

**TOWN OF PROSPER**

**CONSTRUCTION / GENERAL NOTES**

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# **TOWN OF PROSPER CONSTRUCTION / GENERAL NOTES**

## **DESCRIPTION**

1. It is not the intent of these construction notes to cover all details and/or specification requirements of the Town of Prosper. All work and materials shall be in accordance with the Town's standard specifications, general design standards, ordinances, rules, policies, requirements and regulations, as well as any other applicable state and/or federal rules, regulations and/or requirements, as they exist or may be amended. Engineering drawings shall govern for construction of all Civil Improvements.
2. The existence and locations of all underground utilities shown (main lines, no lateral or services shown) on the drawings were obtained from available records and are approximate. Neither the owner nor the engineer assumes any responsibility for utilities not shown or not in the location shown. The Contractor shall determine the depth and location of existing underground utilities prior to trenching and shall be required to take any precautionary measures to protect all lines shown and / or any other underground utilities not of record or not shown on the plans. Contractor shall be responsible for contacting all franchise and Town utilities prior to construction.
3. Any Contractor / Subcontractor performing work on this project shall familiarize himself/herself with the site and shall be solely responsible for any damage to existing facilities resulting directly or indirectly from his operations. Said existing improvements shall include but not be limited to berms, ditches, fences, and plants. Any removal or damage to existing improvements shall be replaced or repaired by the Contractor at his expense and shall be approved by the Town of Prosper.
4. All construction, testing, and materials shall meet or exceed all requirements of the Town of Prosper. All submittals must be originals with signatures where applicable; facsimiles or emails shall be followed up with originals.
5. All testing shall be done by an approved laboratory at the expense of the Contractor. The Town will only accept signed original copies of all testing reports for review.
6. The Developer or his/her designee shall be responsible for furnishing and installing all temporary and permanent traffic control in accordance with the minimum requirements of the latest revision of the Texas Manual on Uniform Traffic Control Devices Handbook. All reference for using Texas Department of

Transportation (TxDOT) standards and construction details shall be the latest revisions and/or amendments thereof. The Town of Prosper uses raised pavement markings (buttons) for striping and thermoplastic markings in lieu of paint. The minimum sign size shall be the standard size in the manual. Details are available upon request for the type of button patterns and posts and connections required for the signs.

7. The Contractor shall make every effort not to impede traffic on existing streets, alleys, or firelanes open to the public. In the event the construction work requires the closure of an existing street, alley, or firelane, the Contractor shall request the road closure through the Town. If the closure eliminates the second point of access to existing buildings with a certificate of occupancy, then the access may not be closed for more than forty-eight (48) hours and will require Fire Chief/Fire Marshal approval in either case. Unless otherwise specified by the Town, all other streets or alleys may not be closed for more than seventy-two (72) hours.

## **WATER SYSTEM**

### General Notes

1. All tapping sleeves and valves shall be full body ductile iron. With prior approval by the Town Engineer, stainless steel Smith Blair 623 may be allowed for connection to existing lines twenty-inch (20") or larger.
2. Valves shall be J & S, or Waterous. - 150 psi test.
3. Fittings shall be of the mechanical joint type, flanged where applicable, and be manufactured by US Pipe, American, or other as approved by the Town – Class 250. All fittings shall be restrained by the use of Mega-Lugs or approved other and concrete thrust blocking. All concrete shall be designed with appropriate sulfate resistant cement or equivalent based on local soil conditions.
4. Fire hydrants shall be Kennedy K81-D or American Flow Control (Waterous) traffic model WB 67-250, three-way standard thread with valve in lead or approved other. All main steamer nozzles shall have a nominal inside diameter of four inches (4-1/2") with a Storz connection and cap.
5. Water lines in the area of storm drain inlets shall be constructed behind the inlet by pulling the pipe using longitudinal bending in accordance with the manufacturer's requirements. Fittings may be used if bending is impractical; consult with the project Town Construction Inspector.

6. Water lines crossing under storm drains and sanitary sewer lines shall have a minimum of eighteen inches (18") clearance below storm drains and twenty-four inches (24") clearance below sanitary sewer lines or otherwise as governed by Texas Commission on Environmental Quality (TCEQ) Chapter 290 requirements. Parallel water lines shall be at least nine feet (9') clear horizontally to sanitary sewer lines and manholes. Where minimum clearance cannot be achieved, water lines shall be encased six inches (6") around in concrete to ten feet (10') either side of the utility crossing. Where water lines cross creeks or ditches the water line shall be protected by concrete encasement at least ten feet (10') past the embankment slope on each side.
7. Water mains: All water mains shall have a minimum of forty-eight inches (48") cover over the top of the pipe. All new water mains shall be PVC pipe in accordance with the following: C900 DR 14 for four-inch (4") to eight-inch (8"), C900 DR 18 for twelve-inch (12"), and C905 DR 18 for over twelve-inch (12"), all "blue" in color as per Town specifications; the pipe shall be laid on a minimum of class "F1" embedment (see Standard Construction Detail No. W10). Water mains up to twelve inches (12") shall be installed two feet (2') back of curb; mains larger than twelve inches (12") shall be installed at least three feet (3') from the back of curb depending upon conditions. Detectable Metallic Tape ("Blue-Caution Buried Water Below" or approved other) shall be installed after initial backfill on approximate centerline of pipe and prior to final backfill above all PVC mains.
8. The Contractor shall install fire hydrants at the locations shown. A M.J. and flanged tee with a flanged end to M.J. gate valve is required so that the gate valve is anchored to the main.
9. Fire hydrants shall be painted as follows:
  - A. Tnemec Series 2H-Hi Build Tneme-Gloss, Chilean Red for six-inch (6") mains.
  - B. Tnemec Series 2H Hi-Build Tneme-Gloss, True Blue Safety for eight-inch (8") mains.
  - C. Tnemec Series 2H Hi-Build Tneme-Gloss, Safety Yellow for twelve-inch (12") or larger water mains.All hydrants shall be painted with two coats of Tnemec Series 43-38H Diffused Aluminum, Silver Paint. When a color code other than aluminum is required, the top bonnet, including the lip and all nozzle caps, shall be painted the appropriate color.
10. All bolts and nuts used with mechanical joint fitting shall be "Cor-Ten" steel or approved other.
11. The installation of a blue stemsonite (or other) model 88-SSA fire hydrant marker will be installed opposite fire hydrants just off center to the side of the street adjacent to the hydrant.

12. Polyethylene encasement - the Contractor shall furnish and install polyethylene wrap around ductile iron pipe, related fittings, and valves. This wrap shall be an 8 mil. thickness polytube. Seams and overlaps shall be wrapped and held in place by two-inch (2") wide plastic backed adhesive tape, Polyken 900 or Scotchrap no. 50, or an approved other, with approximate two-foot (2') laps on the polytube. The wrap on the barrel of the pipe shall be loose enough to allow the film to shift with the soil. The wrap shall be installed without breaks, tears, or holes in the film. The cost of the polyethylene tube wrap and complete installation shall be included in the unit price bid for the furnishing and the installation of ductile iron pipe, related fittings, and valves.
13. Valve boxes shall be furnished at the required length in order to be set to final grade on each gate valve. After the final clean up and alignment has been completed, the Contractor shall pour a reinforced concrete block 24" x 24" x 6" around all valve boxes so the finished grade is level with the finished parkway. All valve stack components shall be cast iron. Valve boxes over four feet (4') deep will require extensions. All valves shall be marked with a saw on the curb or pavement with "V". The "V" shall point to the location of the valve as follows: If the valve is in the paving, the "V" shall be marked upright; if the valve is outside the paving, the "V" shall be marked upside down.
14. The Contractor shall coordinate operation of all existing valves with the Town. Contact the assigned Town Construction Inspector.

All water lines shall be pressure tested to 200 psi for a three (3) hour continuous period. Leakage rate shall not exceed twenty-five (25) gallons per inch of nominal diameter per mile of pipe over a twenty-four (24) hour period. Contractor shall flush and sterilize lines and prove lines to be free of fecal coliform organisms by obtaining samples for laboratory tests for contamination. The line shall be flushed out, completely replacing its entire volume with water from the Owner's mains. Once the line has been filled, all flushing is required to be metered, and paid for by the contractor at the current residential rate. Meters will be installed by the Town on blow offs as shown on the Testing Program. There will be a charge of \$25.00 for each meter set. The Contractor shall reflush and resterilize until all samples prove free from contamination.

15. All residential water services shall be as follows:
  - A. Water services shall be normally located two feet off the lot line. Plastic meter boxes shall be DFW 16 AMR with a DFW 1600 AMR solid lid or equal for 1" meters and shall be installed two feet (2') back of curb line.

- B. Minimum one-inch (1") meter and one-inch (1") A.S.T.M. D2737 working pressure of 200 psi at 23 C, SDR 9, Poly services are required to serve all residential lots, and service shall be provided to each of the family units. Sand embedment shall be used around the pipe and corporation stop. Service saddles shall be brass body with double bronze or stainless steel flattened straps (no banded) – Ford, Cambridge, A.Y. McDonald, or Town approved other.
  - C. The Contractor shall tie a one-inch (1") wide piece of blue plastic flagging to the water service meter set and shall leave a minimum of thirty-six inches (36") of flagging exposed after final completion of paving, backfill, and final grade.
  - D. The utility Contractor shall install the water services to a point two (2) feet back of the curb line to a depth of 12 inches below final grade with 3" clear of soil under the curb stop. The service line shall be continuous with no fittings under paving. The meter box shall be furnished and installed by the utility Contractor after the paving Contractor has completed the final grading in back of the curb. Each service location will be marked on the curb with a single vertical saw mark by the utility Contractor and tied to property corners on the "As-Recorded" plans.
16. For non-residential water services, the meter box or vault shall be furnished and installed by the Contractor after the paving Contractor has completed the final grading in back of the curb. Meter boxes/vaults shall be located outside of paving and flatwork. Each service location will be marked on the curb or pavement with a single vertical saw mark by the utility Contractor and tied to property corners on the "As-Recorded" plans.
17. Density testing/compaction requirements for projects in the Austin Group formation: Frequency of trench compaction tests shall not be less than one (1) for any pipe section and every three hundred linear feet (300') of main pipe per two feet (2') of lift until final grade, starting at two feet (2') above the top of pipe. Water services are to be tested at a rate of one (1) for every six (6) services which cross the proposed right of way or every three hundred linear feet (300') of water service installed. Every other fire hydrant lead that cross the existing or proposed street, alley, or fire lane subgrade shall also receive at least one set of density tests. All ditches shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture. Water jetting is not permitted.

Density testing/compaction requirements for projects in the Eagle Ford formation: Trench backfill shall consist of clay soils and shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content, and compacted to a minimum of 95 percent of standard Proctor (ASTM D 698) maximum dry density. Sand initial backfill shall be placed in thin, loose lifts and moisture conditioned to within 2 percentage points of optimum moisture content and compacted to a minimum of 95 percent of

standard Proctor (ASTM D 698). Frequency of density testing requirements shall be as outlined above.

18. The Contractor shall be responsible for providing "As-Recorded" plans to the engineer of record showing the location of water services and valves by distances to lot lines. This information shall be placed and marked "As-Recorded" by the engineer of record. Copies of these "As-Recorded" plans shall be furnished to the Town as required.
19. The Contractor shall furnish a maintenance bond in the amount of 10 % (ten percent) of the total contract price to the Town (as Obligee) to run two (2) years from the date of Final Acceptance of the project by the Town.

20. STERILIZATION OF WATER MAINS:

During the construction operations workmen shall be required to use utmost care to see that parts of the structures, inside of pipes, fittings, jointing materials, valves, etc., the surface of which come in contact with Owner's water are maintained in a sanitary condition. Every effort must be made to keep the inside of the pipe, fittings, and valves free of all foreign matter, sticks, dirt, rocks, etc. As each joint of pipe is being laid it must be effectively swabbed so that all foreign matter is removed. All fittings and exposed open ends of pipe must be blocked or capped until the line is completed. Prior to any sterilization, pressure testing or flushing a Testing Program will be submitted to the Town showing total footage of pipe to be tested, locations of blow offs and designating sample locations to be used. Test locations will be clearly marked and numbered using half sized drawings of the proposed improvements.

- A. The line shall be filled completely replacing its entire volume with water from the Owner's mains. Once the line has been filled, all flushing is required to be metered, and paid for by the contractor at the current residential rate. Meters will be installed by the Town on blow offs as shown on the Testing Program. There will be a charge of \$25.00 for each 1" meter set and normal rates deposits will apply for moving fire hydrant meters.
- B. Chlorine will be injected into the section of line being sterilized so that its entire capacity will be filled with water containing chlorine in the amount of fifty (50) p.p.m. or in such other quantity as determined by the Engineer. The sterilizing agent shall be introduced at one end of the section and the water released from the opposite end until the sterilizing agent is present at the discharge end in such quantity as to indicate a residual-chlorine of fifty (50) p.p.m. or as otherwise determined by the Engineer. All valves shall then be closed and the

sterilizing solution permitted to remain in the pipe line section for not less than twenty-four (24) hours.

- C. At the end of the sterilizing period the sterilizing solution shall be discharged from the pipe and replaced with water direct from a main of the Owner.
- D. A sample of water from the sterilized main shall be taken from a suitable tap under the supervision of the Engineer or his Inspector and submitted to a TCEQ approved testing laboratory. If the test shows a satisfactory quality of water, the line so sterilized shall then be placed in service by the Contractor who shall notify the Water Superintendent and assist the Water Superintendent in location and operation of all valves installed by the Contractor. If the sample shows unsatisfactory quality of water, the process of sterilization shall be repeated until satisfactory water is obtained. The lines shall be disinfected in accordance with AWWA C651, latest revision thereof.
- E. Sterilization of the line or any section thereof shall not be commenced until the Engineer's approval of the method, apparatus, sterilizing agent, and the section of the line has been obtained.
- F. Test samples will be done to meet the TECQ requirements and test stations will be the contractor's responsibility. When additional taps are required to meet sampling frequency the contractor shall submit his procedure for the Towns approval. Samples will be taken at 1,000 If and with the Towns inspector present. Samples will be wrapped by the Town's Inspector with tamper proof tape prior to leaving the construction site.

## SANITARY SEWER SYSTEM

### General Notes

1. All sanitary sewer pipes four inches (4") to fifteen inches (15") nominal size shall be PVC SDR 35 or 26 meeting ASTM D3034. All sanitary sewer pipes eighteen inches (18") and larger nominal size shall be PVC meeting ASTM F679. All pipes shall be "green" in color as per Town Specifications and be laid on a minimum of Class "F2" embedment (See Standard Construction Detail No. S11). Detectable Metallic Tape ("Green-Caution Buried Sewer Below" or approved other) shall be installed after initial backfill on approximate centerline of pipe prior to final backfill.
2. All sewer mains shall be a minimum diameter of eight inches (8") and shall maintain a minimum flow velocity of two (2) feet per second.
3. All residential sanitary sewer services shall be a minimum four inches (4") in diameter and extended to a point ten feet (10') inside the property line at a maximum depth of five feet (5'). The service shall then be extended at a forty-five degree (45 °) angle to four feet (4') above the finished grade and capped. Sewer services shall be located ten feet (10') downstream from the water service, which is normally in the center of the lot.
4. For non-residential sewer services, each service location will be marked on the curb or pavement with a double vertical saw mark by the utility Contractor and tied to at least one (1) property corner on the "As-Recorded" plans.
5. Density testing/compaction requirements for projects in the Austin Group formation: Frequency of trench compaction tests shall not be less than one (1) for any pipe section and every three hundred linear feet (300') of main pipe per two feet (2') of lift until final grade, starting at two feet (2') above top of pipe. Sewer services are to be tested at a rate of one (1) for every six (6) services staggered or every three hundred linear feet (300') of sewer service installed. Each sewer manhole will receive a density test every two feet (2') of lift until final grade, alternating around all quadrants. Every other main and stub out that crosses the existing or proposed street, alley, or firelane subgrade shall also receive at least one set of density tests. All ditches shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture. Water jetting is not permitted.

Density testing/compaction requirements for projects in the Eagle Ford formation: Trench backfill shall consist of clay soils and shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content, and compacted to a minimum of 95 percent of standard Proctor (ASTM D 698) maximum dry density. Sand initial backfill shall be placed in thin, loose lifts and moisture conditioned to within 2 percentage points of optimum moisture content and compacted to a minimum of 95 percent of standard Proctor (ASTM D 698). Frequency of density testing requirements shall be as outlined above.

6. After paving is completed each service location will be marked on the curb with a two (2) parallel vertical saw marks by the utility Contractor and tied to at least one (1) property corner on the "As-Recorded" plans. All manholes and cleanouts shall be marked on the curb or pavement with "MH" or "CO" as applicable.
7. The Contractor shall be responsible for providing "As-Recorded" plans to the engineer of record showing the location of sewer services by distance to the lot lines or property lines. This information shall be placed on the engineering plans and marked "As-Recorded" plans by the engineer of record. Copies of these "As-Recorded" plans shall be furnished to the Town as required. Ties shall be made by distance measurements for all manholes, cleanouts and services.
8. TV inspections, low pressure air testing, vacuum testing of the manholes, and deflection testing are required on all sewer lines. Prior to paving, all residential sanitary sewer services shall have TV inspections.
9. Manholes shall have a 400# traffic bearing frame and cover and shall have a minimum concrete compressive strength of 4000 psi at twenty-eight (28) days.
10. All concrete structures, whether precast or cast-in-place, shall be designed with an appropriate sulfate resistant cement or equivalent based on local soil conditions. Precast manholes or other special structures in any right-of-way or fire lane easement will require a certification from the manufacturer that the product meets the design criteria and twenty-eight (28) days compressive strength. Cast-in-place manholes or other special structures in any right-of-way and fire lane or utility easements will require cylinders to be made for strength tests by an approved laboratory. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 100-150 cu yd of concrete, nor less than once for each 5000 sq ft of surface area for slabs or walls. Four (4) cylinders shall be made: one (1) shall be broken at seven (7) days, two (2) shall be broken at twenty-eight (28) days, and one (1) shall be held in case of damage of any of the other three (3). The average strength of two (2) cylinders from the same sample, tested at twenty-eight (28) days, is required for each strength test; any strength test beyond twenty-eight (28) days is unacceptable. If the twenty-eight (28) days design strength is not reached upon

strength testing the cylinders, the deficient area shall be cored immediately to be proved out. Cores shall be extracted according to ASTM C 42, latest version, and conditioned in a moisture condition most representative of the in-place service condition. For any areas deficient in strength by not more than 500 psi, the Contractor shall pay to the Town one (1) times the unit bid price per square yard for the area determined to deficient in strength. For any areas deficient in strength by more than 500 psi but not more than 1000 psi, the Contractor shall pay to the Town two (2) times the unit bid price per square yard for the area determined to deficient in strength. For any areas deficient in strength by more than 1000 psi, the structure shall be removed and reconstructed at the full expense of the Contractor. Prior to Town acceptance of any penalty payments for any traffic bearing structure that does not meet twenty-eight (28) days design strength, the Design Engineer shall provide a sealed structural evaluation that assesses the performance adequacy of the deficient structure as constructed under the design service loads. All coring and additional laboratory testing shall be at the expense of the Contractor.

11. The Contractor shall furnish a maintenance bond in the amount of 10 % (ten percent) of the total contract price to the Town (as Obligee) to run two (2) years from the date of Final Acceptance of the project by the Town.

## STORM SEWER SYSTEM

### General Notes

1. All storm sewer pipe, inlets, headwalls, box culverts, and other structures in right of way or fire lanes shall be reinforced concrete as per Town Specifications and shall be laid on a minimum of a compacted crushed stone or pea gravel cushion, six inches thick below the bottom of the pipe shell unless otherwise approved by the Town. The initial backfill of select material or fine granular shall be required to a minimum of the spring line of the pipe unless otherwise approved by the Town.
2. Density testing/compaction requirements for projects in the Austin Group formation: Frequency of trench compaction tests shall not be less than one (1) for any pipe section and every three hundred linear feet (300') of main pipe per two feet (2') of lift until final grade, starting at two feet (2') above top of pipe. Every other lateral; stubout that crosses the existing or proposed street, alley, or firelane subgrade; inlet; and junction box will receive a density test every lift. All ditches shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture. Water jetting is not permitted.

Density testing/compaction requirements for projects in the Eagle Ford formation: Trench backfill shall consist of clay soils and shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content, and compacted to a minimum of 95 percent of standard Proctor (ASTM D 698) maximum dry density. Frequency of density testing requirements shall be as outlined above.

3. The joints shall be constructed and jointed together in such a manner that no spill through of backfill will occur. This includes the lift holes used in certain pipe or box sizes. Approved joint materials are concrete mortar; cold applied, plastic asphalt joint compound; rubber gaskets; and cold applied, preformed plastic gaskets.
4. Storm drainage inlets shall be as indicated on the approved construction plans. For secondary and major street intersections, a recessed type inlet will be required. For industrial and residential streets, a curb line inlet will be required unless otherwise approved. A round manhole cover with locking device shall be placed on all inlet tops. The top shall be placed near the outlet pipe. All inlets shall have a minimum compressive strength of 4000 psi at 28 days.

5. All concrete structures, whether precast or cast-in-place, shall be designed with appropriate sulfate resistant cement or equivalent based on local soil conditions. All precast box culverts or other special structures in any right-of-way or fire lane easement will require a certification from the manufacturer that the product meets the design criteria and twenty-eight (28) days compressive strength. All cast-in-place box culverts or other special structures in any right-of-way and fire lane or utility easements will require cylinders to be made for strength tests by the approved laboratory. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 100-150 cu yd of concrete, nor less than once for each 5000 sq ft of surface area for slabs or walls. Four (4) cylinders shall be made: one shall be broken at 7 days, two (2) shall be broken at twenty-eight (28) days, and one shall be held in case of damage of any of the other three (3). The average strength of two (2) cylinders from the same sample, tested at twenty-eight (28) days, is required for each strength test; any strength test beyond twenty-eight (28) days is unacceptable. If the twenty-eight (28) days design strength is not reached upon strength testing the cylinders, the deficient area shall be cored immediately to be proved out. Cores shall be extracted according to ASTM C 42, latest version, and conditioned in a moisture condition most representative of the in-place service condition. For any areas deficient in strength by not more than 500 psi, the Contractor shall pay to the Town one (1) times the unit bid price per square yard for the area determined to deficient in strength. For any areas deficient in strength by more than 500 psi but not more than 1000 psi, the Contractor shall pay to the Town two (2) times the unit bid price per square yard for the area determined to deficient in strength. For any areas deficient in strength by more than 1000 psi, the structure shall be removed and reconstructed at the full expense of the Contractor. Prior to Town acceptance of any penalty payments for any traffic bearing structure that does not meet 28 days design strength, the Design Engineer shall provide a sealed structural evaluation that assesses the performance adequacy of the deficient structure as constructed under the design service loads. All coring and additional laboratory testing shall be at the expense of the Contractor.
  
6. The Contractor shall furnish a maintenance bond in the amount of 10 % (ten percent) of the total contract price to the Town (as Obligee) to run two (2) years from the date of Final Acceptance of the project by the Town.

## PAVING SYSTEM

### General Notes

1. Absolutely no earthwork, lime application, or other preparation of the subgrade for paving of streets, alleys, or fire lanes shall be initiated without authorization from the Construction Inspection Division. Once all testing of underground facilities has been completed and verified to meet the Town's specifications, the Division will issue, upon request, a letter to the project owner or superintendent that will authorize the initiation of all subgrade work in preparation for paving. It shall be the Contractor's responsibility to show by standard testing procedures that the work constructed does meet the requirements of the Town's specifications. All testing of materials required for the construction of any street, alley, or fire lane shall be performed by an approved agency for testing materials. The nomination of the testing laboratory and the payment of such testing services shall be made by the Contractor. The engineer shall approve the laboratory nominated to do the testing of materials.
2. Subgrade construction and density testing/compaction requirements for projects in the Austin Group formation: All street, alley, and fire lane right-of-way or easement width shall be excavated full width in accordance with the pavement section to be constructed. The subgrade shall be stabilized with hydrated lime material to a distance 12 inches beyond the back of curb or edge of paving as applicable. The amount of lime material shall be that amount which will reduce the plasticity index (PI) below fifteen (15) as verified by testing by an approved laboratory; the Town will add one (1) percent to the laboratory results for field variation. Laboratory testing (lime series) shall generally be conducted when all utilities are complete and the roadway subgrade is complete. Lime shall be applied by percentage dry unit weight of soil treated to a minimum in place compacted thickness of six (6) inches. All fill shall be compacted to no less than ninety-five percent (95%) of standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture content. Frequency of compaction tests shall not exceed every three hundred linear feet (300') per two feet (2') of lift until final grade, starting at two feet (2') above natural/sound grade to top of finished subgrade. All street, alley, and fire lane subgrade shall be compacted to no less than ninety-five percent (95%) of standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture content. Frequency of tests shall not exceed every three hundred linear feet (300') of subgrade, alternating from left quarter point to center line to right quarter point. Verification of lime depth, testing for subgrade gradations/pulverizations (Min. of 100% passing 1 3/4" sieve and 60% passing No. 4 sieve.), and plasticity indices of the soil shall also be conducted; the frequency of this testing shall be as above.

3. Subgrade general design requirements for projects in the Eagle Ford formation: All pavement projects shall have a subgrade investigation and pavement design. Sulfate testing in the subgrade shall be done using EPA 9038 or EPA 375.4 with 10:1 dilution ratio. Sufficient testing should be done to determine with reasonable certainty the levels of sulfate present. Note: Majority of testing should be performed in the light brown clays. The minimum lime content shall be the percentage, by weight, of hydrated lime required to meet the Minimum Design Criteria plus 1.0%. Minimum lime percentages shall be 8.0 percent hydrated lime for light brown clays and 11.5 percent hydrated lime for dark brown clays (includes one (1) percent for field variation). Light brown clays having over 5,000 ppm (0.5 percent) sulfate and dark brown clays having over 25,000 ppm (2.5 percent) sulfate shall be stabilized using double application method. The weathered shale is not suitable for stabilization without permission from the Town of Prosper Director of Engineering Services or his/her designee and appropriate detailed engineering and laboratory design. The continuously reinforced pavement shall consist of Town of Prosper standard sections for the street classification or based on rigid pavement design in accordance with The Town of Prosper "Thoroughfare and Circulation Design Requirements." The upper 8 inches (residential) to 12 inches (arterial) of the subgrade shall be lime stabilized in accordance with the laboratory determined lime percentage. The lime stabilized subgrade shall be moisture treated to a minimum of 4 percentage points above optimum moisture content, allowed to mellow before final compacting to a minimum of 95 percent standard Proctor (ASTM D 698) at a minimum of 2 percentage points above optimum moisture content. Moisture treatment and lime stabilization shall extend at least four feet beyond the edge of pavement. A moisture barrier consisting of at least 10 mil poly sheeting shall be placed horizontally on the subgrade beyond the pavement edge and extend at least 6 feet on either side of the pavement neat line after final compaction. The barrier shall be covered with at least 8 inches of lightly compacted soil. Care should be taken not to rip or tear the poly sheeting during placement of the cover fill. All concrete, which comes into contact with soils containing more than 0.1% (1,000 ppm) sulfate shall be designed to resist sulfate attack. As a minimum, the concrete shall have a maximum water/cementitious materials ratio of 0.45, with 25% ASTM C 618 Class F fly ash and ASTM C 150 Type II cement (or Type V). Detailed mix design shall be performed for concrete pavement in high sulfate areas. These construction plans shall reflect the results of the field and laboratory investigations to provide an engineered pavement section consisting of moisture treated subgrade, lime stabilized subgrade and continuously reinforced concrete.

Subgrade construction and testing requirements for projects in the Eagle Ford formation:

LIME STABILIZATION OF SUBGRADE SOILS

A. MATERIALS:

All materials used in the construction shall meet the following requirements. In the event the Contractor wishes to use materials not listed in this section, the Contractor shall submit to the Engineer mix design data and proof of performance data as required by the Engineer who shall review the submittal and determine whether the materials will meet the design intent. No other materials shall be used without the written permission of the Engineer.

1. Lime – The lime shall meet the requirements of ASTM C977 / AASHTO M 216; contain at least 92 percent calcium and magnesium oxide, and the rate of slaking test for moderate reactivity per ASTM C110 / AASHTO T 232. All lime shall come from a single source, shall be the same source as used in the design, and shall be subject to periodic testing to confirm properties. Each shipment of lime shall be accompanied by a Certificate of Compliance stating the conformance of the product to these specifications. Certificates shall be provided to the Engineer.

In the event the Contractor changes lime sources, no work shall be done until the Engineer accepts, in writing, a new lime-soil mix design using the new lime source.

2. Water – Water used for slaking, mixing or curing shall be free of oil, salts, acid, alkali, sugar, vegetable, or other deleterious substances which may cause damage to the finished product. All water shall meet the material requirements AASHTO T 26. Known potable water may be used without testing.
3. Soil – Subgrade soils used in the stabilization shall be of the same AASHTO or ASTM classification and Plasticity Index range as used in the approved mix design. All organics, roots and deleterious materials shall be removed from the area to be stabilized and shall be wasted. The condition of the subgrade soils must be approved by the Engineer prior to beginning work.
4. Asphalt – Asphalt used to seal the surface of the lime stabilized subgrade shall be CSS1h or other approved asphalt as approved by the Engineer and shall conform to the requirements of TxDOT Item 300, "Asphalts, Oils and Emulsions". Each shipment shall be accompanied by a Certificate

of Compliance stating the conformance of the product to these specifications which shall be provided to the Engineer.

5. Submittals – At least 30 days prior to commencing lime stabilization work, the Contractor shall furnish the following information to the Engineer:
- a) The proposed source and supplier of lime.
  - b) Description of the proposed construction equipment, construction methods, expected production rates and planned sequence of lime stabilization of subgrade.
  - c) A lime/on-site soil mix design in accordance with Eades-Grim Method. Design shall comply with the following requirements:
    - 1) Minimum pH: 12.4 (ASTM D 2976 / AASHTO T 289) after completion of initial mixing with lime at ambient temperature.
    - 2) Swell Potential: Less than 1.0 percent, in accordance with ASTM D 4546 / AASHTO T 216 at 200 psf stress.
    - 3) Minimum Unconfined Compressive Strength: 160 psi in accordance with ASTM D 2166 / AASHTO T 208 or ASTM D 1633 / AASHTO T 220.

The approval of the lime-soil mix design shall be at the discretion of the Engineer. Once the design is approved in writing, the mix design shall be incorporated into these specifications by reference.

During lime stabilization work, the Contractor shall furnish the following information to the Engineer at the end of each day:

- a) Certified truck weight tickets of lime, delivered to or used at the site.
- b) A summary of the amount of lime used each day, areas stabilized with lime and first mixed, areas second mixed, completed, and areas with curing completed

**B. EQUIPMENT:**

The machinery, tools and equipment necessary for proper prosecution of the work on this Item shall be on the project and approved by the Engineer prior to beginning this Item. All machinery, tools and equipment used shall be maintained in a satisfactory working condition.

1. Lime Storage – Lime shall be suitably stored in closed, weatherproof containers until immediately before use. Storage bins, when used, shall be completely enclosed.
2. Lime Weight Verification – When lime is furnished in trucks, the weight of lime shall be determined on certified scales or the Contractor shall provide a set of standard platform truck scales at a location approved by the Engineer. Scales shall conform to the requirements of TxDOT Item 520, "Weighing and Measuring Equipment".
3. Slurry Equipment – Quick lime used to manufacture slurry on the project, or other location approved by the Engineer shall be slurried in agitated slurry tanks. The slurrying of Quick lime must be handled in such a way as to not generate any dust hazardous to job personnel or to the public or be potentially damaging to any adjacent property.
4. Distributor Trucks – The distributor truck used for slurry placing shall be equipped with an agitator and a calibrated measuring device or as approved by the Engineer and shall be in good working order. The Contractor shall provide to the Engineer the spread rate calibration (or other acceptable means to calculate the spread rate) prior to use of the equipment.
5. Mixers – Mixers shall be of appropriate size and capacity so as not to delay the project and shall be capable of pulverization to these specifications and mixing of the product.
6. Compaction Equipment – Finishing equipment shall consist of smooth steel wheel vibratory compactors or pneumatic tired roller compactors having a minimum tire pressure of 90 psi. Other types of compaction equipment may be approved at the sole discretion of the Engineer.

C. CONSTRUCTION METHODS:

The completed course shall be uniformly stabilized, free from cracks, loose or segregated areas, of uniform density and moisture content, well bound for its full depth and shall have a smooth surface.

1. Preparation of Subgrade – Prior to stabilization the subgrade shall be compacted and shaped to conform to the typical sections, as shown on the plans with allowances made for bulking of the subgrade. The subgrade shall be moisture treated to the lines and grades shown on the plans and as provided for in the pavement design report. The minimum moisture content shall be 3 percentage points above standard Proctor optimum (ASTM D698) with compaction to at least

95%. If the Contractor elects to use a cutting and pulverizing machine that will process the material to the plan depth, the Contractor will not be required to excavate to the secondary grade or windrow the material. This method will be permitted only if a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a uniform surface over the entire width of the cut. The machine shall provide a visible indication of the depth of cut at all times.

In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the plans and as established by the Design Engineer.

2. Pulverization – The existing pavement or base material shall be pulverized or scarified so that 100 percent shall pass the one (1) inch sieve.
3. Application – The design percentage by weight or pounds per square yard of lime to be added will be as shown on the plans and may be varied by the Engineer if conditions warrant. Only two application methods are acceptable; dry application of pebble quick lime or slurried hydrate or quick lime. The rate of application shall be verified using the methods provided in ASTM D 3155.

Dry quick lime shall be spread only on that area where the mixing operations can be completed during the same working day. Slurried quick lime shall be spread and mixed within 1 hour. Slurry exposed to the air for over 1 hour shall not be accepted for payment.

Unless otherwise approved by the Engineer, the lime operation shall not be started when the air temperature is below 40° F and falling, but may be started when the air temperature is above 35° F and rising. The temperature will be taken in the shade and away from artificial heat. Lime shall not be placed during periods of rain or when weather conditions in the opinion of the Engineer are not suitable.

**CAUTION:** Use of quick lime can be dangerous. Users should be informed of the recommended precautions in handling, storage and use of quick lime.

- a) Dry Placement – Pebble quick lime shall be distributed by a spreader approved by the Engineer. The lime shall be distributed at a uniform rate to achieve the mix design lime content and in such a manner as to reduce the scattering of lime by wind. Lime shall not be

applied when wind conditions, in the opinion of the Engineer, are such that blowing lime becomes objectionable to adjacent property owners or dangerous to traffic. The material shall be sprinkled as approved by the Engineer.

b) Slurry Placement – Lime Slurry shall be delivered to the project in slurry form at or above the minimum lime concentration as listed in the approved mix design. The residue or “stones” remaining in the tank from the slurring procedure shall be spread uniformly over the length of the roadway currently being processed, or wasted, unless otherwise approved by the Engineer. Slurry shall be of such consistency that it can be applied uniformly without difficulty.

4. Initial Mixing – The mixing procedure shall be the same for “Dry Placement” or “Slurry Placement” as herein described. The soil and lime shall be thoroughly mixed by equipment approved by the Engineer. A minimum of 4 passes of the mixer is required. The soil and lime mixture shall be brought to a moisture content at least four (4) percentage points above the design optimum moisture content and shall be left to mellow for three (3) days or longer as required by the approved mix design. The mixing shall continue until a homogeneous friable mixture of material and lime is obtained. The mixture shall have a minimum pH 12.4 (additional lime shall be required to meet this specification).

Following mixing, a sample of the material at the design moisture will be obtained for pulverization testing. All non-slaking aggregates retained on the ¾-inch sieve will be removed from the sample. The remainder of the material shall meet the following pulverization requirement when tested by Test Method Tex-101-E, Part III:

Minimum passing 1" sieve.....100 percent  
Minimum passing No. 4 sieve.....60 percent

The mixture shall be sprinkled and mixed during the mellowing process as required to assist in the chemical reaction. Moisture contents shall remain above optimum for the entire mellowing period.

Where measured sulfate levels in the light brown clay of the Eagle Ford formation exceed 0.5 percent and a double lime application is required, the mellowing period shall be extended for at least 5 days or as indicated in the mix design, whichever is longer.

5. Final Lime Mixing – After the required mellowing period the second lime application, if required, shall be made. Upon approval by Engineer, the material shall be uniformly mixed by the approved methods. If the mixture contains clods, they shall be reduced in size by approved pulverizing methods so that the remainder of the clods shall meet the following requirements (visual observation, not testing, required):

Minimum passing 1" sieve.....100 percent  
Minimum passing No. 4 sieve.....60 percent

At final mixing, the lime, water content and pH for each course of subgrade stabilization shall conform to the following:

Lime.....+1.0 percent above design percentage based on dry unit weight of soil  
Water....+2 percentage points above optimum moisture content  
pH.....12.4

Samples shall be taken at random locations by a qualified geotechnical testing laboratory selected by the Owner and approved by the Engineer per the testing schedule shown in Section 6 or more frequently.

6. Compaction Methods – Compaction of the mixture shall begin immediately after the requirements listed above in 8.04.D.5 are met. NOTE: Where double mixing is required by the mix design, the required additional lime shall be added and the mixture shall be moisture conditioned and pulverized.

Compaction shall continue until the entire depth of the mixture is uniformly compacted to a minimum of 95 percent of standard Proctor density<sup>1</sup> (ASTM D698) at a minimum of 2 percentage points above optimum moisture content.

All irregularities, depressions, or weak spots which develop as determined by the Engineer shall be corrected immediately by scarifying the areas affected, adding or removing materials as required, and reshaping and recompacting by moisture conditioning and rolling. The surface of

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<sup>1</sup> A field one point Proctor test shall be used to determine the maximum standard Proctor density unless a laboratory determined test is available which is of the same age as the lime-soil mixture.

the course shall be maintained in a moist, smooth condition, free from undulations, ruts and cracking, until other work is placed thereon or the work is accepted.

In addition to the requirements specified for density, the full depth of the material shown on the drawings shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests will be made by the geotechnical testing laboratory and submitted to the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet the requirements. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the drawings and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course or pavement is placed, it shall be recompacted and refinished at the entire expense of the Contractor.

When shown on the plans or approved by the Engineer, multiple lifts will be permitted.

7. Finishing and Curing – After the final layer or course of lime-stabilized subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling with a pneumatic or other suitable roller sufficiently light to prevent hair line cracking. The finished surface shall not deviate by more than 0.04 feet (0.5 inch) from the actual finish grade. Any variations in excess of this tolerance shall be corrected by the Contractor, at the Contractor's entire expense immediately prior to placement of the next paving course, in a manner satisfactory to the Engineer.

The completed section shall be moist-cured until a non-yielding surface is obtained to support construction traffic and the next layer of the pavement is constructed, as approved by the Engineer.

In the event the surface cannot be covered by the next layer of pavement or be kept moist, an asphalt membrane shall be applied at the rate of 0.25 gallons per square yard. The Contractor shall protect the membrane from traffic and contamination until the next layer of the pavement system is placed. The addition of a membrane is not a guarantee that the subgrade will not lose moisture over time. Additional testing may be required to verify moisture content as determined by the Engineer.

8. Reworking a Section – When a section is reworked within 72 hours after completion of compaction, the Contractor shall rework the section to provide the required compaction. When a section is reworked more than 72 hours after completion of compaction, the Contractor shall add 25 percent of the specified percentage of lime.

D. TOLERANCES:

The following requirements shall apply to the finished lime stabilized subgrade:

1. Tolerance in Thickness – One measurement shall be taken at random locations by the geotechnical testing laboratory on center of roadway at 300 feet spacing along each roadway direction. When the measurement is not deficient by more than 0.5 inch from the plan thickness, full payment will be made. When such measurement is deficient more than 0.5 inch and not more than 1.0 inch from the plan thickness, two additional measurements shall be taken at random (typically, 25 feet either side of the deficient measurement) and used in determining the average thickness. When the average of the 3 measurements is not deficient by more than 0.5 inch from the plan thickness, full payment will be made. When the average thickness is deficient by more than 0.5 inch, the entire area shall be reprocessed at the Contractor's entire expense.
2. Strength Testing – The lime mixture must develop compressive strength of least 160 psi in 5 days at 100° F when tested in accordance with ASTM D 2166 or D 1633. NOTE: This testing is required, but will be used for information only.

E. QUALITY CONTROL:

The Engineer may periodically require tests by the geotechnical testing laboratory to assist him in evaluating the quality of work and Contractor performance. The Contractor shall assist the Engineer by excavating and backfilling shallow areas as necessary to take density tests.

Any constructed course which does not meet specification requirements shall be reworked, at the Contractor's entire expense, to bring that work within specification requirements. The Engineer's tests shall be used in evaluating whether project meets specification requirements. The following table provides minimum testing requirements:

**MINIMUM MATERIALS SAMPLING AND TESTING FOR LIME STABILIZED SUBGRADE**

TEST TYPE	TEST STANDARD	MINIMUM FREQUENCY OF TESTS
In-Place Soil Density and Moisture Content	ASTM D 698 ASTM D 1556 ASTM D 2167 ASTM D 2922 ASTM D 2216 ASTM D 3017	One test for every 300 feet spacing or less along each roadway direction, but no less than one test per day for each roadway subgrade
pH	Eades and Grim procedures ASTM D 2976	One test per 600 feet spacing or less along each roadway direction, but no less than test per day for each roadway subgrade
Thickness		One test for 300 feet spacing or less along each roadway direction, but no less than one test per day for each roadway subgrade
Compressive Strength	ASTM D 558 ASTM D 1633 ASTM D 2166	(a) One test for 900 feet spacing or less along each roadway direction, but no less than one test per day for each roadway subgrade, sealed and cured at 100 degrees F for 5 days (b) Strength not corrected for length/diameter.
Pulverization Testing	Tex-101-E, Part III	One test for every 600 feet spacing or less along each roadway direction, but no less than one test per day for each roadway subgrade
Swell Potential	ASTM D 4546	One test for every 900 feet spacing or less along each roadway direction, but no less than one test per day for each roadway subgrade

Note: The Engineer may test any other property of the materials or lime-soil mixture in this Item at intervals or occasions of his/her choosing.

F. METHOD OF MEASUREMENT:

The area of lime stabilized subgrade shall be measured by the square yards complete, in place and accepted. The quantity of lime accepted and used shall be measured by the ton.

G. BASIS OF PAYMENT:

Payment shall be made at the Contract unit price per square yard for the lime subgrade of the thickness specified. The price shall be full compensation for furnishing all material, except the lime and for all preparation of the subgrade material removed and replaced, proof rolling of secondary grade, delivering, placing, mixing, and compacting these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

Payment shall be made at the Contract unit price per ton of lime used. This price shall be full compensation for furnishing this material; for all delivery, placing and incorporation of this material; and for all labor, equipment, tools, and incidentals necessary to complete this item. Stabilized subgrade found deficient in percentage of lime shall be paid for at an adjusted Contract Unit Price.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Lime Stabilized Subgrade	Square Yard
Quick Lime	Ton
Moisture Treated Subgrade (fill)	Cubic Yard
Moisture Treated Subgrade (cut or natural grade)	Cubic Yard

4. Minimum Steel Reinforcing and Joint Requirements for Streets, Alleys, and Fire Lanes:

Temperature/shrinkage steel (deformed bars): No. 3 bars on 24" centers each way for all streets. Alleys require four no. 3 bars on 12" centers longitudinal in each half with first bar 6" from each edge, one no. 3 bar centered in invert, and no. 3 bars at 24" centers transverse. All bars shall be supported on the appropriate height chairs arranged in a five chair pattern.

Expansion joints: 24" long no. 6 smooth dowels on 24" centers placed at mid-depth and pinned level with greased plastic caps on one end. Redwoods shall have a removable top strip and extend through subgrade elevation and back of curb or edge of pavement. A small amount of sand may be placed on grade at each side of the board to separate both sides of the pour. Redwoods are required at street intersections and at a maximum spacing of 300 feet for streets and 200 feet for alleys. Required at all fire lane approaches to existing streets; locate near radius return/property line of fire lane. Match existing expansion joints where possible.

Long. Butt joints: Minimum of no. 4 deformed bars drilled and epoxied 12" deep on 18" centers for all streets and alleys. Pullout strength requirements shall meet TXDOT Item 360.4. Clean and seal joints as noted below.

Sawed contraction or dummy joints: 15 feet maximum on centers for all streets and alleys; depth shall be  $\frac{1}{4}$  the thickness of the concrete. Match existing joints where possible. All joints shall be cleaned and sealed with hot poured black rubber or a gray elastomeric sealant to within  $\frac{1}{4}$  inch of the top of pavement. A blocking medium (compressible PE foam backer rod or non-plastic rope compatible with the sealant) may be used. Sealed joints shall be filled level with the pavement so not to block the drainage, when sealed joints are found they shall be removed and reapplied.

Coordinate all proposed joint layouts between existing and proposed pavements with the inspector prior to saw cutting any existing pavement or proposed joints.

#### Minimum Steel Reinforcing and Joint Requirements for Sidewalks:

Temperature/shrinkage steel (deformed bars): No. 3 bars on 24" centers each way. All bars shall be supported on the appropriate height chairs arranged in a five chair pattern.

Expansion joints: 24" long no. 4 smooth dowels on 12" centers placed at mid-depth and pinned level with greased plastic caps on one end. Redwoods shall extend through subgrade elevation and edge of sidewalk. A small amount of sand may be placed on grade at each side of the board to separate both sides of the pour. Required where new work abuts old or is adjacent to other concrete work; spacing is generally 8 times the sidewalk width. Match existing expansion joints where possible.

Contraction or dummy joints: Grooved (tooled) joints 1 inch deep; spacing equal to sidewalk width. Match existing joints where possible.

Coordinate all proposed joint layouts between existing and proposed sidewalks with the inspector prior to saw cutting any existing sidewalk or proposed joints.

All sidewalks shall be concrete and designed to have a minimum compressive strength of 3000 psi at twenty-eight (28) days. Concrete finish shall be with a camel hair broom. Minimum cementitious material shall be five (5) sacks equivalent. If applicable, all batch designs shall specify an appropriate sulfate resistant cement or equivalent based on local soil conditions. Strength deficiencies shall be addressed per Note 5 of the Paving System General Notes.

5. Minimum design requirements: All street, alley, and fire lane paving shall be designed to have a minimum compressive strength of 3500 psi at twenty-eight (28) days with a minimum of five and one half (5 & 1/2) sacks of cement as verified by testing in an approved laboratory. Concrete finish shall be with a baker broom. Two batch designs shall be submitted to the Construction Inspection Division to determine compliance with these requirements: one for machine work and one for hand work. All batch designs must be signed by the testing laboratory and include all documentation, such as results of field trial testing. A fly ash batch design may be submitted for approval on a specific job basis; fly ash up to twenty (20%) by weight of cement replacement may be used in machine pours. If applicable, all batch designs shall specify an appropriate sulfate resistant cement or equivalent. Slump shall be 1 – 3 inches for all machine work and 2 – 4 inches for all hand work. Streets (depending on classification) and fire lanes shall have a minimum thickness of six (6) inches; alleys shall have a minimum thickness of 8"-5"-8". Upon completion of construction, all streets and fire lanes shall be cored for depth (2" cores) at a spacing of 300 ft maximum, alternating from left quarter point to center line to right quarter point. Alleys shall be cored for depth (2" cores) at a spacing of 300 ft maximum along the center line. Pavement of a thickness less than the thickness shown on the plans by more than one-quarter (1/4) inch but less than three-quarter (3/4) inch will be considered deficient. The Contractor shall pay to the Town two (2) times the unit bid price per square yard for the area determined to deficient in thickness as defined above. Pavement deficient in strength by more than three-quarter (3/4) inch shall be removed and replaced completely. The deficient area shall be cored immediately on ten (10) foot centers or one (1) per panel to be proved out. All streets, alleys, and fire lanes will require cylinders to be made for strength tests by the approved laboratory. Samples for strength tests of each class of concrete placed each day shall be taken by an approved laboratory not less than once a day, nor less than once for each 100-150 cu yd of concrete. Four (4) cylinders shall be made: one shall be broken at 7 days, two (2) shall be broken at twenty-eight (28) days, and one shall be held in case of damage of any of the other three (3). The average strength of two (2) cylinders from the same sample, tested at twenty-

eight (28) days is required for each strength test; any strength test beyond twenty-eight (28) days is unacceptable. If the twenty-eight (28) days design strength is not reached upon strength testing the cylinders, the deficient area shall be cored immediately on ten (10) foot centers or one per panel to be proved out. Cores shall be extracted according to ASTM C 42, latest version, and conditioned in a moisture condition most representative of the in-place service condition. For any areas deficient in strength by not more than 500 psi, the Contractor shall pay to the Town one (1) times the unit bid price per square yard for the area determined to deficient in strength. For any areas deficient in strength by more than 500 psi but not more than 1000 psi, the Contractor shall pay to the Town two (2) times the unit bid price per square yard for the area determined to deficient in strength. Pavement deficient in strength by more than 1000 psi shall be removed and replaced completely. No more than three (3) - four (4) inch cores shall be extracted per panel without prior Town approval. A rebar detector shall be used to ensure that the cored areas are clear of any rebar. All coring and additional laboratory testing shall be at the expense of the Contractor. The width to be considered for any deficiencies shall be the full width of the pavement.

6. Any section of all existing public or private streets, alleys, or firelanes shall be replaced within 72 hours of removal.
7. Brick Pavers: Color of the truncated dome pavers for BFR's shall be Dark Brown (Pavestone Product Code #217-32 or approved equal). Colors for the median nose pavers are Antique Brown (Pavestone Product Code #217-12 or approved equal) in a 90 degree herringbone pattern with a soldier course.
8. The Contractor shall furnish a maintenance bond in the amount of 10 % (ten percent) of the total contract price to the Town (as Obligee) to run two (2) years from the date of Final Acceptance of the project by the Town.

## FRANCHISE UTILITY INSTALLATION

### General Notes

1. Density testing/compaction requirements for projects in the Austin Group formation:

Density testing/compaction requirements: Frequency of trench compaction tests shall not be less than one (1) for each pipe/conduit section crossing either a proposed or future street, alley, or firelane and every three hundred linear feet (300') of longitudinal pipe or duct bank per two feet (2') of lift until final grade, starting at two feet (2') above top of pipe. Services crossing any proposed or future street, alley, or fire lane easement are to be tested at a rate of one (1) for every six (6) services staggered or every three hundred linear feet (300') of service installed. Each franchise manhole or other junction structure will receive a density test every two feet (2') of lift until final grade, alternating around all quadrants. Every other main and stubout that crosses the existing or proposed street, alley, or firelane subgrade shall also receive at least one set of density tests. All ditches shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture. Water jetting is not permitted.

Density testing/compaction requirements for projects in the Eagle Ford formation: Trench backfill shall consist of clay soils and shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum

moisture content, and compacted to a minimum of 95 percent of standard Proctor (ASTM D 698) maximum dry density. Frequency of density testing requirements shall be as outlined above.

## UTILITY CROSSINGS

### General Notes

1. Tunneling and boring under Town streets shall be accomplished by means of jacking, boring, or tunneling equipment which is subject to the Town approval prior to start of construction.
2. The voids outside of the carrier pipe or casing pipe shall be backfilled by hydraulically placed material so that there are no open voids over the roof of the tunnel or bore. This shall be done without damage to the roadway structure.
3. All bore pits, trenches, and inspection holes shall be backfilled within 48 hours of the installation of utility lines. The method of compaction shall be such that a soil density equal to that existing prior to the start of construction will be required as verified by an approved testing laboratory. Any excess or surplus material resulting due to displacement of utility lines and conduits shall be disposed of in an acceptable manner to the Town.
4. The street sections that are shown as typical sections shall apply to any alleys, driveways, roadways, etc. that will be within a Town right-of-way or easement.
5. The Contractor shall be required to install all necessary warning and safety devices that would protect the safety and health of the public until the work has been finished and accepted by the Town.
6. The use of a casing pipe will be based upon the specific project location and soil conditions. In general, the minimum casing thickness is 0.25 inch and the material shall be steel. Where more than one section is required, the casing ends shall be welded together. Raci spacers, or Town approved other, shall be used to support the carrier pipe. The use of wood skids is no longer permitted.

## **EROSION CONTROL**

### General Notes

1. Prior to any earth disturbance, erosion control devices shall be installed on all projects.
2. Where existing grasses are disturbed, restoration shall consist of equal or better permanent vegetation. For new construction, provide a minimum of eight feet (8') of the appropriate seasonal seeded curlex adjacent to all street/firelane curbs and four feet (4') adjacent to alleys. The use of innovative products is encouraged, such as those made with composting materials, as long as they are approved by the Town Engineer and permanent vegetative stabilization is established.
3. Twenty four (24") to thirty six (36") inches in width of rock riprap shall be placed along the top and sides of the ground interface with all headwalls and end sections and street/alley/firelane stub outs.
4. Inlet protectors will be removed prior to a certificate of occupancy. It is intended for the erosion control plan to keep all material out of the roadway.
5. A three foot (3') wide concrete apron shall be placed around the exterior of y-inlets for maintenance.
6. Work will be shut down until erosion control measures have been reestablished.