational efficiency and safety. "Access Management" is the systematic control of the location, spacing, design, and operation of driveways, medians, auxiliary lanes, and intersections to improve the balance between access and mobility while preserving street efficiency and safety.

C. Access Management Design

1. Driveways

a. Driveways and their associated openings should be located and designed to provide reasonable access between private property and the street right of way. The driveway should not create an unmanaged traffic hazard for drivers entering the street or for drivers on the through street, nor negatively impact normal use of street right of way.

b. The proper location and design of a driveway should be consistent with the safety and convenience of the public and must take into account nature and volume of traffic on abutting streets, dimensions and construction of abutting streets, use of developed property, dimensions of the developed property, and type and locations of improvements to the developed property.

c. Driveway design considers the effect of vehicles to/from developed property on the movement of traffic and the safety of traveling public on abutting streets.

d. Driveways are based on two property classifications: single family residential and all others.

e. Driveways to/from a property should include no more than the minimum number to provide reasonable access between the property and abutting street.

f. Driveway width is measured at the beginning of the driveway radii tangents within the driveway (see Figure 8.7-1). Driveway Radius is the rounded edge of a driveway that permits easier entry and exit by turning vehicles. Design standards for minimum driveway width and radius can be found in Table 8.7-1.

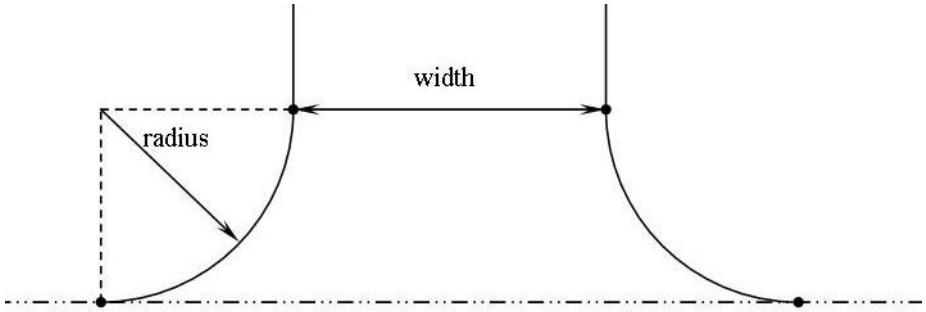


Figure 8.7-1 Driveway Radius and Width

Table 8.7-1 Driveway Design Criteria

	Single Family Residential				All Others			
	Radius (feet)		Width (ft)		Radius (feet)		Width (ft)	
	Max	Min	Max	Min	Max	Min	Max	Min
Two-Way	15	5	24	12	35	25	35	24
Joint-Access	15	5	24	12	35	25	35	24
One-Way	15	5	20	12	35	25	20	15

g. Notes on Driveway Design Criteria:

i. One-way driveways must intersect city streets between 45 and 90 degrees.
ii. Skewed, one-way drives are permitted only on one-way streets and divided streets with no median opening.
iii. Two-way driveways must intersect city streets at approximately 90 degrees.
iv. Where situations permit, AASHTO design vehicles may be used to justify (larger) driveway radii.
v. No driveway radius shall encroach on abutting property (extension of property line) or corner radius.
vi. Driveways shall not be permitted within limits of any intersection. (Design exception may be allowed for major arterial locations with existing esplanades and streets used for lower-volume residential access).
vii. For one-way driveways, the entry driveway shall precede exit driveways (in direction of adjacent travel lane).
viii. Driveway must remain tangential for a minimum of 20 feet past the property line.
ix. Where present or projected traffic operations indicate needs for alternative driveway geometrics, additional consideration may be given.

h. Driveways and Loading Docks/Wells/Berths

i. Loading docks/wells/berths are not permitted for back-in loading from an adjacent arterials.
ii. Loading docks/wells/berths must be located on site to provide for approach and maneuvering on-site with appropriate space to accommodate dimensions of vehicles accessing site.
iii. Loading docks/wells/berths must be located on site such that sufficient area is available to store commercial motor vehicle, truck-tractor, trailer, or semi-trailer or combination of such vehicles within the developed property and no part of vehicle

shall protrude over the property line or obstruct any public street or sidewalk in whole or in part.

i. Driveway Spacing
   i. The distance between connections (driveway to driveway and driveway to public or private street) is measured along the edge of traveled way from the closest edge of pavement of the first connection to the closest edge of pavement of the second connection. Driveway spacing criteria for residential areas can be found in Table 8.7-2. Non-residential driveway placement criteria on arterials and collectors is shown in Table 8.7-3. Spacing between driveways shall be measured along the property line from the edge of one driveway to the closest edge of the next driveway and not centerline to centerline.

Table 8.7-2 Residential Driveway Spacing Criteria.

	Between Adjacent Driveways	To Adjacent Street ROW	To Side Property Line	Maximum Number of Driveways on Frontage
	Spacing (minimum dimension in feet)			
Single-Family Residential	20' (1)	20'	5'	2
(1) 10 foot minimum between one-way driveway pairs. (2) Access should achieve sight distance for safe departure from driveway. (3) Driveway radii cannot extend beyond property line. (4) Driveway radii cannot extend into public street onto adjacent curb radius.				

Table 8.7-3 Non-Residential Driveway Spacing Criteria

Posted Speed (mph) (1)	Minimum Spacing (feet)
25	150'
30	230'
35 (default for minor collectors)	300'
40 (default for minor arterials & major collectors)	350'
45 (default for major arterials)	400'
50	450'
>50	TIA required

   ii. For roadways not built to ultimate cross-section, the higher of current posted speed and design speed of ultimate cross section shall be used to determine spacing.
   iii. Where the development frontage is equal to or greater than the distance to first median opening, at least one driveway will be aligned with the existing and/or future location of the median opening.
   iv. For CBD or Locations unable to comply, approval of the City Engineer required.
   v. All proposed access connections must be placed to achieve adequate intersection sight distance for safe and efficient departure from the proposed access connection (comply with AASHTO standard).
   vi. The minimum driveway offset for all arterials and major collectors shall be 100 feet.
   vii. Driveway radius cannot extend beyond property line.

viii. Driveway radius cannot extend into public street or other driveway curb radius.

ix. Notes regarding connection spacing:

- ⇒ A pair of one-way driveways (entry and exit) should be considered as a two-way driveway for driveway spacing purposes.
- ⇒ Spacing between one-way driveways requires the entry precedes the exit in the direction off the adjacent travel lane and the one-way pair meets spacing requirements from adjacent driveways or streets.
- ⇒ For the special situation of multiple entry driveways placed on one-way street and exit driveways placed on a different street, two same street driveways should be considered as a one-way pair.
- ⇒ Driveways on a street without a median should align with driveways on the opposite side of the street.
- ⇒ Driveway should be placed of a minimum offset distance of 75 ft from any median nose.
- ⇒ The spacing and location of driveways shall be related to both existing adjacent driveways and those shown on approved development plans.
- ⇒ Driveways shall be spaced at distances sufficient to ensure that conflicting movements at adjacent driveways do not overlap.

j. Driveway throat depth. Driveways on arterial roadways shall have a minimum throat depth (distance from outside travel lane/curb to the first opportunity to turn onsite) of:
   i. Major entrance to development with four or more total lanes in the driveway (typically at traffic signals), throat depth of 300’ or greater, based on traffic study;
   ii. Regional shopping centers over 150,000 square feet, throat depth of 250’
   iii. Community shopping centers 100,000 to 150,000 square feet (supermarket or other larger anchor tenants), throat depth of 150’
   iv. Smaller strip shopping center, throat depth of 50’
   v. Smaller commercial developments (convenience store w/gas), throat depth of 30’.

2. Divisional Islands

a. Divisional islands should be considered for driveways having the following characteristics:
   i. for wide driveways
   ii. for right-in/right-out driveways where movements may not be clear
   iii. for driveways where traffic volumes over 4,000 per day are expected
   iv. where the driveway is expected to be signalized in the future
   v. where the driveway has two or more entrance lanes

b. Divisional islands for driveways should be no less than 6 feet wide and no more than 16 feet wide.

3. Medians

a. Median design involves mainly median type, opening, and length. Installing medians provides the potential for safer street operation, increased capacity, and improved aesthetics.

i. Median Openings
   ⇒ Median openings allow vehicles to cross opposing traffic lanes at designated locations.
   ⇒ Median openings shall have the following geometry:
      1. Private driveway
         a. One left turn bay: 52.5'width, nose to nose
         b. Dual/Two left turn bays: 60.0' width, nose to nose
      2. Undivided Streets
         a. Width of 40' or less
            i. One left turn bay: 52.5' width, nose to nose
            ii. Dual/Two left turn bays: 60.0' width, nose to nose
         b. Width greater than 40'
            i. One left turn bay: 55' width, nose to nose
            ii. Dual/Two left turn bays: 80.0' width, nose to nose
      3. Divided Streets/Driveways: maximum approach width + 22'
   ⇒ For intersections other than 90 degrees, apply design vehicle turning templates to determine of median nose cut off.

ii. Minimum Median Separation Lengths
   ⇒ The minimum lengths of medians between openings are determined by the functional classification of the street and the type of interruption (arterial, collector, local street, private driveway, etc.) of the adjacent openings. The minimum length of medians is:
      1. 660' along arterials or major collectors, nose to nose
      2. 350' along minor collectors, nose to nose.
   ⇒ The nearest median cut on any intersection approach of an arterial to an arterial-arterial or arterial-collector intersection shall be 500'.
   ⇒ The nearest median cut on any intersection approach of a collector-collector intersection shall be 350'.

iii. Median Widths
   ⇒ Medians shall be no less than four feet in width.
   ⇒ Medians shall be no more than 30' in width at arterial-arterial and arterial-collector intersections.

4. Treatments for Turning Movements

a. Turn lanes provide a refuge area for left and right turning vehicles. Turn lanes may be placed at intersection approaches, driveway approaches, and median openings to remove turning vehicles from the through lanes, thus reducing congestion and improving traffic operations, capacity, and safety.

b. Dedicated Left-Turn Lanes

i. Left turn lanes and right turn lanes on TxDOT on-state facilities will be warranted based on TxDOT Access Management Manual, TxDOT Roadway Design Manual, and/or at the direction of TxDOT staff.

ii. Dual-left turn lanes shall be considered where left turns exceed, or are projected to exceed, 300 per hour on any signalized intersection approach on planned or existing streets having a classification of major collector or higher.
iii. Left-turn lanes shall be required
⇒ All signalized intersection approaches along planned or existing streets having a classification of major collector or higher;
iv. Left-turn lanes shall be considered in the following situations:
⇒ All unsignalized intersections and driveways along divided streets having a classification of collector or higher;
⇒ All unsignalized intersections and driveways along undivided streets having a classification of arterial or major collector or higher;
⇒ At new public or private school construction;
⇒ At new places of worship.

v. Request not to install dedicated left-turn lanes shall be guided by a traffic study and requires approval from the City Engineer.

c. Dedicated Right-Turn Lanes

i. The use of dedicated right-turn lanes should always be guided by a traffic study. Methods described in *NCHRP Report 457, Evaluating Intersection Improvements: An Engineering Study Guide*, shall be used to check warrants for right turn lanes on arterials and collectors. Other methods may be used if approved in advance by the City Engineer.

d. Minimum Turning Treatment Storage Length

i. Turn bay storage length is an important design element that ensures the provision of sufficient turn lane storage capacity to reduce instances of spillback. Left- and right-turn lane storage lengths must not be less than:
⇒ 150’ at the intersection of arterial-arterials and arterial-collector streets
⇒ 125’ at the intersection of collector-collector or collector-local street
⇒ Based on simulation at signalized intersections (based on higher of 95th percentile theoretical queue or maximum queue observed from at least 20 microscopic simulation runs).
⇒ Calculating Required Storage Length (Single Lane). The required storage length for both left- and right-turn lanes can be obtained using traffic modeling software such as the latest version of the HCM Software (HCS) or Synchro/SimTraffic. The following methods may be used to determine storage length.
1. Signalized Storage Length: For signalized intersections, the storage length should be determined based on results from computer analysis software.
2. Unsignalized Storage Length. The following equation may be used to calculate unsignalized storage length: L=(V/30)(2)(S); where *L* = storage length in feet; *V/30* = turning volume in a two-minute interval; *2* = a factor that provides for storage of all left-turning vehicles on most cycles, and *S* = queue storage length, in feet per vehicle.

ii. Taper lengths shall be a minimum of 100’ length. Taper length can be shorter if on a horizontal curve to the left but may need to be longer if on a horizontal curve to the right. Dimensions of tapers may be adjusted as determined by the City Engineer.

8.8 TRAFFIC SIGNAL/EMERGENCY VEHICLE PREEMPTION (EVP):

A. All traffic signals designed and constructed within the city limits and ETJ shall be equipped with EVP equipment (GTT “Opticom” or approved equal). The equipment shall have all required components for GPS-based EVP per the manufacturer’s specifications, which may include GPS radio unit with antenna and spread spectrum transceiver, multimode phase selector, auxiliary interface panel, card rack (as necessary) and associated cabling. The EVP equipment shall include software compatible with the existing EVP system operated by the city.

BONNEY, TEXAS

CHAPTER 9

FIBER NETWORK

BONNEY, TEXAS

CHAPTER 10

CONSTRUCTION, INSPECTION, APPROVAL AND ACCEPTANCE PROCEDURES FOR PUBLIC INFRASTRUCTURE

CHAPTER 10 – CONSTRUCTION, INSPECTION, APPROVAL AND ACCEPTANCE FOR PUBLIC INFRASTRUCTURE

Introduction

The Village of Bonney is experiencing considerable development throughout its jurisdiction. This includes development both inside the City Limits and within the City's Extraterritorial Jurisdiction (ETJ). It is, therefore, important for the City Council to approve a policy that sets out the procedures for the inspection, approval and acceptance of public infrastructure within its jurisdiction. These policies and procedures apply to construction in both subdivisions and commercial sites where it is anticipated that connections to the public infrastructure will be made, and where the infrastructure will be conveyed, either upon completion or in the future, to the Village of Bonney for operation and maintenance.

These procedures are designed so the developers and contractors will know both the procedures to be followed and the costs for the required reviews and inspections in advance.

It is important that all publicly accepted, operated and maintained infrastructure constructed within its city limits and ETJ be compliant with the City's standards and requirements. It is anticipated that even if the City does not accept the infrastructure for immediate operation and maintenance, it may eventually. As such, developers and contractors should refer to the City's Zoning and Subdivision Ordinances, as well as the City's Design Criteria Manual for specific guidance on allowable uses, platting and approval procedures and construction standards.

These procedures are designed to set out the process for approvals by the Village of Bonney during the construction phase of the development within the Village of Bonney and its ETJ.

Note: For all projects within the ETJ, the developer should also contact the Brazoria County Engineering Offices for instructions on their review procedures.

Permits and Inspection fees

The City currently utilizes a Consulting Engineer to provide infrastructure inspection services. The City expects the development to bear the costs of the services. The

contractor is expected to apply for the appropriate permits and pay the required fees in advance of the project start. Fees shall be set from time to time by the City Council and are designed to include the cost of inspections. The City may amend its fee schedule at any time to ensure the costs for the service are being covered, and may pass increased costs along to the responsible party at any time.

Pre-construction Phase

Prior to construction and prior to the issuance of a permit from the City, a preconstruction conference will be held with City staff and the City's Consulting Engineer. It is expected that prior to the preconstruction conference the following will be provided to the City in advance for review by the staff and the Consulting Engineer:

- **Plans.** Plans, specifications and other documents relating to the proposed development are to be provided.
- **Contract.** The contract between the developer and the contractor is to be provided.

Attendees at the preconstruction meeting should include the City's staff, the City's Consulting Engineer, a developer representative, a representative of the developer's engineering firm, a contractor's representative, and other people as may be identified by the City prior to the meeting. Attendance by all designated attendees is mandatory.

The project will be fully discussed at the meeting including but not limited to the developer's timetable, the points at which the City should be contacted for inspections of the infrastructure, the method of scheduling inspections, and the name, address, and contact information of all relevant participants in the construction process.

Construction Phase

It is expected the City's Consulting Engineer will make periodic reviews of the construction sites. The contractor responsible for construction should follow the procedures established by the Village of Bonney (Request form attached). The City's Consulting Engineer will review results of all testing data as required by the City's Design Criteria Manual.

Construction inspections will include but not be limited to the following.

- **Streets and sidewalks.** Inspections should be expected for sub-grade and base materials work, rebar placement, and concrete pours.
- **Drainage facilities.** The City's Consulting Engineer will inspect all storm water inlets, storm water drains, culverts, open ditches and detention facilities. Within their respective jurisdictions, representatives of Brazoria Drainage District 4 and 5 will also inspect and approve all drainage facilities associated with the development. The contractor should schedule inspections for DD 4 or 5 directly with that office.

- **Water and Sewer Utilities.** Inspections should be expected of all water and sewer lines (both grade and pressure testing), lift stations, water and wastewater plants, manholes, fire hydrants, valve locations and taps.

- **Other. Depending on the type development, there may be landscaping, street lighting, façade type, and other inspections required. The contractor should be aware of all City requirements and call inspectors as appropriate.**

Acceptance of Infrastructure for One-Year Maintenance Period

The City's Consulting Engineer will make a walk-through inspection upon completion of the project prior to making a recommendation for acceptance. The contractor is expected to have fully completed all construction prior to the walk-through inspection. During the walk-through inspection a punch list will be created. The contractor will be expected to complete/correct all the items on the punch list prior to presentation of the project to the City Council for acceptance.

Prior to acceptance for the one year maintenance period by the City Council the following must be on file with the Village of Bonney.

- **Proof of Drainage District Approval.** Documentation must be on file with the City that the appropriate Drainage District has approved the drainage improvements for the development.
- **Maintenance Bond (for Subdivision infrastructure only).** Documentation of the receipt of a properly completed Maintenance Bond (See the Subdivision ordinance for Maintenance Bond requirements for projects within the City Limits. For those in the ETJ, the County requirements shall be met and the City shall receive a copy of the Maintenance Bond).
- **Punch List.** Proof that all items listed on the punch list have been completed to the satisfaction of the City's Consulting Engineer.
- **Certification from the Engineer of Record.**
- Construction material testing lab report and Certification from the Geotechnical Engineer of Record.
- **As Built Drawings and Plans.** The contractor shall provide a true and correct paper and electronic copy in the format prescribed by the Village of Bonney Design Criteria Manual, Section 2.2.4, of the project as-built for filing and recording by the City. Construction documents shall be provided by both PDF and cadd (.dwg).
- Provide all required test reports for the infrastructure.
- Provide digital files of the post construction TV assessment of gravity sewers.
- **Engineer's Letter of Recommendation.** A letter of recommendation from the City's Consulting Engineer is required. This letter will document the project has been constructed in accordance with the plans and specifications originally reviewed, inspections during the construction process, and the Maintenance Bond and as-built drawings are properly executed and on file. The letter will be to recommend acceptance of the infrastructure for the one-year maintenance period to the City Council.
- **Electronic files of all of the above shall be required.**

No building permits will be issued for the development until the City Council has accepted the project for the one year maintenance period.

Final Acceptance of Infrastructure

Prior to final acceptance of the infrastructure, and prior to the end of the one year maintenance period, a final inspection shall be scheduled and conducted by the City's Consulting Engineer. The responsible party for the development is required to contact the City and schedule the inspection. This inspection should be no sooner than eleven months after the beginning of the maintenance period. This inspection will be designed to inspect the infrastructure for failures or other deficiencies that may have occurred during the maintenance period. A punch list will be created if needed as a result of the inspection. The developer and/or contractor are expected to complete/correct all the items on the punch list prior to City Council consideration.

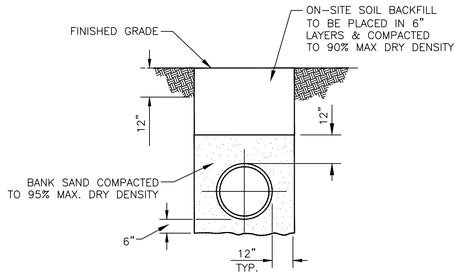
- A letter of recommendation from the City's Consulting Engineer to the City Council will again be required. This letter will document the project has completed its final inspection after the one year maintenance period, confirm the project is in compliance with the plans and specifications, the as-built drawings are properly executed and on file. The letter will be to recommend final acceptance of the infrastructure by the City Council and the release of the Maintenance Bond.

Conclusion

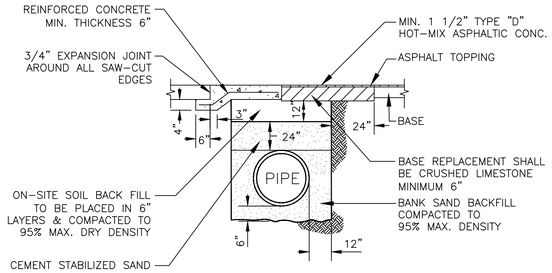
It is the purpose of these procedures to provide predictable criteria for the City, developers and contractors alike to follow. These procedures may be amended from time to time. All developers/contractors are urged to seek the most up to date copy of these procedures prior to beginning the planning process for developments that will have publicly operated and/or maintained infrastructure.

APPENDIX A

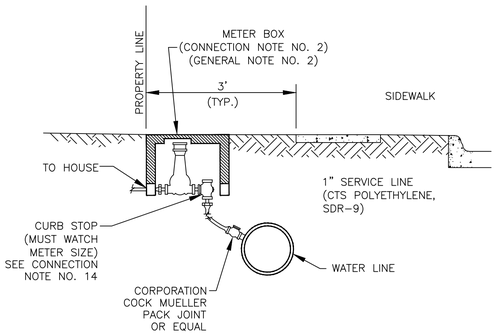
STANDARD CONSTRUCTION DETAILS



WATER
1 TYPICAL TRENCH SECTION IN GRADED AREA



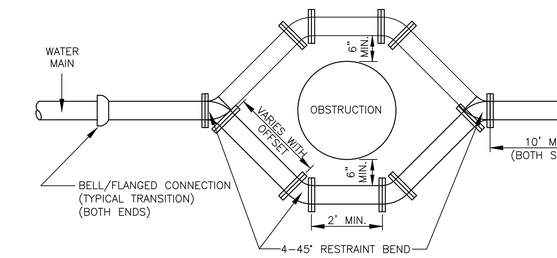
WATER
2 TYPICAL TRENCH SECTION IN PAVED AREA



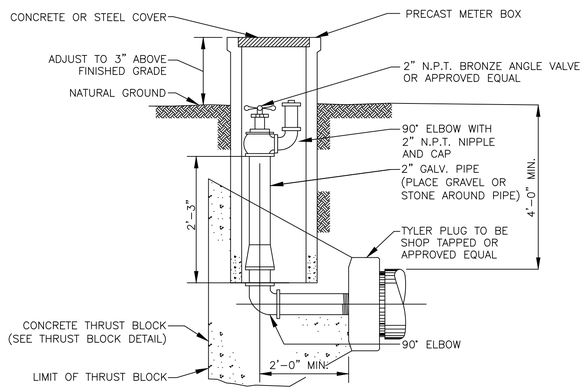
3 WHEN SERVICE METER IS NEAR WATER MAIN

GENERAL NOTES

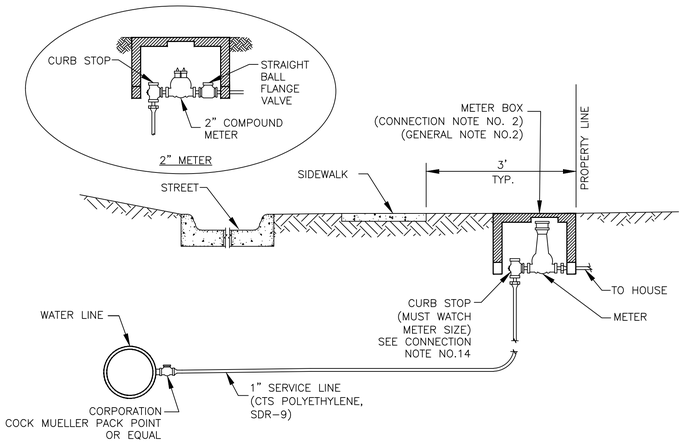
1. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 125 PSI FOR A DURATION OF 8 HOURS OR 150 PSI FOR 4 HOURS.
2. ALL WATER METER BOXES SHALL BE NDS MODEL NO. D15AMR2–DISB OR APPROVED EQUAL. (BOX NEEDS TO BE COMPATIBLE TO NEPTUNE PRO–READ.) LOCKING LIDS WILL NOT BE ACCEPTED.
3. PROVIDE "UNI–FLANGE", "CERTA–LOK", OR APPROVED EQUAL PIPE RESTRAINT AND CASING SYSTEM ON UNDERGROUND PRESSURE PIPE SYSTEMS
4. ALL WATER TAPS SHOULD BE PLACED IN LINE WITH PROPERTY CORNER OR PLACED HALF WAY BETWEEN THE FRONT LOT CORNERS, OR AT PC OF CURB RETURN IN MULTI LOT SUBDIVISIONS.



4 VALVE BOX



5 2" BLOW OFF VALVE ASSEMBLY



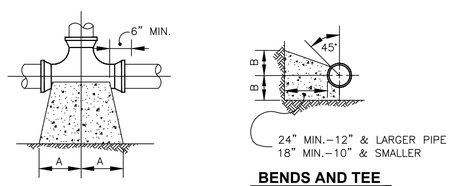
6 WHEN SERVICES CROSS PAVED STREET

FOR A LINE TO PASS OVER AN OBSTRUCTION RATHER THAN UNDER, IT MUST HAVE ADEQUATE OVER AND BE APPROVED BY THE ENGINEERING DEPARTMENT

MIN. PIPE WALL THICKNESS		
4"	–	0.250"
6"	–	0.280"
8"	–	0.322"
12" AND LARGER	–	0.375"

NOTES:
1. PIPE MATERIAL SHALL BE AWWA C900 PVC, DR–14, 200 PSI WITH INTEGRAL PVC RESTRAINED JOINTS.
2. OFFSET ASSEMBLY MUST PASS OVER THE OBSTRUCTION AS LONG AS THE MINIMUM CLEARANCE IS MAINTAINED. SPECIFIC APPROVAL FROM THE UTILITIES DEPARTMENT MUST BE GRANTED FOR THE OFFSET TO PASS UNDER THE OBSTRUCTION.
3. MATERIAL AND COATINGS SHALL BE IN ACCORDANCE WITH WATER MAIN STANDARD SPECIFICATIONS.
4. RESTRAIN EXISTING PIPING BEYOND OFFSET SECTION AS REQUIRED TO PREVENT MOVEMENT.
5. ALL PVC PRODUCTS MUST BE LISTED ON VILLAGE OF BONNEY'S APPROVED PRODUCTS LIST.

7 OFFSET ASSEMBLY



8 THRUST BLOCKING DETAIL

SIZE	90° BEND		45° BEND		22½° BEND		TEES		PLUGS	
	A	B	A	B	A	B	A	B	C	D
4" / 6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"
18"	42"	30"	24"	30"	12"	24"	24"	30"	24"	60"
24"	50"	40"	30"	40"	18"	30"	30"	40"	30"	*78"
30"	60"	48"	36"	48"	20"	36"	36"	48"	36"	*96"

NOTE : DIMENSION WITH ASTERISK (*) REQUIRES STRUCTURAL DESIGN

SERVICE CONNECTION NOTES

1. THE WATER MAIN SHALL HAVE A MINIMUM COVER OF 48" BELOW TOP OF CURB GRADE
2. THE WATER SERVICE LINES THAT ARE INSTALLED BEFORE THE COMPLETION OF STREET CONSTRUCTION SHALL BE LAID IN THE SERVICE DITCH AT THE SAME ELEVATION AS THE WATER MAIN OR A MINIMUM COVER OF 48" BELOW TOP OF CURB GRADE. AT THE PROPER LOCATION FOR THE METER BOX, THE METER (CURB) STOP SHALL BE RAISED TO 18" BELOW TOP OF CURB GRADE WITH ENOUGH EXCESS TUBING TO RAISE THE STOP AT A FUTURE DATE TO 6" BELOW TOP OF CURB GRADE.
3. LOCATOR WIRE TO PLACED ON ALL MAINS AND SERVICES. (MIN. 20 GA. COPPER)
4. SINGLE METER SERVICE LINES SHALL BE 1" MIN. I.D., C.T.S. POLYETHYLENE, SRD–9.
5. CONTRACTOR TO FURNISH AND INSTALL DOUBLE SERVICE METER BOXES AT FINISH GRADE.
6. FIRE HYDRANT ASSEMBLIES SHALL NORMALLY BE LOCATED THREE FEET BEHIND BACK OF CURB, DEFLECT WATERLINES AS NECESSARY TO MAINTAIN THREE FOOT CLEARANCE. REQUIRED ASSEMBLY SHALL INCLUDE ONE LINE SIZE BY SIX INCH TEE, ONE SIX INCH GATE VALVE AND BOX, ONE FIRE HYDRANT AND SIX INCH LEAD PIPING AND TIE BACKS.
7. WATER VALVES ON MAIN LINES SHALL BE LOCATED AS CLOSE AS POSSIBLE TO EXTENDED PROPERTY LINE AND SHALL CONFORM TO AWWA C–500, OPEN LEFT, EQUIPPED WITH 2" SQUARE OPERATING NUT.
8. WATERLINES 4 INCH THOUGH 12 INCH I.D. SHALL COMPLY WITH THE REQUIREMENTS OF AWWA STANDARD C–900 CLASS 150, SDR–18 WITH CAST IRON OUTSIDE DIAMETER.
9. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL HAVE A MINIMUM OF 2500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.
10. GRAY IRON AND DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA C–110 AND END JOINTS OF FITTINGS AND MAIN LINE VALVES SHALL CONFORM TO AWWA C–111 FOR RUBBER GASKETED JOINTS. GRAY IRON AND DUCTILE IRON FITTINGS SHALL BE CEMENT LINED OR EPOXY COATED.
11. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE.
12. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
13. CONTRACTOR SHALL NOTIFY CITY ENGINEER 72 HOURS BEFORE START OF CONSTRUCTION.
14. RIGHT ANGLE CURB STOPS MADE BY FORD, OR APPROVED EQUAL, SHALL BE USED. (SINGLE SERVICE: FORD BA43–342W OR EQUIVALENT, DOUBLE SERVICE: FORD UAVB43–42W OR EQUIVALENT). ONLY PACK JOINT CURB STOPS ARE PERMITTED.
15. WATER MANIFOLDS ARE NOT PERMITTED (EXCLUDING 1 INCH WATER SERVICES WITH 1 INCH U–BRANCH ASSEMBLY.
16. WATER TAPS SHALL HAVE A MINIMUM OF 24 INCH SEPARATION BETWEEN TAPS ON THE MAIN WATER LINE.

NO.	REVISIONS	DATE	NAME
1			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

WATER DETAILS
SHEET 1

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: WATER DETAILS – 1	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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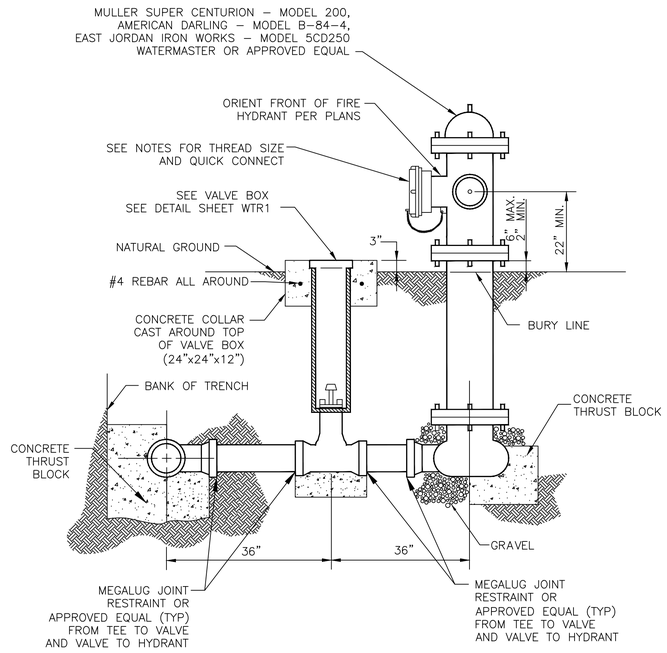
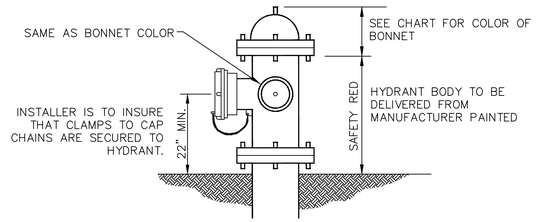


1 FIRE HYDRANT



COLOR CODE

FIRE HYDRANT BARREL	SAFETY RED (225A123)
FIRE HYDRANT CAPS	SAME AS BONNET COLOR

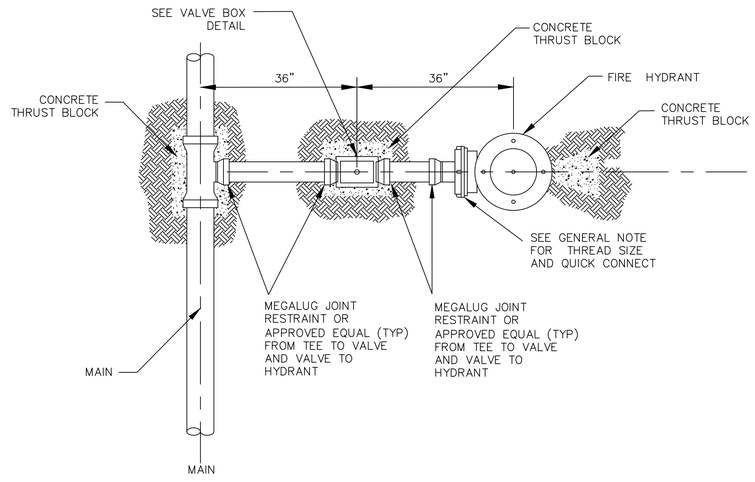
COLOR CODE (BONNETS AND CAPS)

MAIN SIZE	
6"	GLOSS WHITE CODE NO. 225A100
8"	SAFETY ORANGE CODE NO. 225A122
10" AND 12"	JOHN DEERE GREEN CODE NO. 225A133
16" AND 20"	JOHN DEERE YELLOW CODE NO. 225A138
22" AND UP	SAFETY RED CODE NO. 225A123

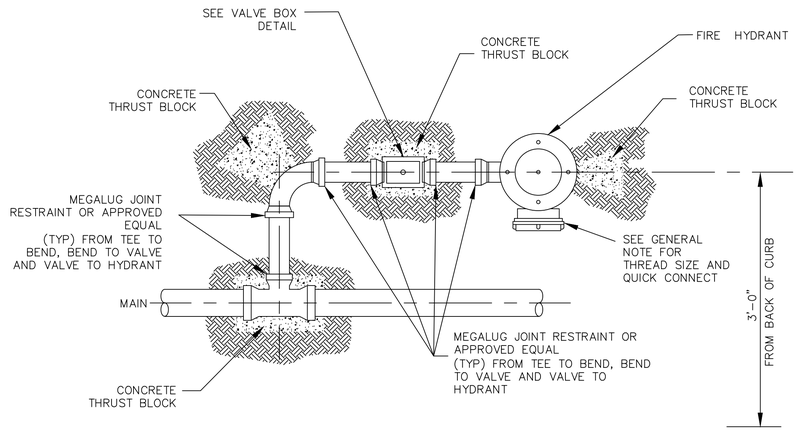
2 FIRE HYDRANT - COLOR CODE

NOTES:

1. PRESSURE TEST OF ALL WATER LINES SHALL BE AT 125 PSI FOR DURATION OF 8 HOURS OR 150 PSI FOR 4 HOURS.
2. FIRE HYDRANT THREAD SIZE: PUMPER CONNECTION 4-492 SIZE=4.492".
3. PROVIDE "UNI-FLANGE" OR APPROVED EQUAL PIPE RESTRAINT AND CASING SYSTEM ON UNDERGROUND PRESSURE PIPE SYSTEMS.
4. FIRE HYDRANT ASSEMBLIES SHALL NORMALLY BE LOCATED THREE FEET BEHIND BACK OF CURB, DEFLECT WATERLINES AS NECESSARY TO MAINTAIN THREE FOOT CLEARANCE. REQUIRED ASSEMBLY SHALL INCLUDE ONE LINE SIZE BY SIX INCH TEE, ONE SIX INCH GATE VALVE AND BOX, ONE FIRE HYDRANT AND SIX INCH LEAD PIPING AND TIE BACKS.
5. ALL CONCRETE THRUST BLOCKING SHALL BE PLACED TO FORM A SOLID CONNECTION BETWEEN FITTINGS, VALVES, AND FIRE HYDRANTS AND UNDISTURBED EARTH. CONCRETE FOR THRUST BLOCKING SHALL HAVE A MINIMUM OF 2500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.
6. INSTALL CONCRETE BLOCK BENEATH FIRE HYDRANTS BEFORE PLACING CONCRETE THRUST BLOCKING TO INSURE THAT FIRE HYDRANTS ARE INSTALLED LEVEL.
7. ALL FIRE HYDRANTS AND VALVE BOXES ARE TO BE ADJUSTED TO FINISH GRADE AFTER PAVING IS COMPLETE.
8. ALL FIRE HYDRANTS ARE TO BE EQUIPPED WITH HYDRA-STORZ QUICK CONNECT HYDRANT SYSTEM (1/4 X 5" BASE) WITH DEBRIS CAP. MANUFACTURED BY HYDRA-SHIELD, INC. OR APPROVED EQUAL. DEBRIS CAP IS TO BE TETHERED WITH A 12" STAINLESS STEEL CABLE, UTILIZING THE EYELET ON THE FIRE HYDRANT AND THE DEBRIS CAP.
9. CONTRACTOR SHALL NOTIFY CITY ENGINEER 72 HOURS BEFORE START OF CONSTRUCTION.
10. ALL FIRE HYDRANT RESTRAINTS TO BE MJ FITTING.



3 FIRE HYDRANT - PLAN



4 ALTERNATE FIRE HYDRANT - PLAN

NO.	REVISIONS	DATE	NAME
1			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

WATER DETAILS
SHEET 2

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: WATER DETAILS – 2	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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SANITARY SEWER SYSTEM CONSTRUCTION NOTES

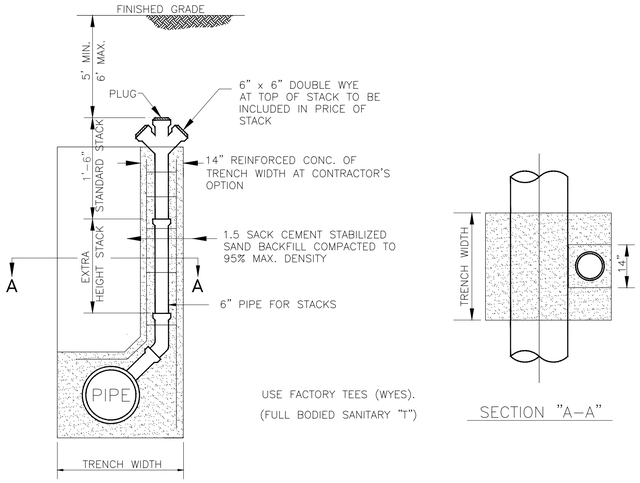
1. FINISHED ELEVATION ON SANITARY SEWER MANHOLE RIMS SHALL BE THREE INCHES ABOVE FINISHED GRADE WITHIN UTILITY EASEMENTS OR STREET RIGHT-OF-WAY. CLEAN FILL SHALL BE ADDED AND SLOPED FROM MANHOLE RIM.
2. CONTRACTOR SHALL MARK LOCATION OF AND MAINTAIN RECORDS OF STUB, STACKS, AND END OF SERVICE LEAD LOCATIONS, WITH WIRE LOOPS AND 2" P.V.C. PIPE.
3. WATER LINES AND SANITARY SEWER LINES SHALL BE INSTALLED IN SEPARATE TRENCHES.
4. ALL PVC PIPE (POLYVINYL CHLORIDE) SHALL BE IN ACCORDANCE WITH ASTM D3034, SDR 26.
5. ALL PVC PIPE (ALL TYPES AND SDR/DR WALL THICKNESS TO BE USED) SHALL HAVE RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D-3212. THE GASKET MATERIAL SHALL CONFORM TO ASTM F-477. SOLVENT WELDED JOINTS WILL NOT BE APPROVED FOR CITY SEWER LINES.
6. ALL DUCTILE IRON PIPE SHALL BE 150 PSI. WITH EIGHT (8) MIL, BLACK VIRGIN POLYETHYLENE WRAP AS SPECIFIED IN ANSI/AWWA C105/A21.5.
7. SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE VILLAGE OF BONNEY DESIGN STANDARDS. CONTRACTOR TO FURNISH TEST PLUGS AND RISERS (NO SEPARATE PAY). ALL SEWER LINES TO BE AIR TESTED IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
8. MAINTAIN 12-INCH MINIMUM CLEARANCE BETWEEN ALL STORM SEWERS, AND CULVERTS UNLESS OTHERWISE NOTED.
9. SEWER TRENCHES UNDER OR WITHIN ONE (1) FOOT OF PROPOSED OR FUTURE PAVEMENT TO BE BACKFILLED WITH CEMENT STABILIZED SAND BACKFILL, AS SPECIFIED, TO WITHIN ONE (1) FOOT OF SUBGRADE. BEDDING WILL BE CLASS "AA" WHERE CEMENT STABILIZED SAND C PER LINEAR FOOT OF PIPE.
10. WATER LINE/SANITARY MANHOLE AND SANITARY SEWER SEPARATION. UNLESS SANITARY SEWER MANHOLES AND THE CONNECTING SEWER CAN BE MADE WATERTIGHT AND TESTED FOR NO LEAKAGE, MUST BE INSTALLED SO AS TO PROVIDE A MINIMUM OF NINE FEET OF HORIZONTAL CLEARANCE FROM AN EXISTING OR PROPOSED WATERLINE. WHERE THE NINE FOOT SEPARATION DISTANCE CANNOT BE ACHIEVED, FOLLOW THESE SPECIAL PROCEDURES:
    a) WHERE A SEWER CROSSES A WATERLINE ALL PORTIONS OF THE SEWER WITHIN NINE FEET OF THE WATERLINE SHALL BE CONSTRUCTED OF DUCTILE IRON (AWWA C151, 150 PSI, THK. CL. 50), OR PVC PIPE WITH A PRESSURE RATING OF AT LEAST 150 PSI USING APPROPRIATE ADAPTERS. VERTICAL CLEARANCE BETWEEN PIPES SHALL BE AT LEAST 2' IF SEWER IS ABOVE THE WATERLINE AND 6" IF THE SEWER IS BELOW THE WATERLINE.
    b) SANITARY SEWER LINES CROSSING UNDER PROPOSED OR FUTURE WATER LINES WITH GREATER THAN SIX INCHES VERTICAL WALL-TO-WALL CLEARANCE BUT LESS THAN TWO FEET OF VERTICAL WALL-TO-WALL CLEARANCE SHALL HAVE ONE EIGHTEEN-FOOT JOINT OF A SPECIFIED DUCTILE IRON PIPE (AWWA C151, 150 PSI. THK. CL. 50) CENTERED ON THE WATER LINE CROSSING.
    c) SANITARY SEWER LINES CROSSING UNDER PROPOSED OR FUTURE WATER LINES WITH GREATER THAN TWO FEET OF VERTICAL BUT LESS THAN NINE FEET OF VERTICAL WALL-TO-WALL CLEARANCE SHALL BE BACKFILLED FOR NINE HORIZONTAL FEET OF WATER LINE ON EACH SIDE OF SEWER LINE WITH CEMENT SAND (MINIMUM 2 SACKS CEMENT PER CUBIC YARD OF SAND) TO A DEPTH OF ONE PIPE DIAMETER OR TWELVE INCHES (WHICHEVER IS GREATER) ABOVE THE SEWER LINE.
    d) WHERE A SANITARY SEWER PARALLELS A WATERLINE, THE SEWER MUST BE INSTALLED IN A SEPARATE TRENCH, AND SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC PIPE MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO FEET BETWEEN OUTSIDE DIAMETERS AND THE HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR FEET BETWEEN OUTSIDE DIAMETERS. THE SEWER SHALL BE LOCATED BELOW THE WATERLINE.
11. ALL PROPOSED GRAVITY SANITARY SEWER LINES SHALL BE DUCTILE IRON OR SDR 26 PVC PIPE. NON-PRESSURE PVC MAY NOT BE SUBSTITUTED FOR D.I.P. OR C-900 (DR 18 ONLY) PVC.
12. BEDDING FOR ALL TYPES OF SANITARY SEWER PIPE SHALL BE CLASS "AA" AT ALL DEPTHS (NO SEPARATE PAY).
13. FOR ALL PVC PIPE, USE MANHOLE WATER STOP GASKET AND CLAMP ASSEMBLY AT MANHOLE CONNECTIONS (NO SEPARATE PAY).
14. SANITARY SEWER MANHOLES SHALL BE STANDARD TYPE, UNLESS OTHERWISE NOTED, AND BACKFILLED WITH CEMENT STABILIZED SAND AS SPECIFIED (NO SEPARATE PAY). ALL SANITARY MANHOLES SHALL BE AT LEAST 1 FOOT ABOVE THE 100 YEAR BASE FLOOD ELEVATION. SECTIONS FOR PRECAST MANHOLES SHALL BE JOINED WITH RUBBER GASKET JOINTS. "RAM NEK" OR SIMILAR WILL NOT BE APPROVED.
15. ALL FAR-SIDE LEADS SHALL BE SIX (6) INCHES OR EIGHT (8) INCHES DIAMETER AT 0.70% MIN. SLOPE AND SHALL BE PVC, SDR 26, 150 PSI PRESSURE PIPE CONFORMING TO ASTM D-2241. STUBS AND FAR-SIDE LEADS WILL BE D.I.P., 150 PSI, THICKNESS CL. 51, WHERE THERE IS LESS THAN THREE (3) FOOT COVER TO TOP OF CURBS (NO SEPARATE PAY).
16. LEADS SERVING TWO LOTS SHALL HAVE A SERVICE "WYE" WITH PLUGS (NO SEPARATE PAY). THE "WYE" SHALL BE LOCATED WITHIN THE STREET RIGHT-OF-WAY OR ADJOINING UTILITY EASEMENT.
17. ALL PRECAST CONCRETE MANHOLES SHALL HAVE THE TOP 18 INCHES CONSTRUCTED OF STEEL OR PRECAST PCC RINGS, SEALED INSIDE AND OUTSIDE.
18. SANITARY SEWER LINE IN PIPE ZONE IN SIDE LOT EASEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND. (NO SEPARATE PAY).
19. IF WET SAND IS ENCOUNTERED IN THE FIELD, USE SPECIAL BEDDING.
20. USE WHITE PIPE FOR ALL FORCE MAINS.
21. PROVIDE "UNI-FLANGE", "CERTA-LOK", OR APPROVED EQUAL PIPE RESTRAINT AND CASING SYSTEM ON UNDERGROUND PRESSURE PIPE SYSTEMS.

SPECIAL NOTES: LOCATION OF SANITARY SEWER FACILITIES

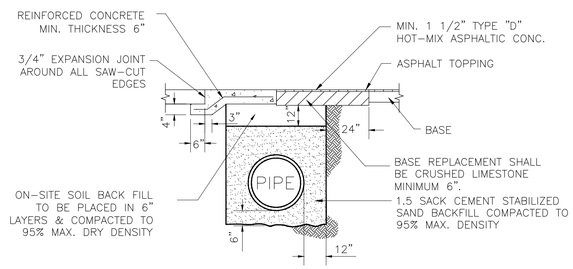
IF STAKES ARE LEFT IN THE GROUND AT THE STACK AND LEADS AFTER CONSTRUCTION OF UTILITIES, THEN AN EFFORT WILL BE MADE TO PRESERVE THEM DURING PAVING C UTILITY CONTRACTOR REMAINS RESPONSIBLE FOR LOCATING AND MARKING THE FACILITIES AS DESCRIBED BELOW.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING AS-BUILT RED LINES AND FLOW LINE ELEVATIONS OF ALL SERVICE CONNECTIONS AND SHALL BE PLACED ON AS BUILT PLANS AT THE COMPLETION OF THIS JOB.

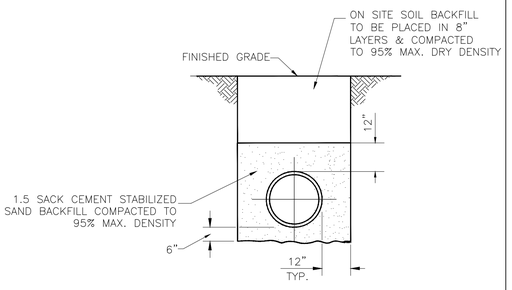
THE UTILITY CONTRACTOR IS RESPONSIBLE FOR LOCATING AND MARKING ALL STACKS AND FAR SIDE LEADS AFTER THE PAVING IN THIS SECTION IS COMPLETE. A 1/4-INCH DEEP NOTCH SHALL BE CUT IN THE CURB AND PAINTED WITH A RED LINE ADJACENT TO THE STACK OR LEAD.



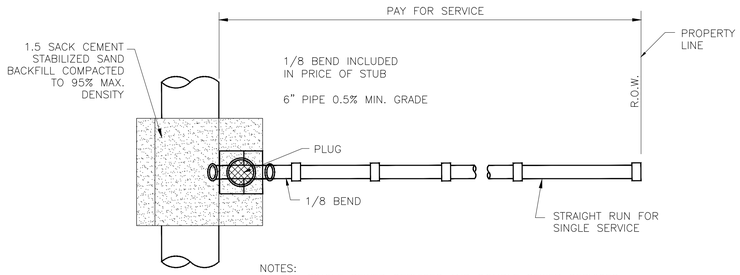
1 SANITARY SEWER STACK



2 TRENCH SECTION IN PAVED AREA

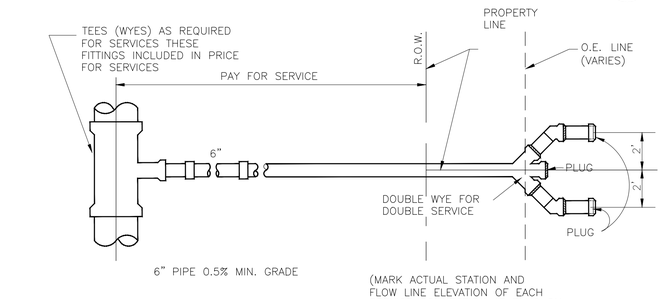


3 AA PIPE BEDDING DETAIL SANITARY SEWER



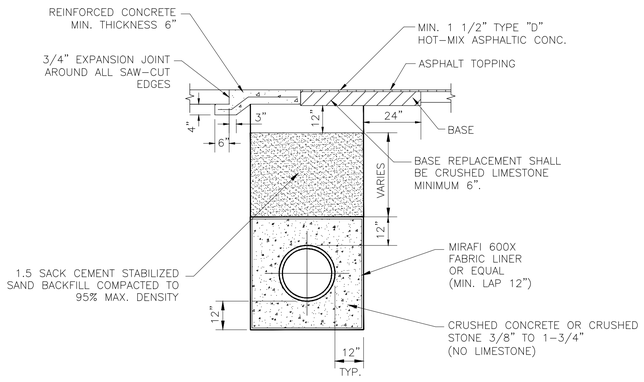
NOTES:
1. ALL SINGLE SEWER SERVICES AND DOUBLE SEWER SERVICES, AS SHOWN, ARE INTERCHANGEABLE, AS REQUIRED, TO CONNECT WITH STACKS, DOUBLE WYES AND WYES, AS REQUIRED, TAPS FOR PVC PIPE TO BE PVC "T" OR "Y".
2. PROVIDE LOCATOR WIRE LOOPS FROM EACH SERVICE CONNECTION TO NEAREST MANHOLE.

4 SINGLE SEWER SERVICE

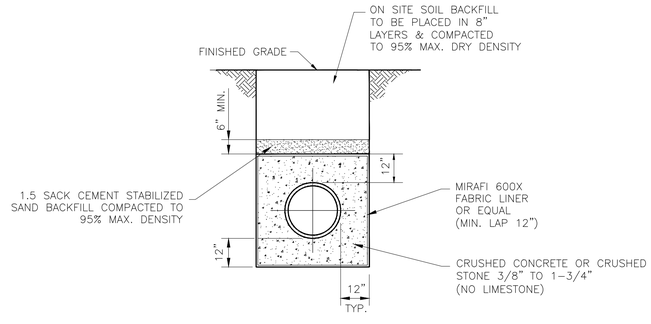


1. ALL SANITARY SEWER SERVICES WILL BE BROUGHT TO WITHIN 4 TO 6 FEET OF FINISHED LOT GRADE ELEVATION AT PROPERTY LINE (RIGHT OF WAY).
2. SEWER SERVICE LEADS SHALL NOT BE BACKFILLED UNTIL VISUALLY INSPECTED BY CITY INSPECTOR.

5 DOUBLE SEWER SERVICE



6 BEDDING AND BACKFILL FOR WET SAND UNDER PAVEMENT



7 BEDDING AND BACKFILL FOR WET SAND

NOTES:
1. ALL SANITARY SEWER TAPS SHOULD BE PLACED IN LINE WITH PROPERTY CORNER OR PLACED HALF WAY BETWEEN THE FRONT LOT CORNERS, OR AT PC OF CURB RETURN IN MULTI LOT SUBDIVISIONS.
2. NECESSITY FOR USE OF THIS SECTION TO BE DETERMINED BY THE ENGINEER AS CONSTRUCTION PROGRESSES AND MAY BE MODIFIED BY TO SUIT CONDITIONS ENCOUNTERED.
3. WELL POINTS TO BE INSTALLED AND TRENCH KEPT DRY DURING CONSTRUCTION UNTIL BACKFILL IS COMPLETELY PLACED AND ENOUGH TIME AS APPROVED BY ENGINEER HAS ELAPSED.

NO.	REVISIONS	DATE	NAME
1			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

SANITARY SEWER DETAILS
SHEET 1

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: SANITARY SEWER DETAILS – 1	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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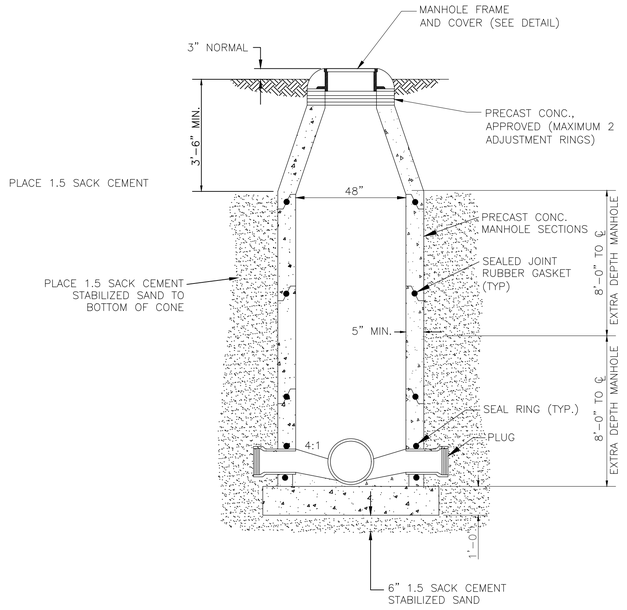
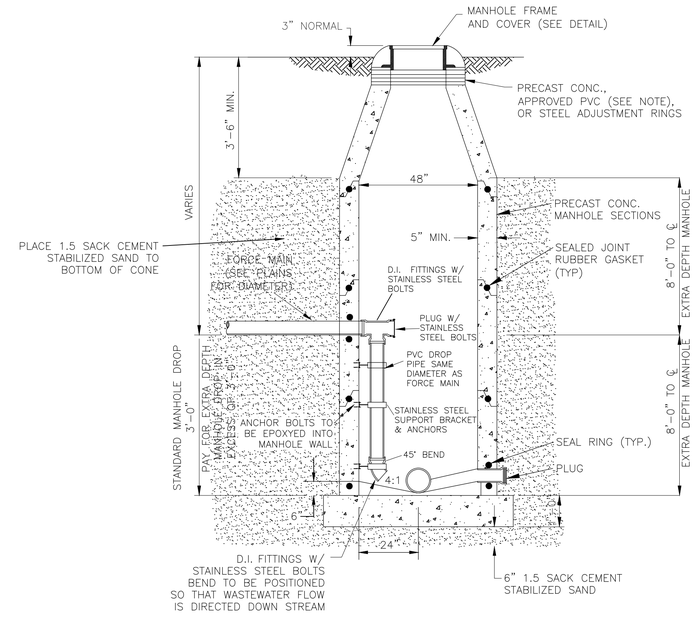


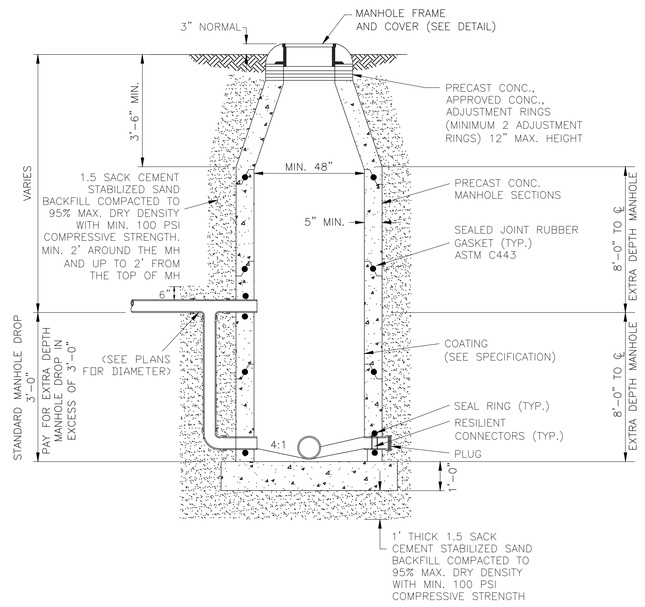
NOTES:
1. ALL MANHOLES IN WET SAND REQUIRE SPECIAL DESIGN
2. H.D.P.E. ADJUSTMENT RINGS AS MANUFACTURED BY LADTECH, INC. OR APPROVED EQUAL.
3. HORSE-SHOE SHAPED PIPE OPENINGS OR BREAKOUT PIPE OPENINGS WILL NOT BE ACCEPTED
4. INTERIOR SURFACE OF THE MANHOLE SHALL BE COATED WITH A MINIMUM 80 MILS THICKNESS OF NEOPOXY, NPR 5300 SERIES, OR RAVEN LINING SYSTEMS, RAVEN-405.

1 STANDARD PRECAST CONCRETE SEWER MANHOLE



NOTE:
1. MANHOLE MUST BE CORED TO APPROPRIATE OPENING.
2. WATER TIGHT GASKET MUST BE USED TO SEAL PIPE TO MANHOLE.
3. ALL PIPE FITTINGS TO BE 1 (ONE) BOLT TYPE RESTRAINT FITTINGS OR APPROVED EQUAL.
4. USE STAINLESS STEEL ANCHOR TO ATTACH PIPE SUPPORTS TO WALL.
5. PIPE SUPPORTS MUST BE STAINLESS STEEL (3' MAX SPACING).
6. INTERIOR SURFACE OF THE MANHOLE SHALL BE COATED WITH A MINIMUM 80 MILS THICKNESS OF NEOPOXY, NPR 5300 SERIES, OR RAVEN LINING SYSTEMS, RAVEN-405.
7. INSIDE FORCE MAIN DROP 8" OR LESS ALLOWED 4' STANDARD MANHOLE.
8. INSIDE FORCE MAIN DROP LARGER THAN 8" MUST BE APPROVED BY CITY ENGINEER.
9. GRAVITY LINES 10 INCHES OR LESS, THE INTERNAL DROP WILL BE USED WITH A STANDARD 4 FOOT DIAMETER MANHOLE. GREATER THAN 10 INCHES WILL REQUIRE A 6 FOOT DIAMETER MANHOLE.

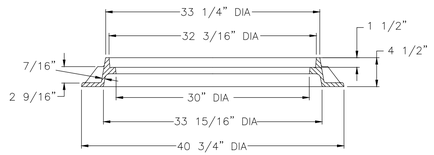
2 STANDARD PRECAST CONCRETE SEWER MANHOLE
INTERNAL DROP FOR FORCEMAIN ONLY



NOTE:
1. PRE-CAST MANHOLES ONLY SHALL BE USED.
2. NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES.
3. MANHOLES SHOULD BE PLACED HALF WAY BETWEEN THE FRONT LOT CORNERS IN MULTI-LOT SUBDIVISION.

NOTE:
1. FOR ALL NEW CONSTRUCTION.
2. CLASS 1 CONCRETE WITH A DESIGN STRENGTH OF 4000 PSI AT 28 DAYS. RATES FOR H-20 LOADING.
3. PRECAST CONCRETE MANHOLE CONFORMING TO ASTM C478. STRUCTURAL REINFORCEMENT CONFORMING TO ASTM 615A.
4. LIFTING INSERTS AS REQUIRED.
5. ALL JOINTS SHALL BE SEALED WITH APPROVED GASKET.
6. MANHOLE MUST BE CORED TO APPROPRIATE OPENING.
7. WATER TIGHT GASKET MUST BE USED TO SEAL PIPE TO MANHOLE.
8. ALL PIPE FITTINGS TO BE 1 (ONE) BOLT TYPE RESTRAINT FITTINGS OR APPROVED EQUAL.
9. PIPE SUPPORTS MUST BE STAINLESS STEEL (3' MAX SPACING).
10. ALL MANHOLES IN OPEN DITCH SHALL HAVE HINGED FRAME AND COVER
11. ALL MANHOLES ABOVE GRADE SHALL HAVE REVOLUTION ASSEMBLY RIM AND COVER (SEE DETAIL SHEET 3 OF 3)
12. VACUUM TEST SHALL BE COMPLETED PRIOR TO COATING OF THE MANHOLE.
13. INTERIOR SURFACE OF THE MANHOLE SHALL BE COATED WITH A MINIMUM 80 MILS THICKNESS OF NEOPOXY, NPR 5300 SERIES, OR RAVEN LINING SYSTEMS, RAVEN-405.

3 STANDARD PRECAST CONCRETE SEWER MANHOLE
WITH EXTERNAL DROP



NOTES:
1. MANHOLE FRAME AND COVER TO BE EAST JORDAN IRON WORKS PATTERN, OR OTHER APPROVED EQUAL. WHERE SEWER IS LOCATED IN EASEMENTS, CONTRACTOR MAY USE LIGHTWEIGHT F AND C, APPROVED BY THE ENGINEER.
2. STAINLESS STEEL INFLOW PREVENTERS MADE BY KoLa, INC., OR APPROVED EQUAL, SHALL BE USED ON ALL SANITARY SEWER MANHOLES.
3. INFLOW PREVENTERS MUST BE ANCHORED W/ STAINLESS STEEL ANCHORS.

4 MANHOLE COVER AND FRAME

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NO.	REVISIONS	DATE	NAME
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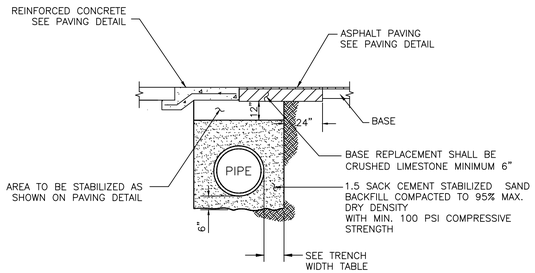
VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

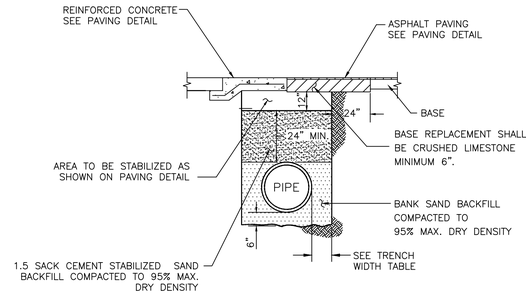
BONNEY, TEXAS

SANITARY SEWER DETAILS
SHEET 2

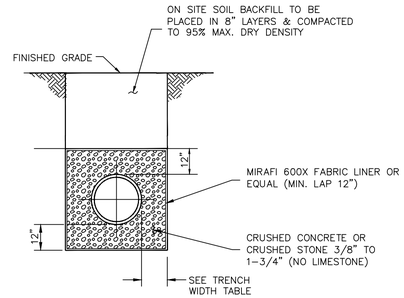
PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: SANITARY SEWER DETAILS – 2	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	



1 TRENCH SECTION FOR GRAVITY SEWER UNDER PAVEMENT



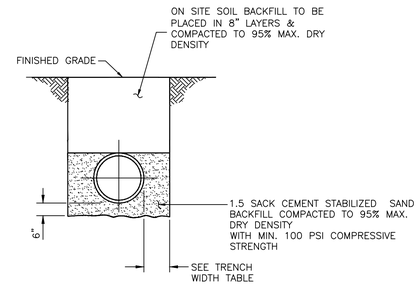
2 BEDDING AND BACKFILL FOR FORCE MAIN UNDER PAVEMENT



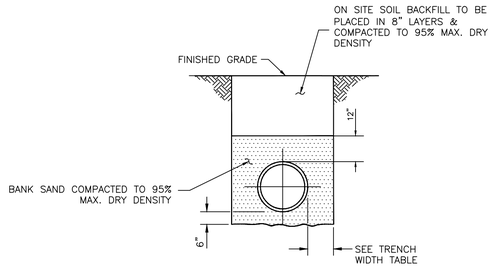
3 BEDDING AND BACKFILL FOR WET SAND GRADED AREA

NOTE:

1. ALL PVC PIPE SHALL HAVE RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. ELASTOMERIC SEALS SHALL BE A SINGLE DOUBLE-SEALING GASKET SPANNING ONE FULL CORRUGATION WITH THE LEADING EDGE BEING LOWER THAN THE SECOND EDGE TO FACILITATE PROPER JOINING. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477.
2. ALL CEMENT STABILIZED SAND BACKFILL SHALL CONFORM TO SPECIFICATION CEMENT STABILIZED SAND – SECTION 02252.
3. ALL JOINTS IN PRE-CAST CONCRETE PIPE AND BOX SHALL RECEIVE JOINT SEALANT, RAM-NEK, OR APPROVED EQUAL.
4. ALL PIPE WITHIN 1' OF PAVEMENT SHALL USE BACKFILL DETAIL FOR UNDER PAVEMENT.

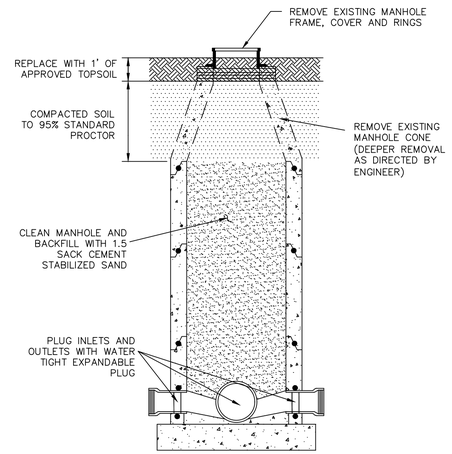


4 AA PIPE BEDDING DETAIL FOR GRAVITY SEWER GRADED AREA

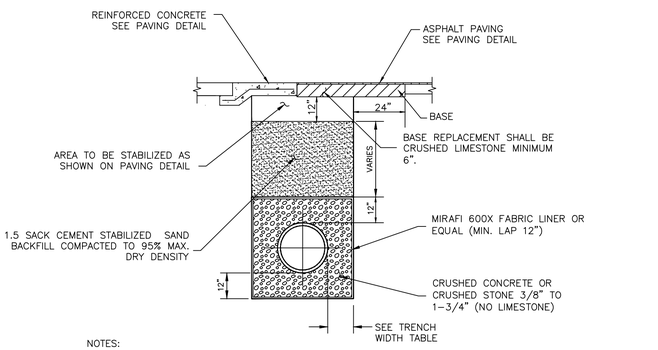


5 BEDDING AND BACKFILL FOR FORCE MAIN GRADED AREA

TRENCH WIDTH TABLE	
NOMINAL PIPE SIZE (INCHES)	MINIMUM TRENCH WIDTH (INCHES)
LESS THAN 18	O.D. + 18
18 TO 30	O.D. + 24
GREATER THAN 30	O.D. + 36



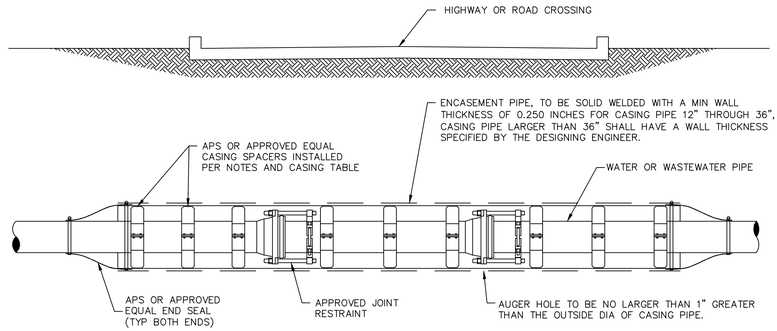
6 SANITARY SEWER MANHOLE ABANDONMENT



NOTES:

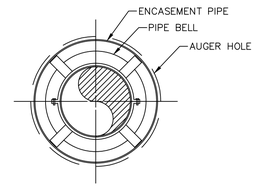
1. NECESSITY FOR USE OF THIS SECTION TO BE DETERMINED BY THE ENGINEER AS CONSTRUCTION PROGRESSES AND MAY BE MODIFIED BY THE ENGINEER TO SUIT CONDITIONS ENCOUNTERED.
2. WELL POINTS TO BE INSTALLED AND TRENCH KEPT DRY DURING CONSTRUCTION UNTIL BACKFILL IS COMPLETELY PLACED AS APPROVED BY ENGINEER.

7 BEDDING AND BACKFILL FOR WET SAND UNDER PAVEMENT



LONGITUDINAL SECTION

CASING TABLE		
NOMINAL PIPE SIZE DIA IN INCHES	MIN CASING SIZE INSIDE DIA IN INCHES	MAX SKID SUPPORT SPACING IN FEET
4	12	4.7
6	12	6.3
8	16	7.4
10	18	8.5
12	20	9.6
15	22	11.0
18	26	12.0
21	30	12.0
24	33	12.0
27	36	12.0



CROSS SECTION

NOTES:

1. SPACERS FOR CARRIER PIPE SHALL BE STAINLESS STEEL, NEOPRENE OR APPROVED EQUAL AND SHALL BE INSTALLED TO CENTER CARRIER PIPE WITHIN CASING WITH A MAX TOLERANCE OF ½" BETWEEN RUNNER AND CASING INSIDE AS WELL AS PREVENT THE CARRIER PIPE FROM RESTING ON THE BELLS WITHIN THE CASING. SEE CASING TABLE FOR SPACER DISTANCE AND NUMBER OF SPACERS.
2. SPACERS TO BE PLACED A MIN OF 1' BACK FROM EACH JOINT THAT FALLS WITHIN CASING, A GREATER SET BACK MAY BE REQUIRED FOR LARGER PIPE. SEE CASING TABLE FOR ADDITIONAL INFO ON SPACING OF SUPPORTS.
3. WHEN INSTALLING GRAVITY PIPE WITH CASING CONTRACTOR SHALL TAKE INTO CONSIDERATION PIPE GRADE SO THAT THE SEWER PIPE MAINTAINS THE PROPER FALL.
4. JOINT RESTRAINTS ARE REQUIRED ON ALL JOINTS THAT FALL UNDER OR WITHIN 10' OF HIGHWAY CROSSINGS REGARDLESS OF PIPE MATERIAL, CASED OR NOT.

8 STEEL PIPE CASING

NO.	REVISIONS	DATE	NAME
1			
2			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

SANITARY SEWER DETAILS
SHEET 3

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: SANITARY SEWER DETAILS – 3	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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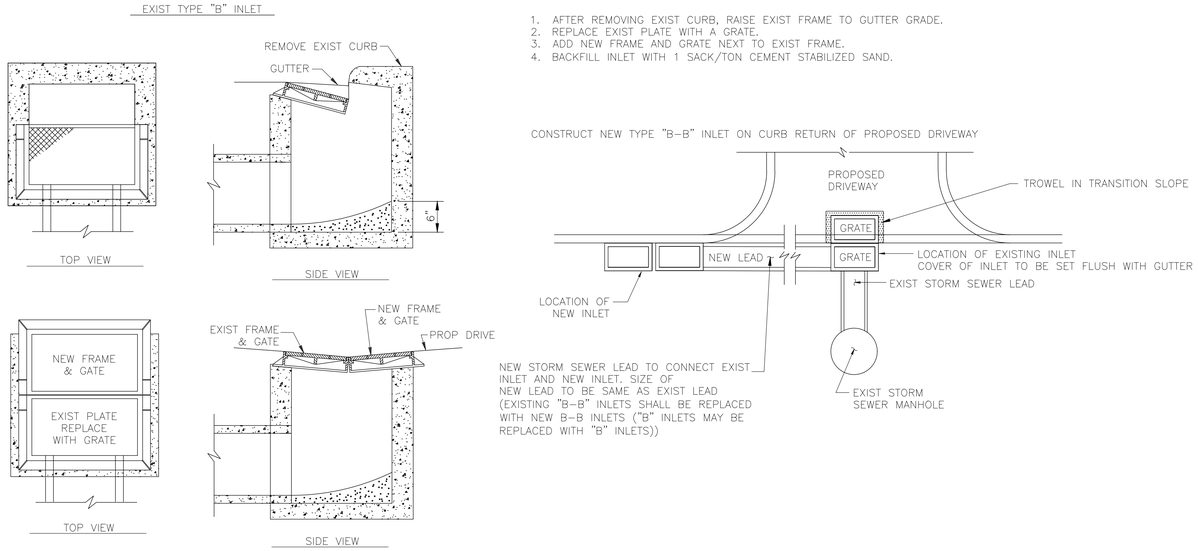
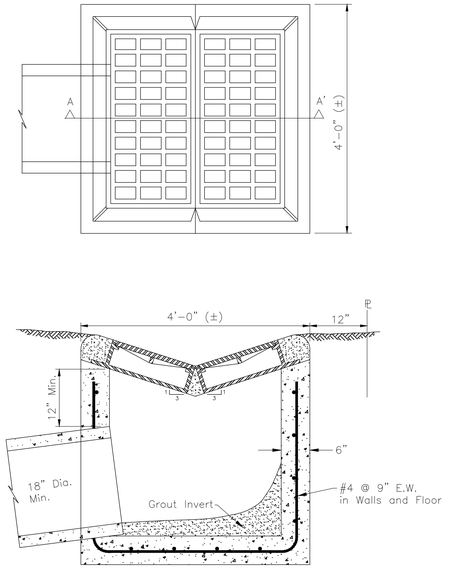


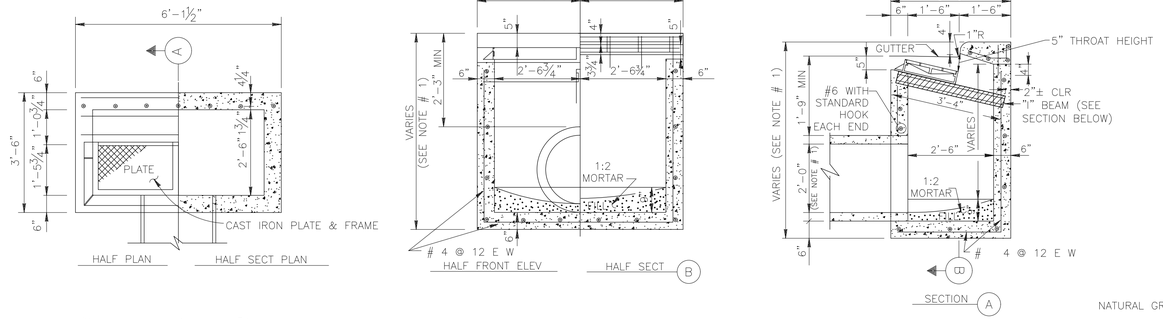
1 "B" AND "B-B" INLET REPLACEMENT



NOTES:

1. POURED-IN-PLACE OR PRE-CAST MANHOLES ONLY SHALL BE USED.
2. NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES OR INLETS.
3. ALL PVC PIPE SHALL HAVE RUBBER GASKET EQUIPPED BELL AND SPIGOT JOINTS CONFORMING TO ASTM D3212. ELASTOMERIC SEALS SHALL BE A SINGLE DOUBLE-SEALING GASKET SPANNING ONE FULL CORRUGATION WITH THE LEADING EDGE BEING LOWER THAN THE SECOND EDGE TO FACILITATE PROPER JOINING. THE GASKET MATERIAL SHALL CONFORM TO ASTM F477.
4. FOR ALL PRE-CAST AND POURED -IN-PLACE INLETS AND JUNCTION BOXES, CENTER DOUBLE - SEALING GASKET IN WALL AND GROUT COMPLETELY AROUND PVC PIPE. GROUT SHALL BE SMOOTH AND FLUSH WITH INNER AND OUTER WALL WHEN ENTERING AT AN ANGLE TO THE WALL OR THROUGH THE CORNER OF AN INLET OR JUNCTION BOX, THE GASKET MAY BE OMITTED.

2 MAINTENANCE BERM INLET BOX



CURB BEAM BAR LIST				
NO	SIZE	LENGTH	SHAPE	LOC
4	# 4	5'-10"	ST	HOR
7	# 4	0'-10"	ST	VERT
7	# 3	1'-6"	BT	

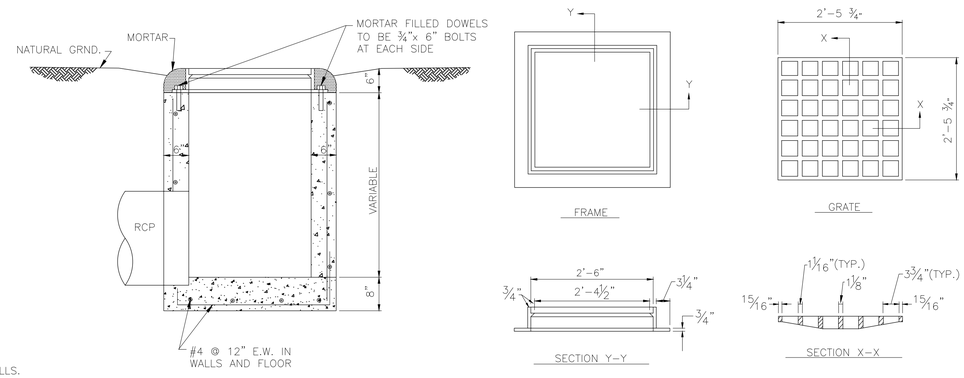
3 "BB" INLET

GENERAL NOTES:

USE STD CAST IRON FRAME & PLATES. LEAD SHALL LEAVE INLET AT LOCATION AND GRADE REQUIRED.

NOTES:

1. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
2. CENTER REINFORCING IN SLAB AND WALLS.
3. CENTER STEEL BEAM ON INLET AND CAST INTO WALLS AS SHOWN.
4. ALL INVERT SHALL BE SMOOTH FINISH.



4 "A" INLET

NO.	REVISIONS	DATE	NAME
1			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

STORM SEWER DETAILS
SHEET 1

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: STORM SEWER DETAILS – 1	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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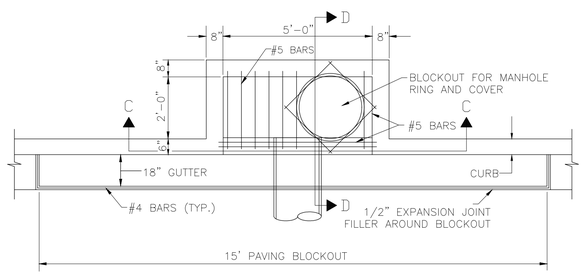
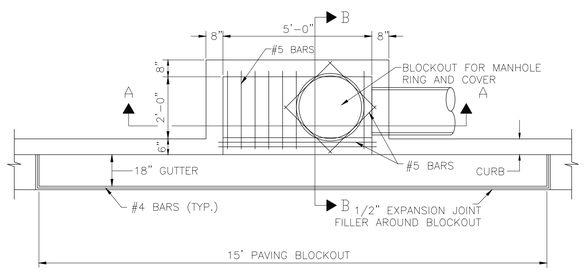
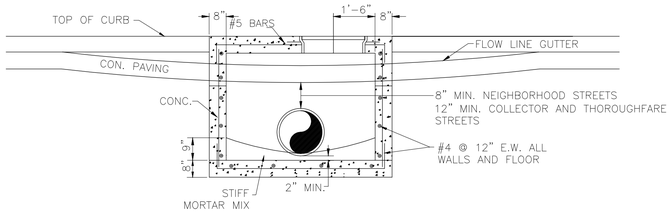


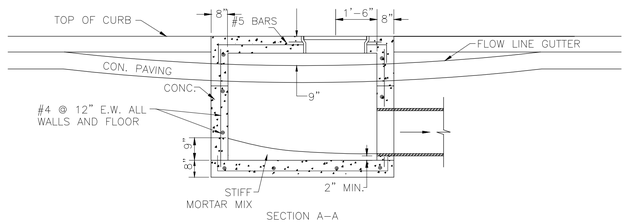
PLAN



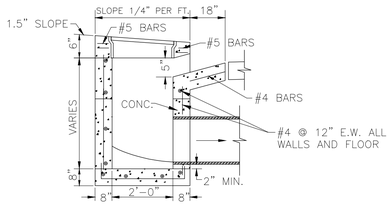
PLAN



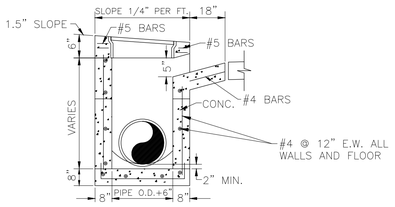
SECTION C–C



SECTION A–A

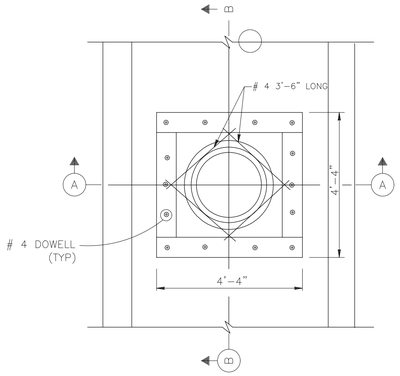


SECTION D–D

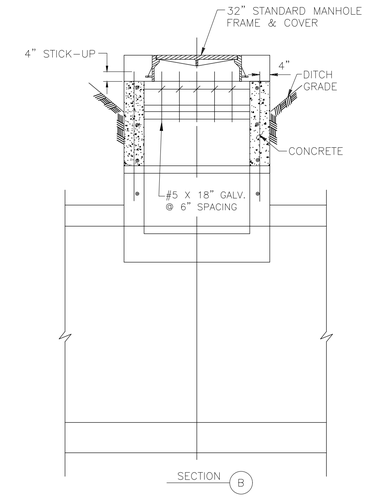


SECTION B–B

1 "C" INLET



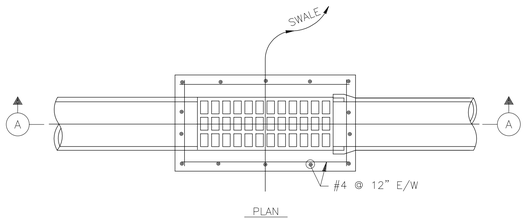
PLAN OF TYPE "E" (COVER NOT SHOWN)



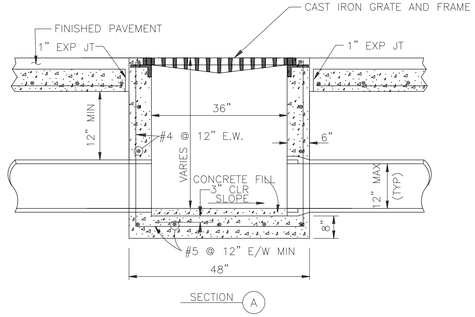
SECTION B

NOTES:

1. ONLY CAST–IN–PLACE OR PRE–CAST MANHOLES SHALL BE USED.
2. NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES OR INLETS.
3. MANHOLES AND INLETS SHOULD BE PLACED AT THE LOT LINE.
4. ALL DETENTION AND PERIMETER DRAINAGE SHALL BE COMPLETED BEFORE ANY INTERIOR CONSTRUCTION IS STARTED.
5. THE MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE MIN. 4000 PSI AT 28 DAYS.
6. FOR CAST IN PLACE STORM INLETS: FOUR FIELD TEST CYLINDERS SHALL BE TAKEN FROM EACH MIX DESIGN PLACED EACH DAY ACCORDING ASTM C172–04 STANDARD PRACTICE FOR SAMPLING FRESHLY MIXED CONCRETE.
7. THE CONTRACTOR SHALL INSTALL COIC STORM DRAIN LABEL ON ALL C INLETS. THE CONTRACTOR SHALL REQUEST AND OBTAIN LABEL FROM PUBLIC WORKS. SASHCO SEALANTS CLEAR/WHITE LEXEL ADHESIVE CAULK OR APPROVED EQUAL SHALL BE USED AS ADHESIVE FOR INSTALLATION.
8. ALL CAST IRON GRATE FRAMES SHALL BE EAST JORDAN IRON WORK OR APPROVED EQUAL.

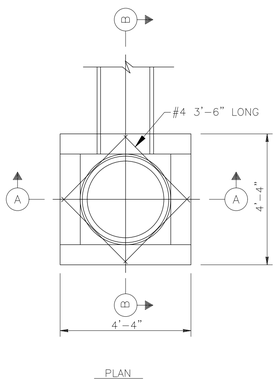


PLAN

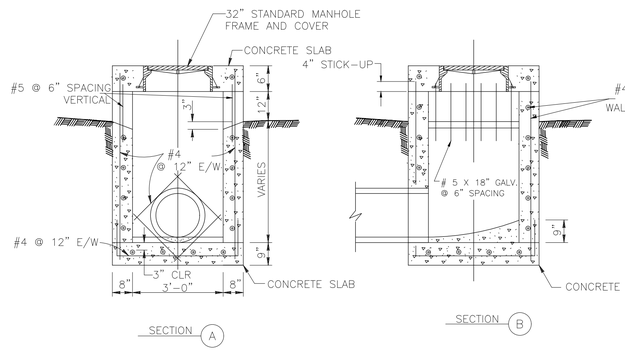


SECTION A

2 "D" INLET



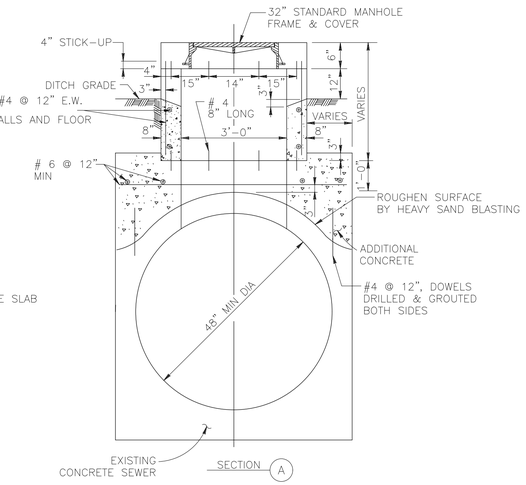
PLAN



SECTION A

SECTION B

3 "E" INLET



SECTION A

4 "E" INLET

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

STORM SEWER DETAILS
SHEET 2

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: STORM SEWER DETAILS – 2	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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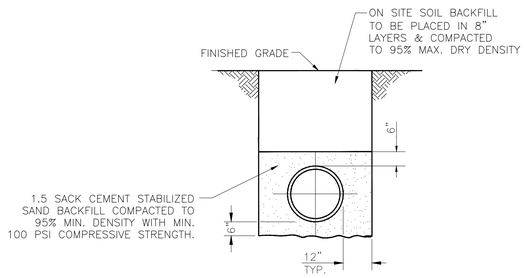
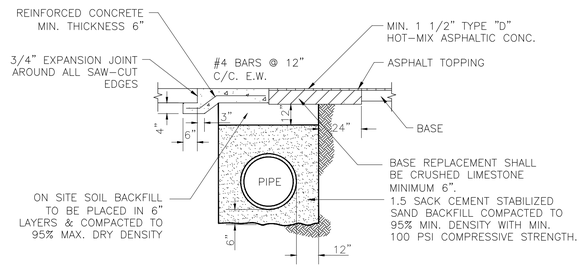


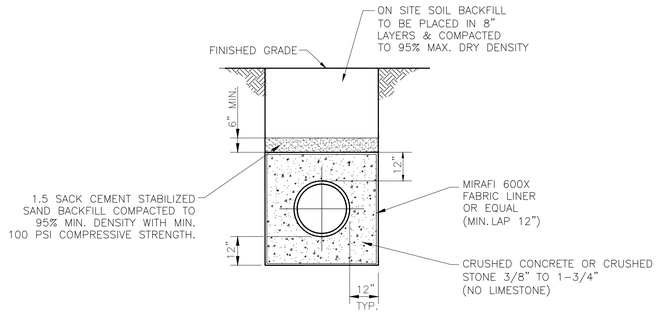
1 **PIPE BEDDING DETAIL**

CONCRETE PIPE (TONGUE AND GROOVE)



2 **PIPE BEDDING DETAIL**

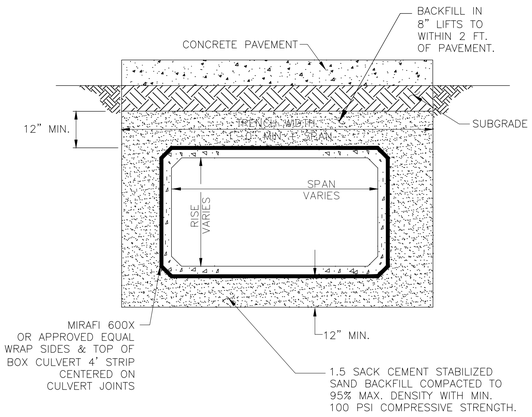
CONCRETE PIPE (TONGUE AND GROOVE)
BELL AND SPIGOT UNDER PAVEMENT



3 **BEDDING AND BACKFILL FOR WET SAND**

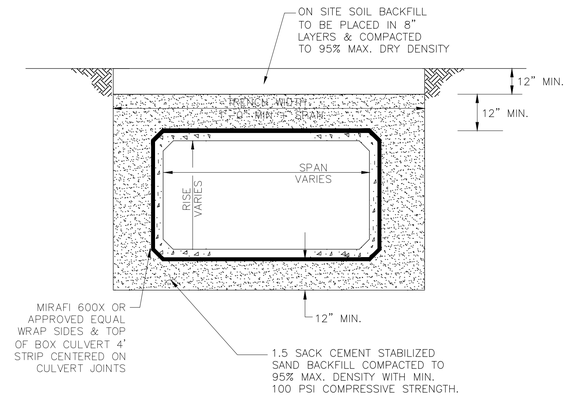
NOTES:

1. POURED-IN-PLACE OR PRE-CAST MANHOLES ONLY SHALL BE USED.
2. NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES OR INLETS.
3. FOR ALL PRE-CAST AND POURED-IN-PLACE INLETS AND JUNCTION BOXES, CENTER DOUBLE-SEALING GASKET IN WALL AND GROUT COMPLETELY AROUND PVC PIPE. GROUT SHALL BE SMOOTH AND FLUSH WITH INNER AND OUTER WALL WHEN ENTERING AT AN ANGLE TO THE WALL OR THROUGH THE CORNER OF AN INLET OR JUNCTION BOX, THE GASKET MAY BE OMITTED.
4. ALL CEMENT STABILIZED SAND BACKFILL SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 100 PSI.



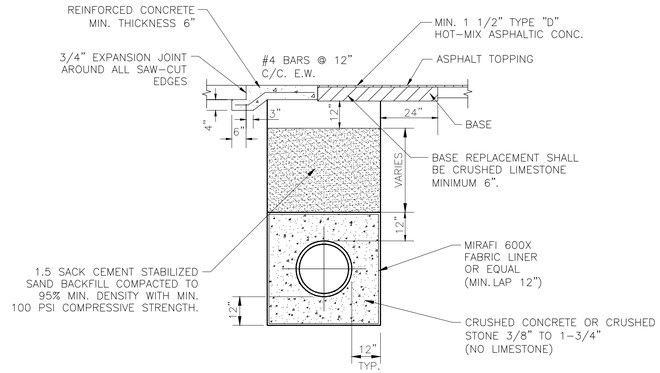
4 **BEDDING AND BACKFILL**

FOR REINFORCED CONCRETE BOX CULVERTS
UNDER PAVEMENT



5 **BEDDING AND BACKFILL**

FOR REINFORCED CONCRETE BOX CULVERTS



6 **BEDDING AND BACKFILL FOR WET SAND**

UNDER PAVEMENT

NOTES:

1. NECESSITY FOR USE OF THIS SECTION TO BE DETERMINED BY THE ENGINEER AS CONSTRUCTION PROGRESSES AND MAY BE MODIFIED BY HIM TO SUIT CONDITIONS ENCOUNTERED.
2. WELL POINTS TO BE INSTALLED AND TRENCH KEPT DRY DURING CONSTRUCTION UNTIL BACKFILL IS COMPLETELY PLACED AND ENOUGH TIME AS APPROVED BY ENGINEER HAS ELAPSED.

NO.	REVISIONS	DATE	NAME
1			
2			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

STORM SEWER DETAILS
SHEET 3

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: STORM SEWER DETAILS - 3	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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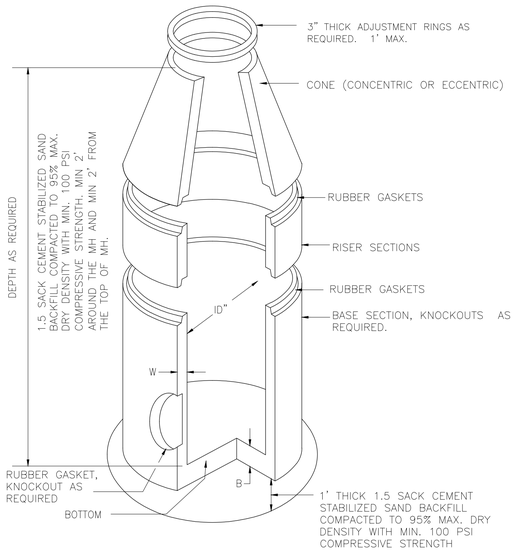
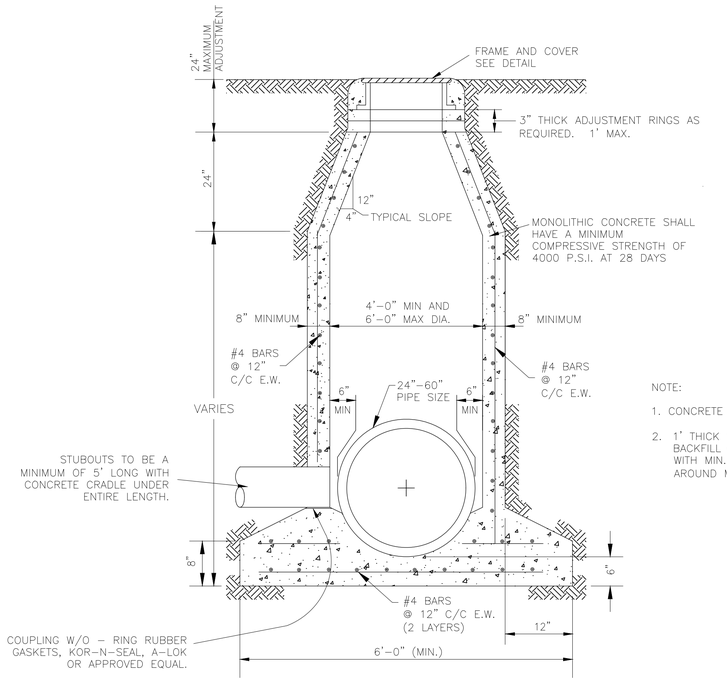
DIMENSIONS AND WEIGHTS			
I.D. SIZE (in)	W (in)	B (in)	RISER WT/LF (lb)
48	5	6	868
60	6	8	1300
72	7	8	1811
96	9	8	3090

NOTE:

1. CLASS 1 CONCRETE WITH A DESIGN STRENGTH OF4000 PSI AT 28 DAYS. RATES FOR H-20 LOADING.
2. PRECAST CONCRETE MANHOLE CONFORMING TO ASTM C478. STRUCTURAL REINFORCEMENT CONFORMING TO ASTM 615A.
3. LIFTING INSERTS AS REQUIRED.
4. ALL JOINTS SHALL BE SEALED WITH APPROVED GASKET.
5. LARGER INSIDE DIAMETER MANHOLES SHALL BE REQUIRED IF LESS THAN 1' OF WALL SURFACE IS LEFT BETWEEN OPENINGS OR AS SPECIFIED BY ENGINEER.
6. ALL MANHOLES IN OPEN DITCH AND ABOVE FINISHED GRADE SHALL HAVE HINGED FRAME AND COVER.
7. ALL MANHOLES IN PAVED AREAS SHALL HAVE BLOCK OUT (SEE DRIVEWAY DETAIL SHEET).



1 TYPE "C" PRECAST STORM SEWER MANHOLE



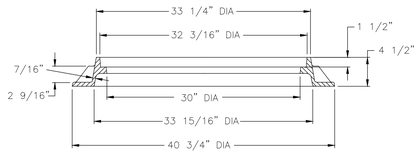
NOTE:

1. CONCRETE SHALL BE A MONOLITHIC POUR.
2. 1' THICK 1.5 SACK CEMENT STABILIZED SAND BACKFILL COMPACTED TO 95% MAX. DRY DENSITY WITH MIN. 100 PSI COMPRESSIVE STRENGTH AROUND MANHOLE COMPACTED IN 8" LIFTS.

2 TYPE "C" CAST-IN-PLACE STORM SEWER MANHOLE

NOTE:

1. ONLY CAST-IN-PLACE OR PRE-CAST MANHOLES SHALL BE USED.
2. NO BRICKS OF ANY KIND WILL BE ALLOWED IN CONSTRUCTION OF MANHOLES OR INLETS.
3. FOR ALL PRE-CAST AND POURED-IN-PLACE INLETS AND JUNCTION BOXES, CENTER DOUBLE- SEALING GASKET IN WALL AND GROUT COMPLETELY AROUND DUAL WALL PVC PIPE. GROUT SHALL BE SMOOTH AND FLUSH WITH INNER AND OUTER WALL WHEN ENTERING AT AN ANGLE TO THE WALL OR THROUGH THE CORNER OF AN INLET OR JUNCTION BOX, THE GASKET MAY BE OMITTED.
4. ALL CEMENT STABILIZED SAND BACKFILL SHALL CONFORM TO SPECIFICATION CEMENT STABILIZED SAND - SECTION 02252.



NOTE:

1. MANHOLE FRAME AND COVER TO BE EAST JORDAN IRON WORKS PATTERN, OR OTHER APPROVED EQUAL. WHERE SEWER IS LOCATED IN EASEMENTS, CONTRACTOR MAY USE LIGHTWEIGHT F AND C, APPROVED BY THE ENGINEER.
2. STAINLESS STEEL INFLOW PREVENTERS MADE BY KoLa, INC., OR APPROVED EQUAL, SHALL BE USED ON ALL SANITARY SEWER MANHOLES.
3. ALL MANHOLES IN OPEN DITCH AND ABOVE FINISHED GRADE SHALL HAVE HINGED FRAME AND COVER.

3 MANHOLE COVER AND FRAME

STORM SEWER SIZE	MANHOLE DIAMETER
48" OR LARGER	6'-0"
48" TO 42"	5'-0"
30" OR LESS	4'-0"

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

STORM SEWER DETAILS
SHEET 4

PROJECT TITLE:
DRAWN BY:
CK'D BY:
SHEET DESCRIPTION: STORM SEWER DETAILS - 4
STANDARD
SCALE:
DATE:
APPROVED BY:
SHEET NO: /

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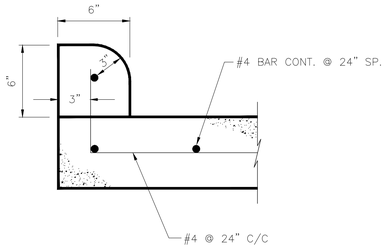
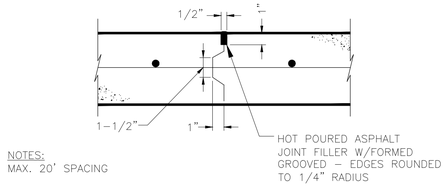


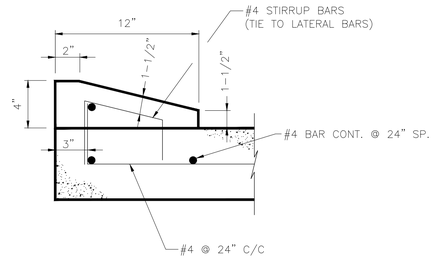
1 **DETAIL - CONCRETE CURB**

SCALE: 1"=0.5'



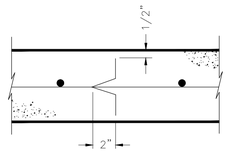
4 **DETAIL - CONSTRUCTION JOINT**

SCALE: 1"=0.5'



7 **DOWEL-ON MOUNTABLE CURB**

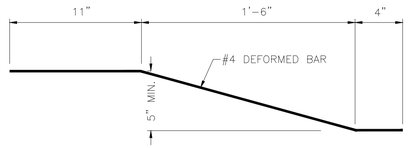
SCALE: 1"=0.5'



2 **DETAIL - DEFORMED METAL STRIP CONTROL JOINT**

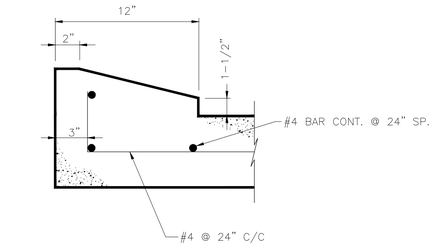
(20' SPACING TYP.)

SCALE: 1"=0.5'



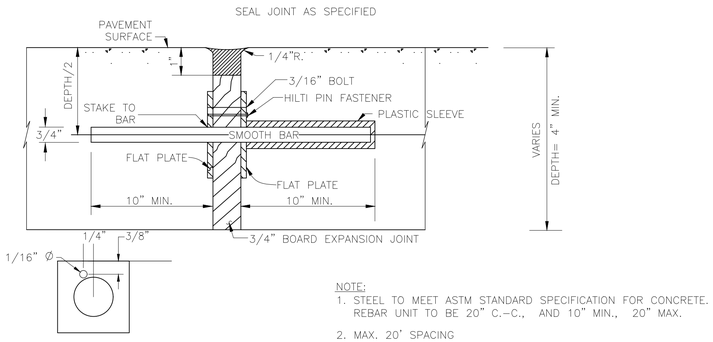
5 **DETAIL - UNDERCUT BAR**

SCALE: 1"=0.5'



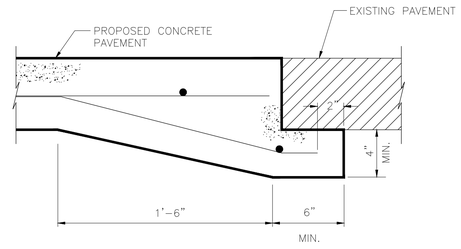
8 **MONOLITHIC MOUNTABLE CURB**

SCALE: 1"=0.5'



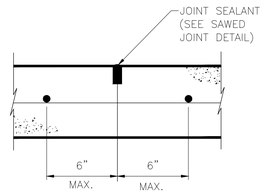
3 **DETAIL - DOWEL TYPE EXPANSION JOINT**

N.T.S

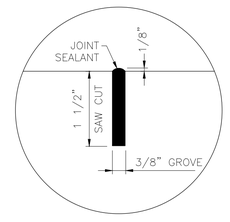


6 **DETAIL - PAVING UNDERCUT**

SCALE: 1"=0.5'



SCALE: 1" = 0.5'



NOT TO SCALE

9 **SAW CUT CONTROL JOINT**

N.T.S

NO.	REVISIONS	DATE	NAME

VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

PAVING DETAILS
SHEET 1

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: PAVING DETAILS – 1	
SCALE: N.T.S.		SHEET NO: /
DATE:	APPROVED BY:	

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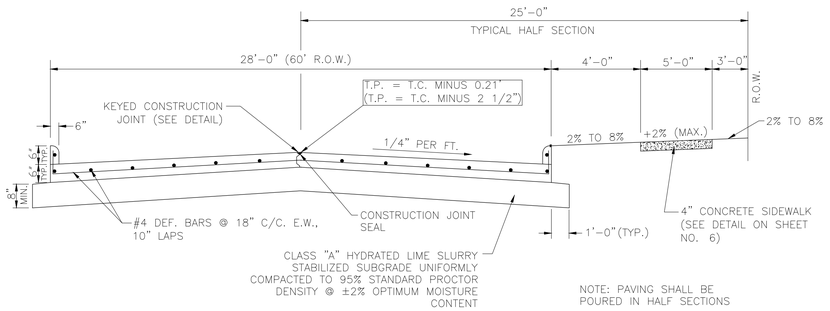
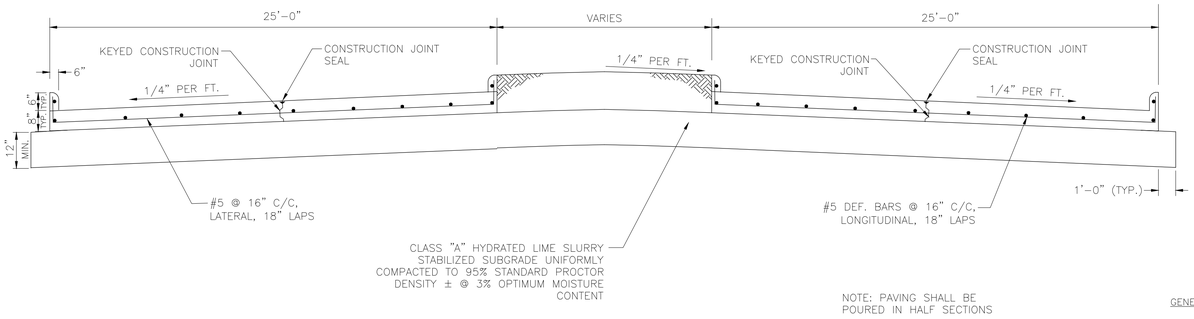


28'-0" WIDE CONCRETE PAVEMENT

RESIDENTIAL STREETS

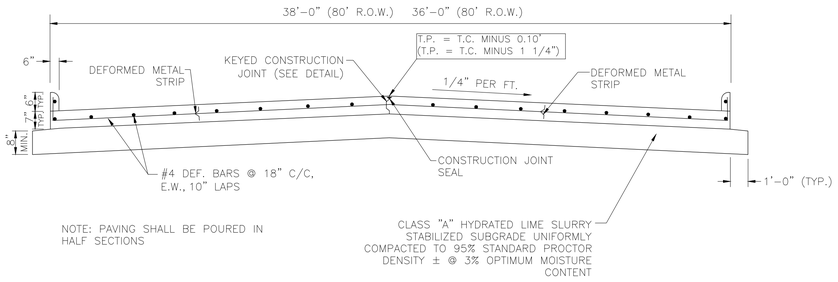


50'-0" WIDE CONCRETE PAVEMENT

MINOR AND MAJOR ARTERIAL - 120' R.O.W.

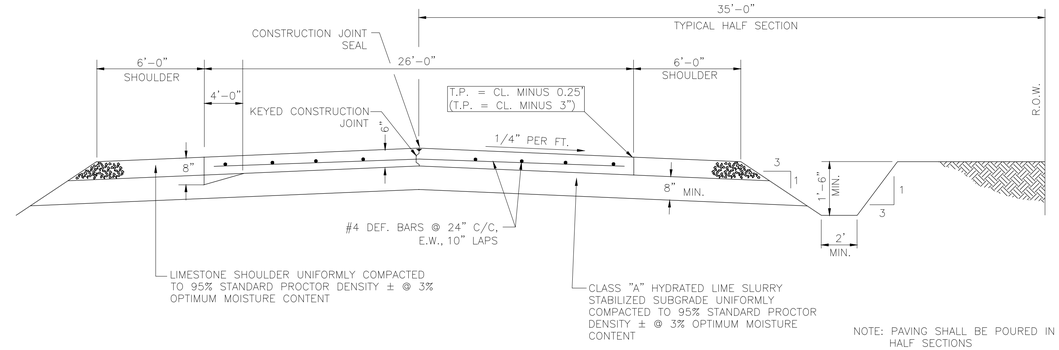
GENERAL NOTES:

1. PAVING EXPANSION/CONTRACTION JOINTS SHALL BE SPACED AT 40'-0" C/C.
2. CONCRETE USED FOR PAVEMENT SHALL BE A MINIMUM OF 5-1/2 SACK, 4000 PSI COMPRESSIVE STRENGTH AT 28 DAYS. 4 FIELD TEST CYLINDERS SHALL BE TAKEN FROM EVERY 100 CUBIC YARDS AND ANY PORTION LESS THAN 100 CUBIC YARDS FOR EACH MIX DESIGN PLACED EACH DAY. ACCORDING TO ASTM C172-04 STANDARD PRACTICE FOR SAMPLING FRESHLY MIXED CONCRETE.
3. CLASS "A" HYDRATED LIME SLURRY SHALL BE APPLIED FOR SOIL STABILIZATION.
4. REINFORCING STEEL SHALL COMPLY WITH OR EXCEED A.S.T.M. SPECIFICATIONS 615, GRADE 60, FOR NO. 4 BARS AND LARGER.



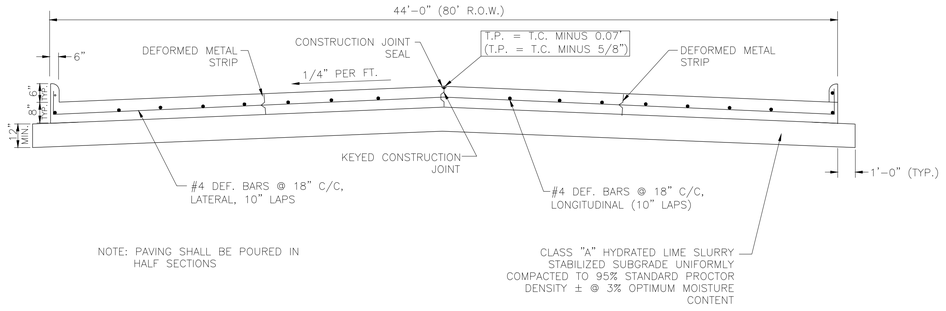
36' - 0" OR 38'-0" WIDE CONCRETE PAVEMENT

MINOR COLLECTOR STREETS - MIN. 80' R.O.W.



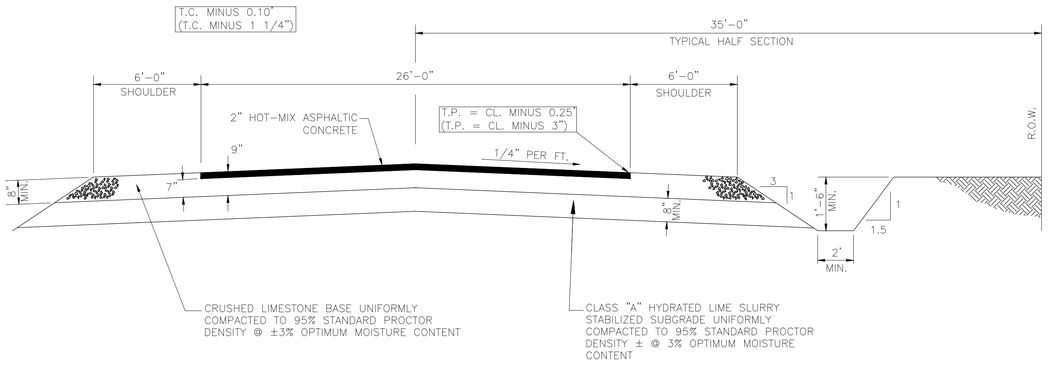
26'-0" WIDE CONCRETE PAVEMENT

RESIDENTIAL STREETS IN LARGE LOT SUBDIVISION MIN. 60' R.O.W. (LOTS 1 ACRE OR MORE)



44'-0" WIDE CONCRETE PAVEMENT

COLLECTOR STREETS - MIN. 80' R.O.W.



26'-0" WIDE ASPHALT PAVEMENT

RESIDENTIAL STREETS IN LARGE LOT SUBDIVISION MIN. 70' R.O.W. (LOTS 1 ACRE OR MORE)

NO.	REVISIONS	DATE	NAME
1			
2			
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VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

PAVING DETAILS
SHEET 2

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: PAVING DETAILS – 2	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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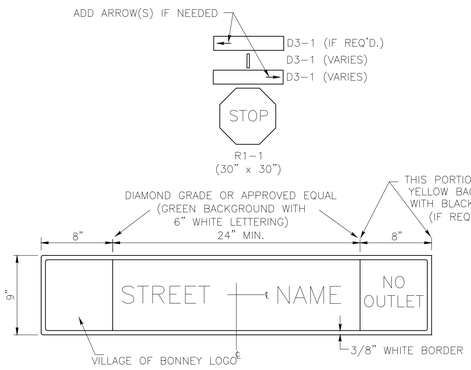
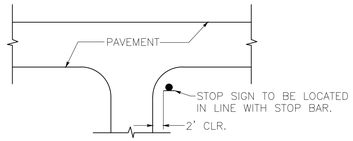


NOTES:
1. SIGNS ARE TO BE MADE OF ALUMINUM, .125" THICK, FLAT BLADE, DOUBLE FACED.

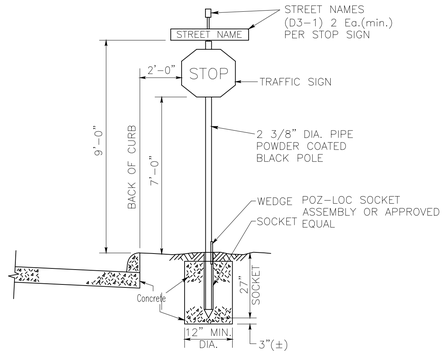
DETAIL OF STANDARD STREET NAME SIGN

N.T.S.



STOP SIGN LOCATION DETAIL

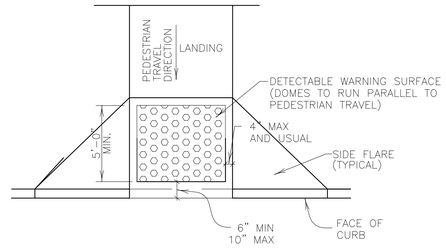
N.T.S.



TYPICAL SIGN MOUNT DETAIL

N.T.S.

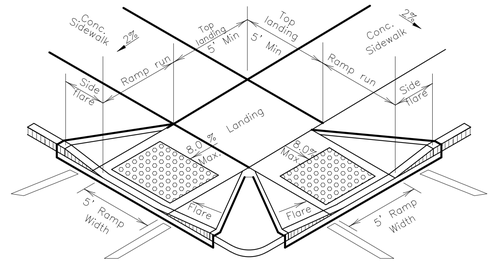
1 STREET SIGN DETAILS



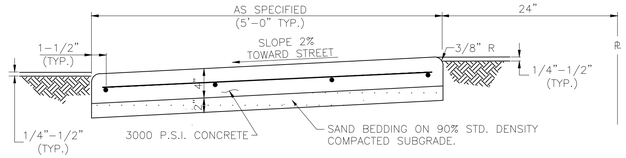
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPLYING WITH SECTION 4.29 OF THE TEXAS ACCESSIBILITY STANDARDS (TAS). THE SURFACE MUST CONTRAST VISUALLY WITH ADJOINING SURFACES, INCLUDING SIDE FLARES. FURNISH DARK RED DETECTABLE WARNING SURFACE ADJACENT TO UNCOLORED CONCRETE, INCLUDING SIDE FLARES.
2. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.
3. ALIGN TRUNCATED DOMES IN THE DIRECTION OF PEDESTRIAN TRAVEL WHEN ENTERING THE STREET.
4. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 48" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTENT THE FULL WIDTH OF THE CURB RAMP (48" FOR 5' WIDE RAMP) OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
5. THE ACCEPTABLE LIST OF QUALIFIED DETECTABLE WARNING MATERIALS FOR THE VILLAGE OF BONNEY INCLUDES ARMOR-TILE CAST IN PLACE TILE, CAST-IN-PLACE COMPOSITE TILES BY ADA SOLUTIONS, INC AND ANY OTHER PRODUCT THAT IS DEEMED TO BE EQUAL TO OR BETTER THAN THE ABOVE REFERENCED PRODUCTS BY THE CITY ENGINEER.
6. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF "6" AND A MAXIMUM OF "10" FROM THE EXTENSION OF THE SURFACE OF CURB.

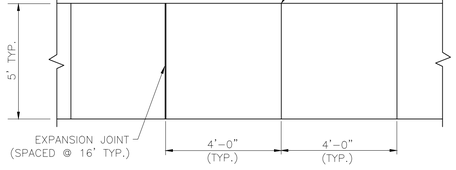
2 CURB RAMP



NOTES:
1. ALL SLOPES ARE MAXIMUM ALLOWABLE. THE LEAST POSSIBLE SLOPE THAT WILL STILL DRAIN PROPERLY SHOULD BE USED. ADJUST CURB RAMP LENGTH OR GRADE OF APPROACH SIDEWALKS AS DIRECTED.
2. LANDINGS SHALL BE 5'x5' MINIMUM WITH A MAXIMUM 2% SLOPE IN ANY DIRECTION.
3. ADDITIONAL INFORMATION ON CURB RAMP LOCATION, DESIGN, LIGHT REFLECTION VALUE AND TEXTURE MAY BE FOUND IN THE CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS) AND 16 TAC 68.102§
4. SEPARATE CURB RAMP AND LANDINGS FROM ADJACENT SIDEWALK AND ANY OTHER ELEMENTS WITH AN EXPANSION JOINT UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. PROVIDE A SMOOTH TRANSITION WHERE THE CURB RAMPS CONNECT TO THE STREET.

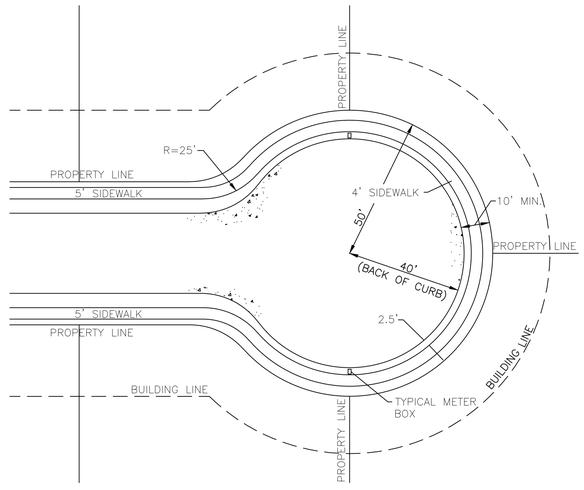


SECTION

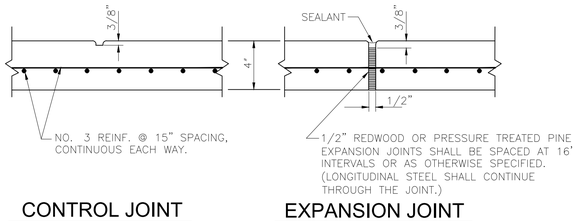


PLAN

NOTE:
1. ALL STREET LIGHTS ARE TO BE INSTALLED PRIOR TO ACCEPTANCE OF SUBDIVISION BY CITY COUNCIL.
2. ALL INTERIOR STREETS WITHIN THE SUBDIVISION MAY HAVE SIDEWALKS INSTALLED BY THE HOMEBUILDER. THE SIDEWALKS ON PERIMETER STREETS SHALL BE INSTALLED BY THE DEVELOPER. SIDEWALKS ON COLLECTOR AND THOROUGHFARE STREETS WILL BE A MINIMUM OF 6 FEET IN WIDTH.
3. ALL UNDERGROUND CABLE WILL BE BURIED IN RIGID CONDUIT NOT LESS THAN ASTM-A-53 TYPE F GRADE A (DOMESTIC) PIPE, GALVANIZING ASTM-A-123. THIS CONDUIT IS TO BE USED WHEN PLACED UNDER ANY STREET OR DRIVE CROSSING, WATER/SEWER EASEMENTS, OR IN ANY STREET RIGHT OF WAYS.



3 CUL-DE-SAC SIDEWALK



CONTROL JOINT

EXPANSION JOINT

NOTE:
1. ALL EDGES SHALL BE ROUNDED WITH 3/8" RADIUS.
2. CONTROL JOINTS SHALL BE SPACED AT 4'-0" INTERVALS.
3. CONTROL JOINTS SHALL BE 3/8" DEEP AND TROWEL EDGE.
4. 1/2" EXPANSION MATERIAL REQUIRED WHERE SIDEWALKS ABUT BUILDINGS, CURBS, DRIVEWAYS, OR EXISTING SIDEWALKS.
5. EXPANSION JOINTS SHALL BE SPACED AT 16 FT. INTERVALS TYPICALLY.
6. WHERE NEW SIDEWALK IS PLACED AGAINST EXISTING SIDEWALK, SAWCUT EXISTING SIDEWALK FULL DEPTH TO AN EVEN STRAIGHT LINE PRIOR TO INSTALLATION OF THE NEW SIDEWALK.
7. ALL NEW SIDEWALK SHALL BE DOWELED INTO ALL ADJACENT CONCRETE STRUCTURES.

4 CONCRETE SIDEWALK

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

PAVING DETAILS
SHEET 4

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: PAVING DETAILS – 4	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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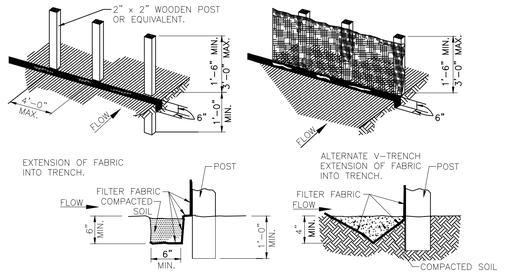
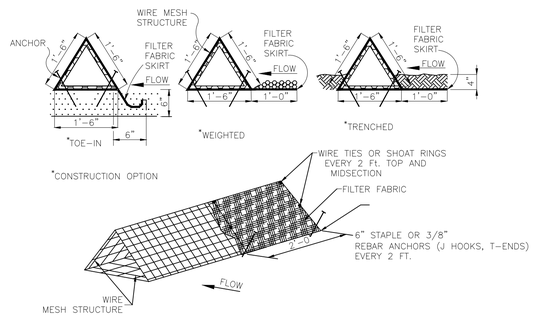


GENERAL NOTES:

1. SET POSTS AT 4-FEET MAXIMUM SPACING. IF FACTORY PREASSEMBLED FENCE WITH SUPPORT NETTING IS USED, SPACING OF POST MAY BE INCREASED TO 8 FEET MAXIMUM.
2. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT THE POST, FOLD TOGETHER, AND ATTACH TO THE POSTS.
3. REMOVE SEDIMENT DEPOSITS WHEN SILT DEPTH REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE.

FILTER FABRIC FENCE

SYMBOL

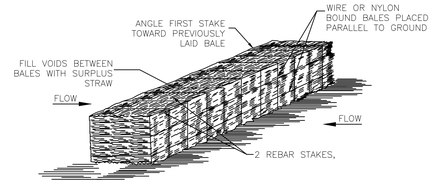


GENERAL NOTES:

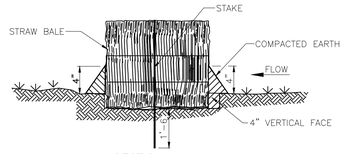
1. PLACE BARRIER IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BARRIER.
2. USING ONE CONTINUOUS SECTION OF FILTER FABRIC, WRAP FABRIC AROUND WIRE MESH AND EXTEND FABRIC TO FORM SKIRT ON THE UPSTREAM SIDE.
3. WEIGHT SKIRT WITH A CONTINUOUS LAYER OF 3-INCH TO 5-INCH OPEN GRADED ROCK, OR TOE IN SKIRT WITH SIX INCHES WITH MECHANICALLY COMPACTED MATERIAL.
4. SECURELY ANCHOR BARRIER AND SKIRT IN PLACE USING 6-INCH WIRE STAPLES ON 2-FOOT CENTERS ON BOTH EDGES, OR STAKE USING 18-INCH BY 3/8 INCH REBARS (T-ENDS, J-HOOKS).
5. FILTER FABRIC SHALL BE LAPPED OVER ENDS 6 INCHES TO COVER SEGMENT JOINTS. FASTEN JOINTS WITH GALVANIZED SHOAT RINGS OR EQUIVALENT.
6. THE BARRIER STRUCTURE SHALL BE WELDED WIRE MESH, 18 INCHES ON EACH SIDE.

TRIANGLE FILTER FABRIC FENCE

SYMBOL



STRAW BALE FENCE



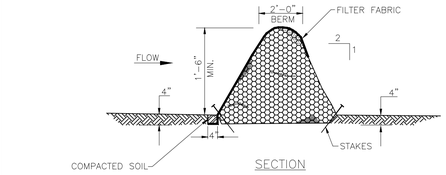
SECTION

GENERAL NOTES:

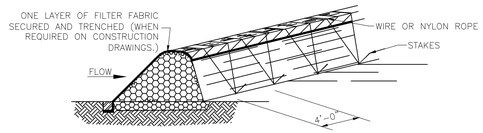
1. LIMIT USE TO ONSITE SWALES FOR PURPOSES OF LOW FLOW VELOCITY DISSIPATION FOR EROSION CONTROL. USE STRAW BALE FENCES TO TREAT OVERLAND FLOW ONLY. DO NOT USE STRAW BALE FENCES TO TREAT FLOW IN CHANNELS.
2. PLACE BALES IN A ROW WITH ENDS TIGHTLY ABUTTING ADJACENT BALES. FILL THE VOIDS BETWEEN BALES WITH SURPLUS STRAW. PLACE BALES WITH BINDING PARALLEL TO GROUND SURFACE.
3. IMBED EACH BALE AT LEAST 4 INCHES IN THE SOIL.
4. SECURELY ANCHOR BALES IN PLACE BY REBAR STAKES. DRIVE STAKES THROUGH THE BALES AND AT LEAST 18 INCHES INTO THE GROUND. ANGLE THE STAKE IN EACH BALE TOWARD THE PREVIOUS BALE TO FORCE THE BALES TOGETHER.
5. BIND BALES WITH WIRE OR NYLON ROPE TIED ACROSS THE STRAW BALES.
6. REPLACE WITH NEW STRAW BALE FENCE EVERY TWO MONTHS.
7. WATTLES STAKED INTO THE GROUND ARE A PREFERRED SUBSTITUTE FOR STRAW BALE FENCES.

STRAW BALE FENCE

SYMBOL



SECTION

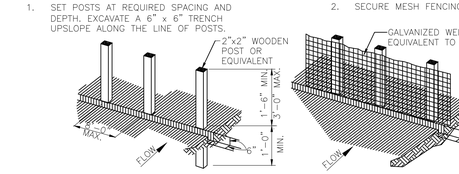


GENERAL NOTES:

1. LIMIT USE TO ONSITE SWALES FOR PURPOSES OF LOW FLOW VELOCITY DISSIPATION FOR EROSION CONTROL. USE BRUSH BERMS TO TREAT OVERLAND FLOW ONLY. DO NOT USE BRUSH BERMS TO TREAT FLOW IN CHANNELS.
2. PLACE WOODY BRUSH AND BRANCHES HAVING A DIAMETER OF LESS THAN 2 INCHES WITH A 6-INCH OVERLAP. AVOID INCORPORATION OF ANNUAL WEEDS AND SOIL INTO BRUSH BERM.
3. MINIMUM HEIGHT OF THE BRUSH BERM IS 18 INCHES, MEASURED FROM THE TOP OF THE EXISTING GROUND AT THE UPSLOPE TOE TO THE TOP OF THE BERM.
4. HAND PLACE BRUSH BERMS ALONG CONTOUR LINES. MACHINE PLACEMENT OF BRUSH BERMS IS NOT PERMITTED.
5. IMBED BRUSH BERM AT LEAST 4 INCHES INTO THE SOIL.
6. ANCHOR BRUSH BERMS USING WIRE OR NYLON ROPE ACROSS THE BERM WITH A MINIMUM TENSION OF 50 POUNDS.
7. SECURELY TIE ROPE TO 18-INCH REBAR STAKES DRIVEN INTO THE GROUND ON 4-FOOT CENTERS ON BOTH SIDES OF THE BERM.
8. PERFORM MAINTENANCE AS NEEDED.

BRUSH BERM

SYMBOL

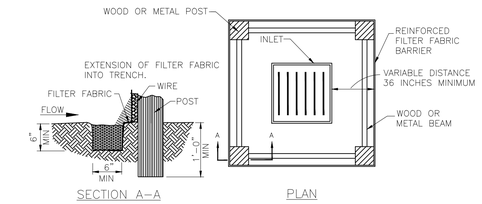


GENERAL NOTES:

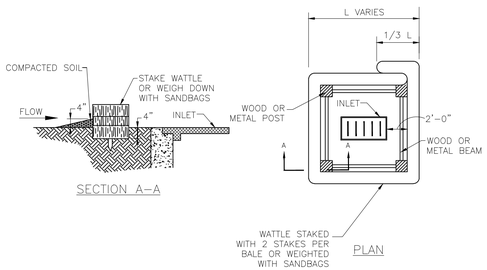
1. SECURELY FASTEN MESH FENCING TO POSTS WITH STAPLES OR TIE WIRES.
2. SECURELY FASTEN FILTER FABRIC TO MESH FENCING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT A POST, FOLD TOGETHER, AND ATTACH TO A POST.
4. REMOVE SEDIMENT DEPOSITS WHEN SILT REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE IN DEPTH.

REINFORCED FILTER FABRIC BARRIER

SYMBOL



SEE REINFORCED FILTER FABRIC BARRIER DETAIL FOR REINFORCED FILTER FABRIC BARRIER REQUIREMENTS

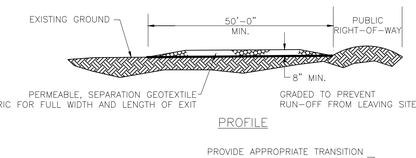


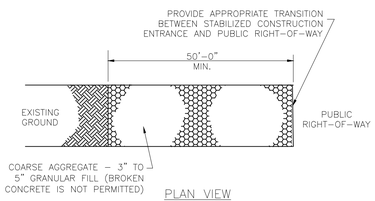
NOTE:
TYPICALLY STRAW BALES ARE NOT RECOMMENDED FOR INLET PROTECTION BARRIERS.

INLET PROTECTION BARRIERS FOR STAGE I INLETS

IPB

SYMBOL





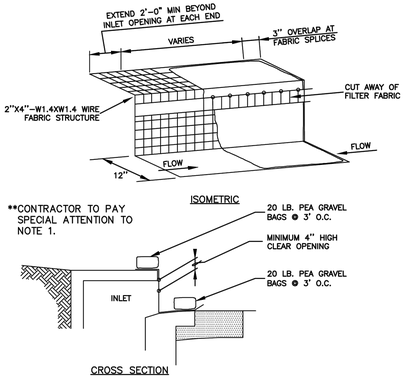
GENERAL NOTES:

1. MINIMUM LENGTH IS AS SHOWN ON CONSTRUCTION DRAWINGS OR 50 FEET, WHICHEVER IS MORE.
2. CONSTRUCT AND MAINTAIN CONSTRUCTION EXIT WITH CONSTANT WIDTH ACROSS ITS LENGTH, INCLUDING ALL POINTS OF INGRESS OR EGRESS.
3. UNLESS SHOWN ON THE CONSTRUCTION DRAWINGS, STABILIZATION FOR OTHER AREAS WILL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT.
4. WHEN SHOWN ON THE CONSTRUCTION DRAWINGS, WIDEN OR LENGTHEN STABILIZED AREA TO ACCOMMODATE A TRUCK WASHING AREA. PROVIDE OUTLET SEDIMENT TRAP FOR THE TRUCK WASHING AREA.
5. PROVIDE PERIODIC TOP DRESSING WITH ADDITIONAL COARSE AGGREGATE TO MAINTAIN THE REQUIRED DEPTH OR WHEN SURFACE BECOMES PACKED WITH MUD.
6. PERIODICALLY TURN AGGREGATE TO EXPOSE A CLEAN DRIVING SURFACE.
7. ALTERNATIVE METHODS OF CONSTRUCTION INCLUDE
   -CEMENT STABILIZED SOIL: COMPACTED CEMENT STABILIZED SOIL, LIMESTONE AGGREGATE, OR OTHER FILL MATERIAL IN AN APPLICATION OF THICKNESS OF 6 INCHES.
   -WOOD MATS: OAK OR OTHER HARDWOOD TIMBERS PLACED EDGE TO EDGE AND ACROSS SUPPORT WOODEN BEAMS WHICH ARE PLACED ON TOP OF EXISTING SOIL IN AN APPLICATION THICKNESS OF 6 INCHES.
   -STEEL MATS: PERFORATED MATS PLACED ACROSS PERPENDICULAR SUPPORT MEMBERS.

STABILIZED CONSTRUCTION ACCESS

SC

SYMBOL



NOTES:

1. DAILY INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2".
2. A SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN ON THIS DETAIL OR AS DIRECTED BY THE ENGINEER OR DESIGNATED REPRESENTATIVE. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.
3. CONTRACTOR SHALL MONITOR THE PERFORMANCE OF INLET PROTECTION DURING EACH RAINFALL EVENT AND IMMEDIATELY REMOVE THE INLET PROTECTIONS IF THE STORM-WATER BEGINS TO OVERTOP THE CURB.
4. INLET PROTECTIONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

WIRE/FILTER FABRIC CURB INLET PROTECTION

IPB

SYMBOL

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

VILLAGE OF BONNEY, TEXAS STANDARD DETAILS

BONNEY, TEXAS

STORM WATER POLLUTION PREVENTION DETAILS SHEET 1

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: STORM WATER POLLUTION PREVENTION DETAILS - 1	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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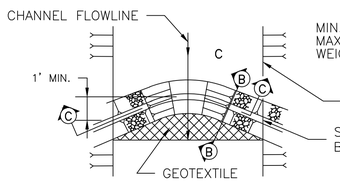


IN-CHANNEL FILTER DAM PLAN

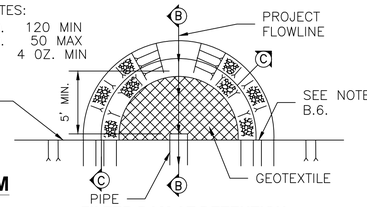
GEOTEXTILE NOTES:

MIN. AOS	SIEVE NO.	120 MIN
MAX. AOS	SIEVE NO.	50 MAX
WEIGHT	OZ/SY	4 OZ. MIN

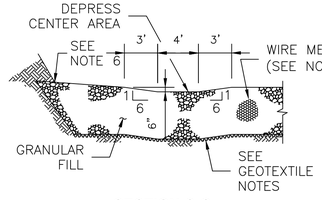
FILTER DAM

RFD–TYPE

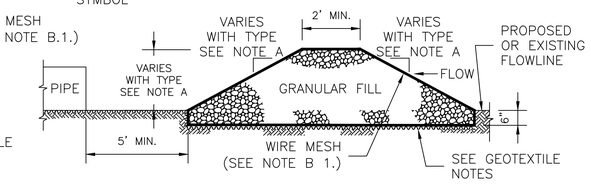
SYMBOL



FILTER DAM AT DETENTION BASIN OUTFALL PIPE PLAN



SECTION C-C



SECTION B-B

NOTE: ONLY APPLIES FOR DETENTION BASIN OUTFALL PIPE PROTECTION.

A. TYPES OF FILTER DAMS

1. TYPE 1 (NON–REINFORCED)
   a. HEIGHT – 18–24 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM)
   c. SLOPES – 2:1 (MAXIMUM).
2. TYPE 2 (REINFORCED).
   a. HEIGHT – 18–36 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
   c. SLOPES – 2:1 (MAXIMUM).
3. TYPE 3 (REINFORCED)
   a. HEIGHT – 36–48 INCHES. MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
   c. SLOPES – 3:1 (MAXIMUM).
4. TYPE 4 (GABION)
   a. HEIGHT – 30 INCHES (MINIMUM). MEASURE VERTICALLY FROM EXISTING GROUND TO TOP OF FILTER DAM.
   b. TOP WIDTH – 2 FEET (MINIMUM).
5. TYPE 5. AS SHOWN ON THE PLANS.

B. CONSTRUCT FILTER DAMS ACCORDING TO THE FOLLOWING CRITERIA UNLESS SHOWN OTHERWISE ON THE PLANS.

1. TYPE 2 AND 3 FILTER DAMS: SECURE WITH 20 GAUGE GALVANIZED WOVEN WIRE MESH WITH 1 INCH DIAMETER HEXAGONAL OPENINGS.
2. PLACE GRANULAR FILL ON THE WIRE MESH TO HEIGHT AND SLOPES SHOWN ON PLANS OR AS SPECIFIED BY THE ENGINEER.
   a. 3–5 INCHES FOR ROCK FILTER DAM TYPES 1, 2 AND 4.
   b. 4–8 INCHES FOR ROCK FILTER DAM TYPE REFER TO GRANULAR FILL IN SPECIFICATION SECTION No. 02378 RIPRAP AND GRANULAR FILL.
3. FOLD WIRE MESH AT UPSTREAM SIDE OVER GRANULAR FILL AND TIGHTLY SECURED TO ITSELF ON THE DOWNSTREAM SIDE USING WIRE TIES OR HOG RINGS.
4. IN STREAMS: SECURE OR STAKE MESH TO STREAM BED PRIOR TO AGGREGATE PLACEMENT.
5. SEE HCFCD SPECIFICATION SECTION NO. 02364–FILTER DAMS.
6. EMBED ONE FOOT MINIMUM INTO SLOPE AND RAISE ONE FOOT HIGHER THAN CENTER OF DEPRESSED AREA AT SLOPE.

MAINTENANCE

ALL EROSION AND SEDIMENT CONTROL WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIRS NECESSARY IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREA ADJACENT TO CREEKS AND DRAINAGE WAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING STORM SEWER INLETS.

INSPECTION

ALL INSPECTION WILL BE PERFORMED BY A XXX INSPECTOR EVERY SEVEN DAYS OR TWO WEEKS, AS WELL AS AFTER EVERY HALF–INCH OR MORE OF RAIN (AS RECOMMENDED ON A NON–FREEZING RAIN GAUGE TO BE LOCATED AT THE PROJECT SITE). AN INSPECTION AND MAINTENANCE REPORT SHOULD BE MADE FOR EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED ACCORDING TO THE INSPECTION REPORT.

WASTE MATERIALS

THE DUMPSTER USED TO STORE ALL WASTE MATERIAL WILL MEET ALL STATE AND THE VILLAGE OF BONNEY SOLID WASTE ORDINANCE. ALL TRASH AND CONSTRUCTION DEBRIS WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION AND THE TRASH WILL BE HAULED TO A LOCAL DUMP. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING)

IN THE EVENT OF A SPILL WHICH MAY BE CONSIDERED HAZARDOUS, THE VILLAGE OF BONNEY FIRE DEPARTMENT SHALL BE CONTACTED IMMEDIATELY AT 281–595–3730.

SANITARY WASTE

CONTRACTOR SHALL PROVE SANITARY WASTE FACILITIES IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REQUIREMENTS AND SPACING. ALL SANITARY WASTE SHALL BE COLLECTED FROM THE PORTABLE UNITS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR OR FIRM AS NEEDED OR AS REQUIRED BY LOCAL REGULATIONS.

ADDITIONAL

DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE SEDIMENT THAT MAY ENTER RECEIVING WATERWAYS.

CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER WHICH MINIMIZES THE RUNOFF OF ALL POLLUTANTS.

ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICAL OF TEMPORARY EMBANKMENTS, TEMPORARY BRIDGES, MATTING, FALSEWORK, PILING, DEBRIS, AND OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT PART OF THE FINISHED WORK.

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

VILLAGE OF BONNEY, TEXAS
STANDARD DETAILS

BONNEY, TEXAS

STORM WATER POLLUTION PREVENTION DETAILS SHEET 2

PROJECT TITLE:		
DRAWN BY:		STANDARD
CK'D BY:	SHEET DESCRIPTION: STORM WATER POLLUTION PREVENTION DETAILS – 2	
SCALE:		SHEET NO: /
DATE:	APPROVED BY:	

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APPENDIX B

COVER SHEET SIGNATURE BLOCK

VILLAGE OF BONNEY

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

THIS IS TO CERTIFY THAT THESE PLANS HAVE BEEN FOUND TO BE IN GENERAL COMPLIANCE WITH THE CURRENT REQUIREMENT ESTABLISHED BY THE CITY OF BONNEY.

_____ _____

DINH HO, P.E., CITY ENGINEER DATE

BONNEY, TEXAS

NOTE: CITY APPROVAL VALID FOR ONE YEAR AFTER DATE OF SIGNATURES

APPENDIX C

DESIGN MODIFICATION FORM

VILLAGE OF BONNEY
DESIGN CRITERIA MODIFICATION FORM

Modifications to standards identified in the Design Criteria Manual may be permitted by the Village of Bonney's City Engineer. The modification proposal must be submitted by a Professional Engineer licensed by the State of Texas and shall follow generally accepted engineering standards for traffic, sidewalk and other infrastructure applicable, and such proposal contains the following information and substantiates the findings . If an appeal to the Village of Bonney City Engineer decision is requested, the City Council (hereinafter referred to as "the City") will review that appeal.

PROJECT NAME: _____

This entire form must be completed in its entirety. If form is submitted incomplete, it will be administratively rejected.

PROJECT ENGINEER: _____
SUBMITTAL DATE: _____
SUBDIVISION NAME: _____

MODIFICATION LOCATION:

_____
_____
_____
_____

1. Set forth the proposed deviation to the technical standard.

SPECIFIC PROPOSED DEVIATION FROM TECHNICAL STANDARD:

_____
_____
_____
_____

2. Set forth the impact such deviation has on speed differential and street capacity, the likelihood of accidents, the long term maintenance and operation effect, the degree of functionality and efficiency, the technological advancements involved, and other relevant matters.

IMPACT OF DEVIATION:

_____
_____
_____
_____

3. Show a comparison of the technical standard to the proposed deviation with respect to overall safety and quality, speed differential, street capacity, existing and projected accidents, long-term maintenance and operation, degree of functionality, degree of efficiency, technological advancements, and other relevant matters.

COMPARISON OF TECHNICAL STANDARD TO PROPOSED DEVIATION:

_____
_____
_____
_____

4. Describe all mitigating improvements that reduce the negative impact of the proposed deviation on overall safety and quality, speed differential, street capacity, accident occurrences, long-term maintenance and operation, degree of functionality, degree of efficiency and demonstrating the degree to which the proposed deviation detrimentally affects the foregoing. Other relevant factors, including technological advances, should be explained by describing how they will affect the proposed development. Mitigating improvements can include but are not limited to, traffic control devices, pavement improvements, added acceleration or deceleration lanes or reservoirs, and other on-site improvements.

MITIGATING IMPROVEMENTS THAT REDUCE NEGATIVE IMPACT:

SUMMARY & CONCLUSION/RECOMMENDATION FOR MODIFICATION:

List of Supporting Documentation Attached? **Yes____** **No____**

Seal of Professional Engineer:

City Use ONLY

Reviewed By:

_____ _____
Date

Modification Request Approved / Denied By:
Copies of Backup Information/Notes Attached

_____ _____
City Engineer Date