

POLICY 39. CONSTRUCTION STANDARDS

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Chapter 39.10. General Provisions.**39.10.010. Improvement Requirements.**

- A. General.
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- H. Product Delivery and Handling.
- I. Product Storage and Protection.
- J. Building Permits.
- K. Other Specifications and Standards.

39.10.020. Definitions.**39.10.010. Improvement Requirements.**

- A. General. This policy defines the general requirements for improvements to be built by the Developer, sub-divider, owner, or Contractor for all types of construction, (to include residential, commercial, industrial, institutional, governmental and professional office). All improvements which are in areas that are or will become public rights-of-way and/or easements, or that will be under the responsibility of a homeowners association shall meet the requirements of these specifications.

The improvements shall include all street improvements in front of all lots and along all dedicated streets to a connection with existing improvements of the same kind and to the boundaries of the development. Layout must provide for future extension to adjacent development and to be compatible with the contour of the ground for proper drainage. All drinking water, sanitary sewer, pressurized irrigation, electric, communication, storm, land or groundwater drains and any other buried utilities or conduits shall be installed to the boundary lines of the Subdivision or development.

- B. Improvements Made Before Recording. No improvements shall be commenced until a final plat is approved and inspection fees paid.
- C. Variations, Substitutions, Exceptions and Changes. Any variation, substitution or exception from the standards in this policy must be authorized in writing by the City Engineer or his/her designee. Product options and substitutions must meet the requirements of APWA 01 25 00 (Product Options and Substitutions). Any item of construction not covered in these standards must have plans and specifications approved by the City Engineer or his/her designee. Requests for changes to the Construction Standards shall be made in writing to the City Engineer. These requests will be reviewed during revision process conducted in conjunction with the APWA revisions.

- D. Protection of Existing Improvements. The Contractor shall be responsible for the protection of any existing improvements on public or private property at the start of work or placed there during the progress of the work. Existing improvements shall include but are not limited to permanent surfacing, curbs, ditches, driveways, culverts, fences, walls and landscaping. Any surface improvements damaged as a result of construction shall be restored or replaced to an equal or better condition than before. This shall be accomplished in a timely manner.
- E. Maintaining Existing Road Surfaces. The Contractor shall be responsible for maintaining existing road surfaces suitable for travel by the public. The Contractor shall be responsible for all dust and mud control and all claims and damages resulting from failure to maintain the construction area.
- F. New Materials. Only new materials may be used during construction unless otherwise authorized by the City Engineer or his/her designee.
- G. City Furnished Products. If the City furnishes any products the Contractor shall conform to requirements and specifications of APWA 01 64 00 (Owner-furnished Products).
- H. Product Delivery and Handling. The Contractor shall conform to requirements and specifications of APWA 01 65 00 (Product Delivery and Handling).
- I. Product Storage and Protection. The Contractor shall conform to requirements and specifications of APWA 01 66 00 (Product Storage and Protection).
- J. Building Permits. The City may issue a building permit upon application, in compliance with all laws, ordinances, rules, and regulations. No building permit will be issued until all the improvements essential to meet the building code and fire code are installed, accepted, and in service and all building permit and impact fees are paid.

When asphalt pavement plants are closed for the winter, building permits may be issued before paving if there is six inches of compacted road base in all areas to be paved.

The City Engineer or his/her designee is hereby designated as the responsible official to accept the improvements.

- K. Other Specifications and Standards. City standards and ordinances shall supersede all other Standards whenever they conflict.

39.10.020. Definitions.

- A. AASHTO. The American Association of State Highway and Transportation Officials, is a standards setting body which publishes specifications, test protocols and guidelines which are used in highway design and construction throughout the United States.
- B. APWA. The Utah Chapter, American Public Works Association Manual of Standard Specifications, latest edition with all approved supplements. These standard specifications can be obtained at <http://utah.apwa.net/>. When sections of the APWA manual are referred to in these standards, the Contractor shall also adhere to the requirements and specifications of all related sections referred to by the section of the APWA manual.
- C. AWWA. The American Water Works Association Standards, latest edition.
- D. City. The City of Spanish Fork, Utah.
- E. City Engineer. The person appointed by the City to be the City Engineer.
- F. City Planner. The person appointed by the City to be the City Planner.
- G. Civil Engineer. A person-licensed with the State of Utah to practice as a professional engineer.
- H. County. Utah County, Utah.

- I. Construction Plans. Construction plans include drawings showing all required improvements for a development showing their location, size, grade, and elevations.
- J. Customer. A person or company receiving service from any City utilities
- K. Contractor. A person or company hired by the City or a Developer to perform construction in or for the City, having appropriate state licenses to perform said work.
- L. Council or City Council. The governing body of the City.
- M. Cul-de-sac. A permanent dead end street.
- N. Development Review Committee. The Development Review Committee (DRC) of Spanish Fork City.
- O. Developer. Person, persons, partnership or corporation developing residential, commercial or industrial property.
- P. Energy Division. The division of City government responsible for the City owned Electric and Communication utilities.
- Q. Final Plat. An original recordable plat drawn on mylar in a form approved by the City and County, showing all lots, streets, utility easements, etc.
- R. Flood Plain. That area designated on the most recent Flood Insurance Rate Map for the City of Spanish Fork, prepared by the Federal Emergency Management Agency, as a flood plain as amended.
- S. General Plan. The general plan document as approved by the city council.
- T. Improved Lot. A lot which has all the improvements required in the Subdivisions ordinance.
- U. Improvements. Includes roads, streets, curb, gutters, sidewalks, grading, landscaping, water and sanitary sewer systems, irrigation systems, drainage systems, power and communication systems, fences, public facilities, trees or other requirements by this chapter or by the City.
- V. Land Surveyor. A person licensed with the State of Utah to practice as a licensed land surveyor.
- W. Lot. A parcel or tract of land within a subdivision which is or may be occupied by a building or structure and the accessory buildings, structures or uses customarily incident thereto, including such open spaces as are arranged and designed to be used in connection with the building according to the zone within which the lot is located.
- X. LID. Low Impact Development is an approach to land development that works with nature to manage storm water as close to its source as possible. LID employs principles such as preserving and creating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats storm water as a resource rather than a waste product.
- Y. MUTCD. The Manual on Uniform Traffic Control Devices defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic.
- Z. NEC. The National Electrical Code is a United States standard for the safe installation of electrical wiring and equipment.
- AA. NESC. The National Electrical Safety Code establishes rules which govern: a) methods of grounding; b) installation and maintenance of electric-supply stations and equipment, of overhead supply and communication lines, and of underground and electric-supply and communications lines; and c) operation of electric-supply and communication lines and equipment.
- BB. Offsite Facilities. Facilities outside of the boundaries of the subdivision or development site which are designated and located to serve the needs of the subdivision or development or adjacent property, usually lying between a development and existing facilities.

- CC. Onsite Facilities. Facilities installed within or on the perimeter of the subdivision or development site.
- DD. OSHA. The Occupational Safety and Health Administration is the main federal agency charged with the enforcement of safety and health legislation.
- EE. Parcel of Land. A contiguous area of land in the possession or ownership of one person with one tax identification number.
- FF. Planning Commission. The Planning Commission of Spanish Fork City.
- GG. Preliminary Plat. A map or plat of a proposed subdivision or development with accompanying supplementary documents.
- HH. Public Utility Easements. The easements required to place public utilities across any privately owned property.
- II. ROW. A public Right of Way is a strip of land that is granted, through an easement or other mechanism, for transportation purposes, such as for a trail, driveway, rail line or highway. A right-of-way is reserved for the purposes of maintenance or expansion of existing services with the right-of-way.
- JJ. SFCN. The Spanish Fork Community Network.
- KK. Site Plan. A plan for a commercial, industrial, institutional, governmental or planned residential development in the City.
- LL. Streets. A thoroughfare which has been dedicated and accepted by the City Council, which the City has acquired by prescriptive right or which the City owns, or is offered for dedication on an approved recorded final plat. For further explanation see the streets section.
- MM. Subdivision. Any parcel of land that is divided, re-subdivided or proposed to be divided into two or more lots, parcels, sites, units, plots, or other division of land for the purpose, whether immediate or future, for offer, sale, lease, or development either on the installment plan or upon any and all other plans, terms, and conditions. A subdivision includes (1) the division or development of land whether by deed, metes and bounds description, devise and testacia, lease, map, plat, or other recorded instrument; and (2) divisions of land for all land for all residential and nonresidential uses, including land used or to be used for commercial, agricultural, and industrial purposes.
- NN. Utilities. Includes drinking water lines; irrigation lines; sanitary sewer; storm, land and groundwater drains; gas lines; electric power lines; cable television and telephone lines; underground conduits; and junction boxes and all appurtenances to the above.
- OO. Zoning Ordinance. The comprehensive zoning ordinance adopted by the city council as Title 15, Part 3 of the Spanish Fork Municipal Code.

Chapter 39.20. Improvement and Design Requirements.**39.20.010. General.**

- A. Easement.
- B. Traffic Control.
- C. Survey.
- D. Temporary Controls.
- E. Landfill, Construction Debris, or Garbage.

39.20.015. Specialized Engineering.

- A. General
- B. Hillside Geotechnical Engineering.
- C. Bank Stabilization.

39.20.020. Construction Plans.

- A. General.
- B. Plan Sheets.
- C. Electric and Communication Plans.
- D. Street, Parking Lot and Driveway Plans.
- E. Sanitary Sewer, Storm, Land and Groundwater Drain Plans.
- F. Drinking Water and Pressurized Irrigation Plans.
- G. Landscaping Plans.
- H. Irrigation Canal and Pipe Plans.

39.20.030. Street Improvements.

- A. General.
- B. Cul-de-sacs.
- C. Curbs, Gutters, and Sidewalks.
- D. Partial-Streets Widths.
- E. Driveway and Intersection Location.
- F. Parking.
- G. Reverse Frontage Lots.
- H. Temporary Turn-Arounds.
- I. Allowable Grades.
- J. Stamped Concrete.
- K. Precast Concrete or Block Walls.
- L. Pedestrian Ramps.
- M. Horizontal and Vertical Curve.

39.20.040. Utility Improvements.

- A. General.
- B. Communication.
- C. Electric.
- D. Pressurized Irrigation.
- E. Sanitary Sewer.
- F. Storm Drain.
- G. Drinking Water.

39.20.010. General.

- A. Easements. Developer shall provide easements for all utility extensions through private property. Developer shall also provide a 10 foot public utility easement along public right-of-ways or streets and along one side of all other property lines. If setbacks are less than 10 feet then public utility easements shall be the extent of the setback.
- B. Traffic Control. A traffic control plan shall be submitted to the City prior to construction in or along public streets. All traffic control shall comply with APWA 01 55 26 (Traffic Control) and the MUTCD.
- C. Survey. The alignment of the side property lines for each lot in a subdivision shall be marked in the top back of curb with a lot line witness marker that meets the requirements and specifications of APWA 31 05 10 (Boundary Markers and Survey Monuments). Developer shall provide survey bench marks and monuments as required by the City Engineer or his/her designee.

All property corners shall be marked with a rebar corner marker that meets the requirements and specifications of APWA 31 05 10 (Boundary Markers and Survey Monuments). Corners must be marked before acceptance of a subdivision's improvements by the City. The rebar must be offset 2 to 4 inches by a steel tee post four feet out of the ground on the property line alignment.

D. Temporary Controls. Temporary controls such as noise, dust, mud, surface water, ground water, pollution and erosion controls shall be made. Controls shall meet the requirements and specifications of APWA 01 57 00 (Temporary Controls). The pumping of groundwater across sidewalks, into gutters or into the sanitary sewer system is prohibited.

E. Landfill, Construction Debris or Garbage. No buildings, paved parking lots, paved roads, curb, gutter, or sidewalks are allowed to be located over landfills, construction debris, or garbage.

39.20.015. Specialized Engineering.

- A. General. Any specialized engineering beyond the expertise of city staff such as, but not limited to, geotechnical, traffic, environmental, hillside, floodplain, bank stabilization and erosion control will require the review of qualified consultants. All review costs shall be paid by the property owner/developer.
- B. Hillside Geotechnical Engineering. Any development resulting in grading, excavation, filling or erecting of any structure on or within close proximity to any slope or hillside with a slope between ten percent (10%) and thirty percent (30%) shall be required to submit a site specific geotechnical report. Close proximity to a steep slope shall be defined as the horizontal distance from the slope which is less than or equal to the vertical distance from the crest of the slope to the toe of the slope. The geotechnical report shall include sufficient subsurface exploration, laboratory testing and geotechnical engineering analysis to render design level geotechnical recommendations and opinions regarding slope stability and required mitigation to protect planned or future development above and below the slope(s) from earth deformations and other adverse soil or geologic conditions.

All work completed in connection with the site specific geotechnical report shall be performed by an experienced geotechnical engineering firm and under the direct supervision and direction of a professional geotechnical engineer properly licensed in the state of Utah.

The scope of work described below is considered the minimum requirement for the geotechnical investigation. The geotechnical firm (Consultant) shall use their experience and engineering judgment in conjunction with the minimum requirements outlined below to develop an appropriate site-specific geotechnical scope of work and report.

1. Field Explorations. Prior to commencing field explorations the geotechnical engineer shall review available geologic maps, aerial photographs and other pertinent literature to develop an understanding of the site and its geologic setting.

Locate utilities within areas of explorations by notifying the appropriate local one-call state utility locate service. Independent private utility locates may be required for utilities not identified by the local one-call service. Complete subsurface explorations in accordance with the minimum requirements outlined in this section.

- a. Single residential building lot – complete at least one (1) soil boring.
- b. Residential subdivisions – complete at least one (1) soil boring in every proposed lot.

Boring (s) shall be located within close proximity to slope crests so as to render a representative soil profile of the slope for analysis. The boring(s) shall extend to a minimum depth of 15 feet below the top of the slope. For example, if a 30-foot tall slope is being evaluated the boring shall extend at least 45 feet below the top of the slope. Borings shall extend through existing fill materials so that at least one sample is collected in native soil. Adjust boring depths for anticipated site development cuts and fills and for known soil conditions.

The geotechnical shall consider past property use and location. Additional soil borings shall be planned for sites located in areas that are known or suspected to have had previous slope deformations or seeps, springs or other adverse features. Special attentions shall be given to identifying, to the extent practical, the presence and extent of existing fill.

Collect a minimum of four (4) soil samples in the upper ten (10) feet of the profile and at intervals of five (5) feet thereafter. Adjust sampling intervals to include major changes in soil layering. Collect a sufficient number of undisturbed samples in fine-grained soils to properly assess strength and consolidation properties. Perform split barrel sampling in granular soils. Field blow counts should be corrected for energy and depth and presented as Standard Penetration Test (SPT) blow counts on the soil boring logs.

Field classify encountered soil in accordance with the American Standard for Testing and Materials (ASTM) and Unified Classification System (USCS).

Borings encountering bedrock shall be extended a minimum of 5 feet into the bedrock. Rock coring equipment shall be used where practical to aid in assessing rock properties. Where cores are collected, Rock Quality Designator (RQD) values should be presented on the boring logs.

2. Laboratory Testing. Samples collected in the field shall be properly packaged to avoid disturbance or freezing and transported to an accredited geotechnical and materials testing laboratory for further observation and testing. Laboratory testing shall be performed under the direction of a Utah licensed professional geotechnical engineer and in accordance with appropriate ASTM standards. At a minimum laboratory testing shall include the following:
 - a. Sieve analysis – determine grain size distribution and percent fines (minus 200 sieve)
 - b. Atterberg tests – classification, indexing, shrinkage and expansiveness
 - c. In-place density
 - d. Natural moisture content
 - e. Shear strength – Direct Shear and/or Triaxial Shear

Additional laboratory testing may be required to address site conditions and provide necessary engineering properties for analysis. The geotechnical engineer shall use his professional judgment and local experience to determine an appropriate scope for laboratory testing.

Laboratory test results shall be presented in the Geotechnical Report, on individual summary sheets in the report appendix or on the boring logs.

3. Geotechnical Report Requirements. The results of the field and laboratory programs shall be evaluated by a Utah registered professional geotechnical engineer. Based on the results of their evaluation, an engineering report shall be prepared that details the results of the testing performed, provides logs of the borings and a diagram of the site/boring layout and provides geotechnical recommendations and information regarding following:
 - a. General suitability of the site for the planned development
 - b. Recommended precautions and limitations
 - c. Subsurface exploration procedures
 - d. Soil and rock conditions encountered
 - e. Groundwater depth during and after drilling
 - f. Geologic setting
 - g. Geologic hazards
 - h. Slope stability including provisions, recommendations and designs to mitigate the effects of unstable slopes and other geologic hazards that may adversely impact planned developments above and below the slope(s)
 - i. Special design and construction provisions for footings or foundations near steep slopes, including type and depth of foundation system and set back distance from slopes
 - j. Surface water runoff control and drainage
 - k. Subsurface drainage
 - l. Site grading and earthwork requirements, as appropriate

Detailed individual boring logs and graphical cross sections summarizing soil / rock profiles and slope stability analysis and results shall be included in the geotechnical report. The logs shall contain sufficient detail to render a clear description of the soil stratigraphy, soil descriptions and classifications, SPT blow counts, sample locations and depths, ground water depths and appropriate laboratory test results. Individual boring logs shall include a description of the boring location, exploration equipment used, relative or actual elevation, date of exploration and other

pertinent information relative to the field exploration. The cross sections shall contain sufficient detail to render a clear description of the slope stability analysis results and any mitigation measures required. The cross sections shall contain soil profile data and a summary of engineering properties and parameters used in the analysis for each significant soil / rock layer.

The final geotechnical report shall bear the geotechnical engineer's stamp and seal. One (1) electronically submitted PDF copy of the report shall be delivered to the City of Spanish Fork within sufficient time for review and comment. The City will have the report reviewed by its own geotechnical engineer. The cost of that review will be borne by the applicant.

- C. Stream Bank Stabilization. In order to protect future development adjacent to the Spanish Fork River from flooding and natural erosion hazards, all future development that borders the river within the boundaries of Spanish Fork City shall complete a natural hazards analysis for flooding, erosion, and ground water hazards. A technical report must be prepared by a professional engineer, registered in the State of Utah, to document that analysis. The analysis and report shall, at a minimum, include the following items:

1. A figure with a recent aerial photograph for a base map showing the study area and the FEMA Special Flood Hazard Areas. The study area shall include the proposed lot(s) or parcel(s) that are to be developed and 1,000 feet upstream and 1,000 feet downstream (measured along the centerline of the river) of the proposed development.
2. A proposed site plan that shows the location of proposed structures, or building envelopes, adjacent to the river.
3. A review of historic river channel locations in the area. Use the following items, if available:
 - a. Historical aerial photographs
 - b. Original government cadastral survey of the area
 - c. Historic quadrangle maps
 - d. Recent aerial photographs and maps.

Include a figure in the report that documents the results of this analysis.

4. An assessment of channel migration and erosion trends in the area.
5. Provide a figure that shows one or more typical field surveyed channel cross sections of the river channel adjacent to the proposed development. Comment on banks slopes, material on channel bottom, and vegetation.
6. Average anticipated flow velocities in the channel adjacent to the development associated with flood events that have a 10-, 2- and 1-percent chance of occurring in any given year.
7. A field assessment of the condition and stability of the existing channel in the study area, on both sides of the river. This field assessment shall primarily be a visual assessment completed by a professional with a member of Spanish Fork Engineering Department staff in attendance. It shall include, but not be limited to:
 - a. soil types;
 - b. erodibility of the channel bed and banks;
 - c. general condition of the channel and banks;
 - d. an assessment of the condition and percent cover of existing vegetation on the channel banks and in the floodplain;
 - e. an assessment of any existing erosion control measures that exist in the area;
 - f. Identification of any erosion hazards that need to be mitigated.

8. Identify maintenance easements needed to access the channel.
9. Provide an overall "professional opinion" based on previous experience, professional judgment, and technical analyses of any existing erosion and flood hazards that could potentially endanger proposed structures, utilities or infrastructure and recommend means to mitigate those hazards.

In addition to the erosion hazard assessment, the following issues shall also be addressed in this report:

1. Generally identify how storm water runoff from the proposed development will be managed. If storm water will be discharged into the Spanish Fork River, confirm that backwater from the river will not back up into the pipe and cause flooding in the newly developed area during a 1-percent annual chance flood.
2. Assess whether the area is suitable for basements based on anticipated ground water levels during the 1-percent annual chance flood.
3. Historic ground water levels in the area (if any).
4. If a ground water drain is proposed as part of the development, assess how it will function during the 1-percent annual chance flood.
5. Provide a certified statement from a professional geotechnical engineer regarding whether the proposed area is suitable for the construction of basements based on the assumption that the river will be conveying the 1-percent annual chance flood.

39.20.020. Construction Plans.

- A. General. The following instructions are for the purpose of standardizing the preparation of construction plans to obtain uniformity in appearance, clarity, size, and style. Plans and designs shall meet the standards defined in the specifications and drawings hereinafter outlined. All drawings and/or prints shall be clear and legible and conform to good engineering and drafting room practice.

Include the following in construction plans for all developments:

1. A copy of the proposed final plat or site plan;
2. A plan view of the entire project showing all utilities, roads, and appurtenances;
3. Plan and profiles of all storm, land and groundwater drains, sanitary sewer, curb, gutter, and irrigation;
4. Detail drawings of street cross sections according to the standard drawings and other detail drawings only for items not found in the City standard drawings. Detail drawings shall be to scale and completely dimensioned and described. All items shall be designed in accordance with minimum requirements established by the City Construction Standards;
5. Complete plans for all off-site work to be done in conjunction with the project;
6. A stamp and signature of a Civil Engineer licensed in the state of Utah on each plan sheet, detail drawing, and design sheet;
7. Engineer's take off quantities and cost estimate for all construction work related to the project;

- B. Plan Sheets. Include the following on each plan sheet:

1. North Arrow;
2. A standard engineering scale between 1 inch equals 10 feet and 60 feet. A scale of 1 inch equals 100 feet may be used on the plan view of the entire project if necessary to fit project on one sheet;
3. Title block along right side of sheet with title of drawing in lower right corner. Include in title block:
 - a. Name of subdivision and plat or site plan;
 - b. Name of city;
 - c. Specific type of drawing (construction drawings, plan view, plan and profiles, off-site construction, detail drawings);
 - d. Name of engineer, surveyor, or firm preparing drawings;
 - e. Drawing number of total number of drawings;
4. Also include the following with profile drawings:
 - a. Vertical scale of 1 inch equals 1, 2, 3, 4, 5, or 6 feet;
 - b. Reference to the vertical datum. The 1929 or 1988 North American Vertical Datum (NAVD29 or NAVD88) shall be used for all elevation data;
 - c. Benchmark location and elevation for checking construction;
 - d. Stationing aligned from plan view with the profile view;
 - e. Existing ground, ditch, and utility lines;
 - f. A sheet index on each sheet showing profiled area in relation to the overall project.

- C. Electric and Communication Plans. Construction plans must include the location of all existing poles, transformers, secondary junction boxes, sectionalizers, overhead electrical wire and overhead communication cable. After plans are updated to meet the approval of the Development Review Committee, the Developer shall submit a computer aided design (CAD) file of the plans to the Energy Division. CAD file

must be in a dwg or dxf format. Thereafter the energy division will design and make available plans for the proposed electric and communication lines for the development.

- D. Street, Parking Lot, and Driveway Plans. Include the following for curb, gutter, storm, land and groundwater drains, drainage structures, sidewalks, and street surfacing plans:
1. Plan and profile for top back of curb for each side of the street. Label profile line as top back of curb for both sides of street if it is the same;
 2. Stationing and top back of curb elevations with curve data for curb returns;
 3. Flow direction and type of cross drainage structures at intersections with adequate flow line elevations;
 4. Type of curb and gutter if other than the standard thirty inch curb and gutter in the standard drawings;
 5. Location and width of driveways;
 6. Street cross sections with all proposed and existing utilities and base sections as per soils report and Construction and Development Standards;
- E. Sanitary Sewer, Storm, Land and Groundwater Drain Plans. Include the following for sanitary sewer, storm, land and groundwater drain plans:
1. Plan and profile of all new and existing mains and manholes;
 2. Box and manhole size, location, and elevations of flow lines and rim;
 3. Location, size, grade, and type of pipe of new and existing mains;
 4. Location of each lateral with distance stubbed back into property clearly drawn and dimensioned;
 5. Storm water calculations for a 10, 25, and 100 year storm;
 6. Storm inlet boxes shall be located on street corners and or property lines.
- F. Drinking Water and Pressurized Irrigation Plans. Include the following for drinking water and pressurized irrigation plans:
1. Location, size, and type of pipe of new and existing water mains;
 2. Location of valves, fittings, hydrants, boxes, meters, and appurtenances;
 3. Minimum cover;
 4. Location of each lateral with distance stubbed back into property clearly drawn and dimensioned;
 5. Looping of the drinking waterline will be required at the discretion of the City Engineer or his/her designee to provide adequate fire flows and redundancy.
- G. Landscaping Plans. For landscaping that will be maintained by the City or a homeowner's association submit one copy of the landscaping plans including all irrigation system layouts, details, legends, and drawings. These project plans shall meet the requirements of the Chapter 30.90. Landscaping and Chapter 30.95. Irrigation Sprinkler Systems.
- H. Irrigation Canal and Pipe Plans. Plans that affect canals or irrigation pipes must be stamped approved by those responsible for their maintenance before they will be approved by the City.

39.20.030. Street Improvements.

- A. General. The Developer shall construct all streets and appurtenances required for the development as specified by the City Council in accordance with the City Construction and Development Standards and/or other codes adopted by the City. The design and all street work shall be done as directed and under the supervision of the City Engineer or his/her designee. No street shall serve over 50 units without a second improved access.
- B. Access. A maximum of 35 units shall be allowed with a permanent single access street. A maximum of 50 units shall be allowed with a temporary single access if there are provisions to provide a secondary access at a future date. All secondary access roads shall be paved according to the standards outlined in Chapter 39.60. Streets and Pavements.
- C. Cul-de-sacs. The maximum length of a cul-de-sac is 400 feet measured from the nearest right-of-way line of the adjoining street to the center of the cul-de-sac. The minimum radius of the cul-de-sac is 62 feet at the property line.
- D. Curbs, Gutters and Sidewalks. Curbs, gutters, and sidewalks shall be built along all public streets according to the standard drawings. All curbs, gutters, and sidewalks shall connect to existing curbs, gutters, and sidewalks within a reasonable area as determined by the City Engineer or his/her designee.

- E. Partial-Streets Widths. In certain conditions, and when special approval is given, partial road widths may be allowed. A partial road width shall include half the road plus 10 feet. The road shall also include a 2 foot shoulder along the unfinished portion of the street with a minimum 2% slope away from the edge of pavement. In the event that a partial road is allowed, all intersections shall be fully improved with an appropriate asphalt taper. All City improvements must be made in dedicated City right-of-way or public utility easements. "No Parking" signs shall be installed on the opposite side of the road from the development.
- F. Driveway and Intersection Location. Driveways and street intersection locations shall be designed according to Spanish Fork City Transportation Master Plan. No driveways shall be constructed within the following distances from an adjoining street. These distances are from Top Back Curb(TBC) to the edge of driveway for accesses:
1. Along Local Streets:
 - a. 34' from an adjoining local street,
 - b. 100' from adjoining collector/arterial (approach),
 - c. 120' from adjoining collector/arterial (departure).
 2. Curb cuts shall only be allowed for driveways. Driveways shall be a minimum of 3 feet from any above grade utility box. All accesses and streets onto collectors and arterials must be approved by the City Engineer or his/her designee.
- G. Parking. Parking shall meet the requirements of the zoning ordinance and standard drawings.
- H. Reverse Frontage Lots. New residential developments shall not be designed to allow direct access from individual lots or dwelling units to major collector or larger streets. The City Engineer may allow direct access from a minor collector street if the lots have a larger front setback of 35 feet and a driveway designed to prevent vehicles backing into the street. Where direct access to a minor collector street is allowed, a shared drive approach with separate driveways will be required where possible.
- Masonry walls, six feet tall, shall be provided along the sides of residential developments which have reverse or side frontage to arterial streets, collector streets, interstates or railroads. If a lot has frontage on a minor collector street, a 3' masonry wall is required. The walls will be of decorative block, brick, or similar materials together with design elements such as columns, capping, inlays, and variations in materials. The material, style, and color of the wall must be reviewed and approved by the City Engineer or his/her designee. The wall shall be constructed according to a design stamped by a licensed professional civil engineer and City construction standards. The City Council may waive this requirement in those instances where the height of the interstate, arterial street, or collector street is significantly higher than the top of the wall. The City Council may also waive the requirement for a masonry fence if a park or open space area is adjacent to such streets. The Council may waive all fencing requirements or impose non-sight obscuring fencing, at their sole discretion.
- I. Temporary Turn-Arounds. Temporary turn-arounds are to be provided on all streets which extend more than one lot from an intersection. These are to be recorded as easements or dedicated to the City. The turnaround shall be 96 feet in diameter and consist of a minimum of 8 inches of compacted road base. If a temporary turnaround is located along the frontage of a subdivided lot, the roadway including asphalt, curb, and gutter and sidewalk shall be improved.
- J. Allowable Grades. The maximum grade allowed for any City street or private driveway is 8.0% unless otherwise approved by the City Engineer or his/her designee. In no case shall grades greater than 12.0% be allowed. The minimum grade allowed for any City street 0.45%. The City Engineer or his/her designee may allow a minimum grade of 0.35% if the roadway has incorporated Low Impact Development (LID) systems.
- K. Stamped Concrete. The color and pattern of stamped concrete shall be approved by the Development Review Committee.
- L. Precast Concrete or Block Walls. The design of all walls must be approved by the Development Review Committee. Design must be stamped and signed by a licensed professional civil engineer registered in the state of Utah.
- M. Pedestrian Ramps. Pedestrian ramps shall be placed at all corners of intersections and at all other locations of regular pedestrian traffic across roads as determined by the City Engineer or his/her designee. All ramps shall conform to the requirements of the Americans with Disabilities Act and City standards.

- N. Horizontal and Vertical Curve. Horizontal and vertical curve alignments shall be determined by AASHTO Geometric Design of Highways and Streets (Greenbook) and additional ASSHTO design standards.

39.20.040. Utility Improvements.

- A. General. It shall be the responsibility of the Developer to connect to existing utilities or improvements wherever they are located and extend those improvements to and through the development. Workmanship and details of construction shall be in accordance with the City Construction Standards and/or other codes adopted by the City. All work shall be done under the supervision of the City Engineer or his/her designee.
- B. Communication. Communication lines shall be underground except when the City Engineer or his/her designee feels that such underground lines are not in the best interest of the City.
- C. Electric. Electrical lines shall be underground except when the City Engineer or his/her designee feels that such underground lines are not in the best interest of the City. Lines shall be located opposite of water and pressurized irrigation lines.
- D. Pressurized Irrigation. The Developer shall connect the development with the city pressurized irrigation system with all appurtenances and shall make such pressurized irrigation available to each lot or unit within the development. Adequacy of supply and sizes of pressurized irrigation mains shall be established by the City Engineer or his/her designee. Meter boxes shall be on the opposite corner of the lot from where the electrical boxes are located.
- E. Sanitary Sewer. The Developer shall provide each lot with a sanitary sewer system in accordance with the ordinances of the City. All said work shall be done as directed and under the supervision of the City Engineer or his/her designee.
- F. Storm Drain. The Developer shall provide on-site storm drainage facilities according to the storm water Drainage Design manual and in accordance with the ordinances of the City. Storm drainage systems shall incorporate Low Impact Development (LID) systems. The maximum allowable storm water discharge from any commercial and industrial development will be limited to 0.15 cfs/acre of development.
- G. Drinking Water. The Developer shall connect the development with the city drinking water system with all appurtenances and shall make such drinking water is available to each lot or unit within the development. Adequacy of supply and sizes of drinking water mains shall be established by the City Engineer or his/her designee. Pipes shall be located opposite from electrical lines. Looping of the drinking waterline will be required at the discretion of the City Engineer or his/her designee to provide adequate fire flows and redundancy.

Chapter 39.25. Inspection and Testing.**39.25.010. General.**

- A. Quality Assurance.
- B. Submittals.
- C. Preconstruction Meeting.
- D. Inspection and Testing Notification.
- E. Testing and Sampling.
- F. Testing Agency.
- G. Work without Required Inspection and Testing.
- H. Inspection and Testing Fees.
- I. Sub-standard Work and Pay Factors.
- J. Weekly Progress Meetings.
- K. Road Construction.
- L. As-Built Survey.
- M. Acceptance of Improvements.

39.25.020. Communication.

- A. Conduit Inspection.
- B. Service Stub Inspection.
- C. Final Communication Inspection.
- D. Bedding Inspection.

39.25.030. Earthwork.

- A. Compaction and Moisture Content Tests.
- B. Red-head Inspection.
- C. Proof Roll Inspection.
- D. Thickness Test.

39.25.040. Electric.

- A. Conduit Inspection.
- B. Service Stub Inspection.
- C. Street Light Base Inspection.
- D. Bedding Inspection.
- E. Final Electrical Inspection.

39.25.050. Landscaping and Irrigation Sprinkler Systems.

- A. Plant Material Inspection.
- B. Sprinkler System Assembly Inspection.
- C. Fall Sprinkler Winterizing Test.
- D. Spring Sprinkler Energizing Test.
- E. Final Acceptance Inspection.

39.25.060. Portland Cement Concrete Work.

- A. General.
- B. Slump, Temperature, and Air Entrainment Test.
- C. Compression Test.
- D. Forms and String Line Inspection.
- E. Gutter Drainage Inspection.
- F. Thickness Test.
- G. Curing Inspection.

39.25.070. Pressurized Irrigation.

- A. General.
- B. Main Line Inspection.
- C. Pressurized Irrigation Service Inspection.
- D. Pressure Test.
- E. Leakage Test.

39.25.080. Sanitary Sewer.

- A. General.
- B. Main Line Inspection.

- C. Service Inspection.
- D. Air Pressure Test.
- E. Video Inspection.
- F. Deflection Test.

39.25.090. Storm, Land and Groundwater Drains.

- A. General.
- B. Main Line Inspection.
- C. Air Pressure Test.
- D. Video Inspection.

39.25.100. Streets.

- A. Asphalt Pavement Material Tests.
- B. Compaction Tests.
- C. Grading Inspection.
- D. Thickness Test.
- E. Profile Tolerance Inspection.
- F. Asphalt Concrete Temperature Test.
- G. Asphalt Paving Limitations.

39.25.110. Drinking Water.

- A. General.
- B. Main Line Inspection.
- C. Drinking Water Service Inspection.
- D. High Chlorine Test.
- E. Pressure Test.
- F. Leakage Test.
- G. Bacteria Test.

39.25.010. General.

- A. Quality Assurance. The following work shall be subject to the inspection and testing requirements of this chapter:
 1. Work on existing or proposed City property;
 2. Work on property that will be owned by a property owners association;
 3. Work on existing or proposed streets, easements, or right-of-ways;
 4. Work on existing or proposed City utilities.

The Contractor must ensure that all inspection and testing required by these standards is performed and accepted by the City Engineer or his/her designee. The Contractor must also ensure that any additional inspection and testing required by the City or a testing company is performed and accepted by the City. In projects other than those bid out by the City, the Developer is ultimately responsible for the work of the Contractor.

- B. Submittals. Contractor shall turn in submittals for all testing not performed by the City.
 1. *Field Test Report.* Contractor must submit original field test report immediately to City whenever possible. Reports may not be submitted later than the end of the current day.
 2. *Laboratory Test Report.* Submit original report to the City within 48 hours after test results are determined.
 3. *Material and Equipment Specifications.* Four copies of the manufacturer's specifications and manuals for equipment and materials used must be submitted to the City 7 days before the pre-construction meeting. Pre-construction meeting may not be held until material and equipment specifications are approved.
- C. Preconstruction Meeting. The Contractor must schedule a preconstruction meeting with the City's engineering secretary before any work on a new development or City project may begin.

The Contractor, Developer, project engineer, and all sub-contractors must be present at the preconstruction meeting. Any sub-contractor not attending the preconstruction meeting must schedule an additional preconstruction meeting with the City before beginning work. Work must begin within 4 weeks of the preconstruction meeting or a new preconstruction meeting must be scheduled by the Contractor.

- D. Inspection and Testing Notification. The City may contract with a private company to conduct any inspections or testing specified to be performed by the City. All inspections and tests must be scheduled with the City or company contracted by the City a minimum of 1 full business day before needed. Requests for inspection on work requiring continuous inspection shall be made 3 full business days prior to commencing the work.
- E. Testing and Sampling. The City Engineer or City Inspector may require that sampling be performed in their presence, in which case the Developer or Contractor shall be notified of this requirement in writing at the time the building permit is issued, or at the preconstruction meeting, or when construction drawings are released by the City for construction, as applicable.

Each sample or test shall be accompanied by the following written data, which shall be reported to the City with test results:

1. Name of Project.
 2. Name of Developer/Contractor.
 3. Project Street Address.
 4. Appropriate Test Name.
 5. Date of Sampling.
 6. Sample Number (if more than one sample per day).
 7. Name of technician who performed the testing.
 8. Location of sample.
- F. Testing Agency. All materials testing, whether in a laboratory or in the field, shall be conducted by a testing agency approved by the City Engineer or his/her designee.

The City will contract with an independent certified testing company for the compaction and concrete testing on improvements in the public right of way, or improvements in a Planned Residential Development (PRD) which would be public if not for the PRD, or improvements in common areas. The Developer shall pay a fee for this testing before construction commences. Fees shall be based on the current contract the City has with the testing company. Additional tests and all re-tests shall require additional fees to be paid. Final acceptance of improvements shall not be issued until all additional fees are paid. The City may deduct these additional fees from the 10% cash bond paid by the Developer.

- G. Work without Required Inspection and Testing. Any work performed without required inspection or testing will give the City the option to hold the bond covering that portion of the improvements in violation, or, require the removal and replacement of the un-inspected work. The City shall have the option of retaining part or all of the bond for 10 years after installation of improvements constructed without required inspection or testing. The City Engineer may also accept the work at a reduced price if the lowest pay factor is applied.
- H. Inspection and Testing Fees. Inspection fees and/or connection fees required by Resolution 99-18 shall be paid and permits required shall be obtained prior to the preconstruction meeting.
- I. Sub-standard Work and Pay Factors. If any inspection or test indicates that work does not meet City standards the City Engineer may require that the work be redone. If the work has a pay factor option in the standards, the City Engineer may accept the work at a reduced price upon condition that the pay factors outlined in the City standards apply. Payment reduction amounts shall either be assessed to the developer as a fee based upon bond estimates for the work, or be applied against payments to Contractors for City contracts. When any work is done to a lower standard than allowed for in the pay factor tables the work shall be redone until it meets City standards.
- J. Weekly Progress Meetings. All construction projects in the City will have a weekly progress meeting at the City office. The City Engineer or his/her designee, City inspectors, the Contractor, and sub-contractors shall be in attendance.
- K. Road Construction. Road construction may not commence until all underground utilities are installed and pass all the inspections and tests required by these standards.
- L. As-Built Survey. The Contractor shall notify the City to survey all underground utilities either installed or uncovered in the course of construction. Contractor shall give the City 24 hour's notice to survey utilities.
- M. Acceptance of Improvements. Inspections made by the City or a company hired by the City to determine compliance with the specifications do not imply final acceptance of the work. The City requires the

completion of all facilities before any are accepted for maintenance. The following inspections must be scheduled and passed before final acceptance of any improvements:

1. *End of Construction Inspection.* The Contractor must schedule with the City an end of construction inspection once all the improvements in a development or project are completed according to the Construction and Development Standards.
2. *Final Acceptance Inspection.* One year after the Contractor or Developer passes the end of construction inspection, he or she must schedule a final acceptance inspection. This inspection must be conducted after the one year asphalt preservation coat is applied when applicable.

If the Contractor or Developer does not pass one of these inspections a punch list of work items necessary to pass the inspection will be given to the Contractor or Developer within 2 business days of the inspection. The Contractor or Developer must reschedule inspections with the City until the project or development passes the inspection.

All improvements shall be free from defects, damage, or debris at the time of these inspections. The Contractor or Developer shall not be responsible for debris or damage not caused as a result of his or her work or quality of work.

Any faulty or defective work shall be corrected by the Contractor within 30 days of the failed inspection or according to the contract the City has with the Contractor.

If the Contractor or Developer fails to do so, the City Engineer or his/her designee shall have such repairs made, and the cost of such repairs shall be paid by the Developer together with 25% in addition thereto for stipulated damages for such failure on the part of the Developer to make the repairs.

39.25.020. Communication.

- A. Conduit Inspection. The City must inspect all conduit before backfilled.
- B. Service Stub Inspection. The City must inspect all service stubs before backfilled.
- C. Final Communication Inspection. Once all communication work for a development is completed to City standards, a final communication inspection must be done by the City Engineer or his/her designee. This may be done at the same time as the final electrical inspection.
- D. Bedding Inspection. The City must inspect the bedding in all communication trenches.

39.25.030. Earthwork.

- A. Compaction and Moisture Content Tests. The City will test all sub-grade and fill material for compaction and moisture content. Test locations shall be determined by the City.
 1. *Trenches.* Tests will generally be taken 1 per 200 lineal foot of trench per 8 inch lift.
 2. *Streets.* Tests will generally be taken 3 per 200 lineal foot of street per 8 inch lift.
 3. *Other Cuts and Fills.* Tests will generally be taken 1 per 2,000 square feet of compacted area.
- B. Red-head Inspection. The project engineer must provide red-heads for all grade work when brought to within 3 inches of finish grade. The City must inspect and accept finished grading to the engineered red-heads.
- C. Proof Roll Inspection. Prior to placing fill material for roadbed backfills, proof roll sub-grade using gross weight of 18,000 pounds per tandem axle, with a tire pressure at least 90 psi, unless otherwise specified by the soils report. Contractor shall proof roll under the supervision of the City according to the following conditions:
 1. *Passes.* All proof roll passes will traverse the sub-grade parallel to the roadbed centerline. All subsequent passes will be offset half the vehicle width until the entire sub-grade is tested.
 2. *Mitigation.* The City will analyze, determine, designate, and measure the areas, if any, requiring additional compaction or reconstruction.
 3. *Sub-grade Protection.* Once sub-grade passes the proof rolling test, protect the surface from construction operations and traffic damage. Repair all cuts, ruts, and breaks. Keep surface in a satisfactory condition until geotextile fabric or base course has been placed.
- D. Thickness Test. Material thickness tests will be conducted by the City when the City Engineer or his/her designee considers it necessary. The total depth shall be reasonably close to that shown on the typical section. Depth analysis shall be made on at least four holes for each section. Base thickness shall be

accepted if 75% of the test holes are less than 1/4" below the specified thickness and no individual hole shall be more than 3/4" below the specified thickness.

39.25.040. Electric.

- A. Conduit Inspection. The City Engineer or his/her designee must inspect all conduit before backfilled.
- B. Service Stub Inspection. The City must inspect all service stubs before backfilled.
- C. Street Light Base Inspection. The City must inspect all street light bases before they are backfilled around.
- D. Bedding Inspection. The City must inspect the bedding in all electrical trenches.
- E. Final Electrical Inspection. Once all electrical work for a development is completed to City standards a final electrical inspection must be done by the City.

39.25.050. Landscaping and Irrigation Sprinkler Systems.

- A. Plant Material Inspection. All plant materials are to be inspected and approved by the City at the time of delivery on site. This approval does not constitute final acceptance of any plant material by the Spanish Fork City Parks Department Representative. All plant materials will be inspected again at time of final inspection and once again at the end of the warranty period. Any plant found to be unacceptable at any of these inspections shall be immediately removed and replaced.
- B. Sprinkler System Assembly Inspection. An on-site inspection shall be conducted by the City after the entire sprinkler system is assembled and prior to backfilling the trenches. During this inspection all fittings, bends, sweeps, valves, sprinkler heads and any other appurtenance on the system shall be surveyed by the City.
- C. Fall Sprinkler Winterizing Test. In the fall of the year during the installation and guarantee period, the Contractor shall meet with the City on the project site. The Contractor shall winterize the system by draining all the water and doing everything necessary to insure the protection of the system until spring. Blowing out the lines by compression shall be permitted during the 1 year guarantee. The individuals involved from both parties shall exchange all information necessary for the eventual takeover of the system by the Spanish Fork City Maintenance Personnel.
- D. Spring Sprinkler Energizing Test. The Contractor with the Spanish Fork City Maintenance Personnel in attendance shall energize the sprinkler irrigation system the spring following the fall winterizing test. Contractor shall repair all defects found as a result of winter damage, improper installation, improper maintenance, defective materials or inadequate sprinkler drainage.
- E. Final Acceptance Inspection. At the end of the guarantee period, all landscaping and irrigation sprinkler systems must then be inspected and tested by the City. As-built drawings shall be furnished to the City at the time of the final inspection.

Irrigation sprinkler systems must operate in a satisfactory manner, with a full uniform coverage of the areas that are indicated to be sprinkled. Sprinkler heads shall be adjusted to proper level.

Landscape and irrigation sprinkler systems will not be inspected for acceptance in parts. Where inspected work does not comply with requirements, Contractor shall replace rejected work and continue specified maintenance until reinspected by the City and found to be acceptable. Remove rejected plants and materials promptly from the project site.

39.25.060. Portland Cement Concrete Work.

- A. General. All materials and processes involved in concrete work shall be subject to inspection and testing as detailed in the various paragraphs of this section and in general compliance with ASTM E105-54T. Results of tests performed by laboratories approved by the City to the satisfaction of the City Engineer or his/her designee shall be accepted by the supplier as a basis for acceptance or rejection of any and all materials.

The latest appropriate ASTM tests and methods shall be considered to be standard, and will include but not be limited to concrete, cement, aggregates additives, curing compounds, parting compounds and jointing materials. A copy of all batch tickets for concrete placed shall be submitted to the City.

- B. Slump, Temperature and Air Entrainment Test. The City shall test slump, temperature, and air entrainment on every fifty cubic yards or less of concrete placed each day. Tests shall be taken after 1/2 to 1 yard has

been poured from the mixer. Once a sample is taken the concrete pour shall be stopped until tests show that the concrete meets City standards. Concrete that does not meet City requirements for slump, temperature, and air entrainment shall not be used. Any that may already have been poured shall be removed before hardening.

- C. Compression Test. The City shall test compression on every fifty cubic yards or less of concrete placed each day according to ASTM C143, C231, C1064, C172, and C31. Three cylinder specimens shall be taken for each test, one shall be broken at 7 days, one at 28 days and the third held for 45 days after submittal in case further testing is required.

Specimens shall attain the specified strength at 28 days. One lot is 1 day's production. A lot with sub-standard compressive strength may be accepted at reduced price if the appropriate pay factor is applied to the whole lot. The following table outlines the pay factors for sub-standard Portland cement concrete strength:

PORTLAND CEMENT CONCRETE
COMPRESSIVE STRENGTH PAY FACTORS

Pay Factor	Tolerance (psi below 28 day specified strength)
0.98	1 to 100
0.94	101 to 200
0.88	201 to 300
0.80	301 to 400
0.50	401 to 500
Replace	More than 500

These pay factors may not be applied toward concrete in structures.

- D. Forms and String Line Inspection. The City shall inspect all forms and string lines before concrete may be placed.
- E. Gutter Drainage Inspection. The City shall inspect all gutters for drainage prior to paving. Water shall be let into all gutters and any gutters with standing water in excess of 1/4 inch after runoff shall be replaced. Contractor must supply water truck for gutter drainage inspection.
- F. Thickness Test. The City shall determine the number, if any, and location of core tests necessary to ensure the proper thickness of Portland cement concrete. Tests shall be taken at equal intervals in a test area. A test area shall be defined as a total area placed at the same time and by the same process. The average thickness shall then be determined from all the cores taken. Tests shall be taken and verified by a certified testing lab contracting to the City.

When the average thickness is more than 0.25 inches below the specified thickness, a minimum of 1 core per 1,500 square feet of pavement shall be taken. Work with sub-standard thickness may be accepted at reduced price if the appropriate pay factor for the lowest tested thickness is applied to all of the sub-standard work. The following table outlines the pay factors for sub-standard Portland cement concrete thickness:

PORTLAND CEMENT CONCRETE
THICKNESS PAY FACTORS

Pay Factor	Tolerance (inches below specified thickness)
1.00	0.00 to 0.25
0.90	0.26 to 0.50
0.70	0.51 to 0.75
0.50	0.76 to 1.00
Replace	More than 1.00

- G. Curing Inspection. The City shall inspect the curing of all Portland cement concrete work within 24 hours of pouring the concrete.

39.25.070. Pressurized Irrigation.

- A. General. The inspections and tests in this section are required for all pressurized irrigation construction in the City boundaries and on all construction relating to the City pressurized irrigation system outside the city boundaries.
- B. Main Line Inspection. The City must inspect all pressurized irrigation main line installation on an ongoing basis. Inspection notification must be given before any construction of the main line may begin. All crosses, tees, bends, valves, and drains must be inspected and surveyed by the City before they are backfilled.
- C. Pressurized Irrigation Service Inspection. The City must inspect all pressurized irrigation services before service trenches are backfilled. The City must be able to survey services at the main during the inspection.
- D. Pressure Test. The Contractor must pressure test all pressurized irrigation systems, system extensions and service laterals to the setter in the presence of the City Engineer or his/her designee or have tests documented and submitted by a certified testing company approved by the City. Pressure tests must meet the requirements and specifications of APWA 33 08 00 (Commissioning of Water Utilities).
- E. Leakage Test. Leakage tests shall be conducted concurrently with the pressure tests. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$Q \equiv \frac{LD * \sqrt{P}}{133,200}$$

In which Q is the allowable leakage, in gallons per hour; L is the length of pipeline tested in feet; P is the average test pressure, in pounds per square inch (gage) and D is the nominal diameter of the pipe in inches.

Provide a 225 psi test pressure for 2 hours unless specified otherwise. If any test of pipe laid discloses leakage greater than specified, the Contractor shall, at their own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

39.25.080. Sanitary Sewer.

- A. General. The inspections and tests in this section are required for all sanitary sewer construction in the City boundaries and on all construction relating to the City sanitary sewer system outside the city boundaries.

- B. Main Line Inspection. The City must inspect all sanitary sewer main line installation on an ongoing basis. Inspection notification must be given before any construction of the main may begin.
- C. Service Inspection. The City must inspect all sanitary sewer services before service trenches are backfilled. The City must be able to survey services at each end during the inspection.
- D. Air Pressure Test. Contractor shall conduct a low pressure air test by the following method under the direction of the City Engineer or his/her designee with equipment equal to Cherne Industrial, Inc., or provide proof that test was conducted by a certified testing company. Sanitary sewer pipes with inside diameters of 30 inches or larger shall be leak tested according to manufacturer's specifications.

All wyes, tees, or ends of lateral stubs shall be suitably capped and braced to withstand the internal test pressures. Caps shall be easily removable for future lateral connections or extensions. After a manhole to manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole with pneumatic plugs.

Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psi-G greater than the average back pressure of any ground water that may be over the pipe. At least 2 minutes shall be allowed for the air pressure to stabilize.

The portion of line being tested shall be accepted if the portion under test does not lose air at a rate greater than 0.003 cubic feet per minute per square foot of internal pipe surface or 2.0 cubic feet per minute minimum when tested at an average 3.0 psi-G greater than any back pressure exerted by ground water that may be over the pipe at the time of the test.

The pipe and joints shall also be considered acceptable when the time required in minutes for pressure to decrease from 3.5 To 2.5 psi-G (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

PRESSURE REDUCTION TIME LIMITS	
Pipe Diameter (inches)	Time (minutes)
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

If the installation fails to meet this requirement, the Contractor shall determine at his/her own expense the source of leakage. He shall repair or replace all defective materials and/or workmanship. All sanitary sewer mains shall be tested, cleaned and accepted by Spanish Fork City before laying the street surface.

- E. Video Inspection. Contractor shall clean and then have the City video inspect all sanitary sewer main lines prior to paving. The City must approve video inspection company.

Cleaning shall be done using a high pressure jet cleaning machine, producing a minimum of 800 psi. Waste water and debris shall not be permitted to enter the City sanitary sewer system, but shall be removed at the lowest manhole of the extension.

Video Inspection shall be done by Spanish Fork City. All costs associated with the video inspection shall be added into the inspection fee.

Main line determined to be defective by the City Engineer or his/her designee shall be remedied by the Contractor. Contractor shall then clean and video inspect the main lines again.

- F. Deflection Test. Contractor shall perform a displacement test on all sewer lines after video inspection. Deflections tests must be conducted in the presence of the City Engineer or his/her designee or be documented and submitted by a certified testing company approved by the City. In no case shall pipe be accepted that has a deflection of more than 5% after it has been backfilled. The Mandrel must be pulled by hand or air. A pipe deflection test shall be required of the Developer/Contractor after backfilling and compaction of the trench.

39.25.090. Storm, Land and Groundwater Drains.

- A. General. The inspections and tests in this section are required for all storm, land and groundwater drain construction in the City boundaries and on all construction relating to the City storm, land and groundwater drain system outside the city boundaries.
- B. Main Line Inspection. The City must inspect all storm, land and groundwater drain main lines during installation on an ongoing basis. Inspection notification must be given before any construction of the pipe may begin. All groundwater drains shall be pre-approved by the City Engineer or his/her designee.
- C. Air Pressure Test. Contractor shall conduct a low pressure air test for all sealed drains by the following method under the direction of the City Engineer or his/her designee with equipment equal to Cherne Industrial, Inc., or provide proof that test was conducted by a certified testing company. Storm drain pipes with inside diameters of 30 inches or larger shall be leak tested according to manufacturer’s specifications.

All wyes, tees, or ends of lateral stubs shall be suitably capped and braced to withstand the internal test pressures. Caps shall be easily removable for future lateral connections or extensions. After a manhole to manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole with pneumatic plugs.

Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psi-G greater than the average back pressure of any ground water that may be over the pipe. At least 2 minutes shall be allowed for the air pressure to stabilize.

The portion of line being tested shall be accepted if the portion under test does not lose air at a rate greater than 0.003 cubic feet per minute per square foot of internal pipe surface or 2.0 cubic feet per minute minimum when tested at an average 3.0 psi-G greater than any back pressure exerted by ground water that may be over the pipe at the time of the test.

The pipe and joints shall also be considered acceptable when the time required in minutes for pressure to decrease from 3.5 To 2.5 psi-G (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

PRESSURE REDUCTION TIME LIMITS	
Pipe Diameter (inches)	Time (minutes)
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.8
21	10.0
24	11.5

If the installation fails to meet this requirement, the Contractor shall determine at his/her own expense the source of leakage. He shall repair or replace all defective materials and/or workmanship. All storm drain lines shall be tested, cleaned and accepted by Spanish Fork City before laying the street surface.

- D. Video Inspection. Contractor shall clean and then video inspect all storm, land and groundwater drain lines before paving. The City must approve video inspection company.

Cleaning shall be done using a high pressure jet cleaning machine, producing a minimum of 800 psi. Debris shall not be permitted to enter the City storm drain system.

Video inspection shall clearly show any debris, broken pipe, misaligned pipe, displaced pipe and defective joints for all sections of the main line. All defects and their location shall be detailed on a separate video log report. A digital video disk (DVD) of video inspection and log report shall be submitted by the inspection company to the City Engineer or his/her designee.

Log reports shall be submitted on the City video form or an approved equivalent. Log reports must be submitted with an 11x17 copy of the plans. All manholes in the log report must reference the labeled manholes numbers on the plans. Each manhole must also have a street address clearly shown on the log report.

39.25.100. Streets.

- A. Asphalt Pavement Material Tests. Material tests will be conducted by the City when the City Engineer or his/her designee considers it necessary.
- B. Compaction Tests. The City will test all bituminous pavement for compaction and moisture content. Test locations shall be determined by the City but will generally be taken 3 per 200 lineal foot of street or 1 per 2,000 square foot of paved area. Pay factors as per APWA 32 12 16 (Plant-Mix Asphalt Paving) shall apply.
- C. Grading Inspection. The sub-grade, sub-base, and road base shall all be graded to an engineered red-head and accepted by Spanish Fork City. Red-heads shall be placed every 50 feet at the crown of the road. If the distance between red-heads and edge of pavement exceeds 25 feet additional redheads shall be installed half way between the crown and edge of pavement. Red-heads shall also be placed every 50 feet at the edge of pavement where there is no curb and gutter.
- D. Thickness Test. Material depth tests will be conducted by the City when the City Engineer or his/her designee considers it necessary. The total depth shall be reasonably close to that shown on the typical section. Depth analysis shall be made on at least four holes for each section. Base thickness shall be accepted if 75% of the test holes are less than 1/4" below the specified thickness and no individual hole shall be more than 3/4" below the specified thickness. Work with sub-standard thickness may be accepted at reduced price if the appropriate pay factor for the lowest tested thickness is applied to all of the sub-standard work. The following table outlines the pay factors for sub-standard asphalt pavement thickness:

PAVEMENT DEPTH PAY FACTORS

Pay Factor	Tolerance (inches below specified thickness)
0.95	0.00 to 0.25
0.90	0.26 to 0.50
Replace	More than 0.5

- E. Profile Tolerance Inspection. Profile tolerance inspections may be required by the City any time within a year of paving. Collector and arterial streets shall meet the requirements of APWA 32 12 16 (Plant-Mix Asphalt Paving). For local streets profiling, the maximum vertical distance from the pavement surface to a straight edge is:
 - a. 1/4-inch in 10-feet parallel to centerline.
 - b. 3/8-inch in 10-feet perpendicular to centerline except at cross section grade breaks.

Collector and arterial streets shall meet the requirements of APWA 32 12 16 (Plant-Mix Asphalt Paving).

- F. Asphalt Concrete Temperature Test. This test shall be conducted on the first three loads of asphalt concrete installed, and on one in four of all future loads as required by the City. Testing shall be conducted according to the requirements and specifications of APWA 32 12 16 (Plant-Mix Asphalt Concrete Paving). Temperature gauge shall be allowed to stabilize for 1 minute before taking reading if using probe type. If using infra-red "gun" type, reading shall consist of an average of a minimum of 3 readings, where reading is

taken immediately after displacing a minimum of 2 inches of material from the surface being tested and the "gun" is within 18" of the surface being tested.

- G. Asphalt Paving Limitations. Pave according to Section 02741 Part 3.8 of the 2012 Standard Specifications for Road and Bridge Construction published by the Utah Department of Transportation (UDOT) unless otherwise approved by the City Engineer or his/her designee. In the event the City Engineer approves paving between October 15th and April 15th, an overlay in the spring will be required as outlined in the table below. Do not place HMA on frozen base or during adverse climatic conditions such as precipitation or when roadway surface is icy or wet. Use a release agent that does not dissolve asphalt and is acceptable to the City Engineer or his/her designee for all equipment and hand tools used to mix, haul, and place the HMA. Place HMA between April 15 and October 15, and when the air temperature in the shade and the roadway surface temperature are above 50 degrees Fahrenheit.

PAVEMENT DEPTH AFTER OCTOBER 15TH / BEFORE APRIL 15TH

Street	Typical	Base Asphalt	Spring Overlay	Total Asphalt
Local	3"	2.5"	2"	4.5"
Collector	4"	3"	2"	5"
Arterial	5"	4"	2"	6"
Parking lot & Driveway	3"	2.5"	2"	4.5"
Commercial Local	4"	3"	2"	5"

39.25.110. Drinking Water.

- A. General. The inspections and tests in this section are required for all drinking water construction in the City boundaries and on all construction relating to the City drinking water system outside the city boundaries.
- B. Main Line Inspection. The City must inspect all drinking water main line installations on an ongoing basis. Inspection notification must be given before any construction of main line may begin. All crosses, tees, bends, valves and hydrants must be inspected and surveyed by the City before they are backfilled.
- C. Drinking Water Service Inspection. The City must inspect all drinking water services before service trenches are backfilled. The City must be able to survey services at the main during the inspection.
- D. High Chlorine Test. High Chlorine tests shall meet the requirements and specifications of APWA 33 13 00 (Disinfection). The City must conduct a high chlorine test at every hydrant on a new drinking water main installation. If a hydrant does not exist on the test section, tests must be taken at the end of each line. The chlorine residual shall be at least 25 mg/L.
- E. Pressure Test. Pressure test must be conducted after the successful completion of the bacteria test. The Contractor must pressure test all drinking water systems, system extensions and service laterals to the setter in the presence of the City Engineer or his/her designee or have tests documented and submitted by a certified testing company approved by the City. Pressure tests must meet the requirements and specifications of APWA 33 08 00 (Commissioning of Water Utilities).
- F. Leakage Test. Leakage tests shall be conducted concurrently with the pressure tests. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$Q \equiv \frac{LD * \sqrt{P}}{133,200}$$

In which Q is the allowable leakage, in gallons per hour; L is the length of pipeline tested in feet; P is the average test pressure, in pounds per square inch (gage) and D is the nominal diameter of the pipe in inches.

Provide 225 psi test pressure for 2 hours unless specified otherwise. If any test of pipe laid discloses leakage greater than specified, the Contractor shall, at their own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

- G. Bacteria Test. Bacteria tests shall meet the requirements and specifications of APWA 33 13 00 (Disinfection). Tests may only be scheduled at certain regular times set by the City. The Contractor shall be present and open all hydrants or other locations to be tested from. The City shall submit samples to a certified lab to be tested according to state drinking water regulations.

If any sample point fails on the first test, the line will be flushed and re-tested at all sample points. If any sample point fails a second time, the complete line will be re-disinfected and re-tested at all sample points. If any samples come back marked "presence", which means coli form bacteria is present, the line will be re-disinfected and re-tested at all sample sites. Contractor is responsible to pay for all bacteria tests and retests.

Drinking water services will not be installed until bacteria sample results have been approved by the City Engineer or his/her designee. All testing lab fees shall be paid for by the Contractor.

Chapter 39.30. Contractor Requirements.**39.30.010. General.**

- A. Contractors Working for a Developer.
- B. Contractors Working for the City.
- C. Status Verification System.

39.30.020. Insurance.

- A. General.
- B. Workers' Compensation.
- C. Commercial General Liability Insurance.
- D. Automobile Liability Insurance.

39.30.030. Bonding.

- A. General.

39.30.040. Excavation Permits.

- A. General.
- B. Contractors.
- C. Property Owners.

39.30.050. Inspection Fees.

- A. General.

39.30.060. Materials Submittals.

- A. General.

39.30.070. Quality Control.

- A. General.
- B. Materials Production.
- C. Testing and Inspection.

39.30.010. General.

- A. Contractors Working for a Developer. Contractors and Sub-Contractors working for a Developer must prequalify before doing any work in existing or proposed City property, streets, easements, or right-of-way and for any work on existing or proposed City utilities. To prequalify the following must be on file in the City Engineer's office:
 - 1. A current Contractor's license specified for project type according to Utah State Code;
 - 2. Insurance information;
 - 3. Contractor information sheet;
 - 4. Project Bond;
 - 5. Excavation Permit;
 - 6. UDOT Permit for construction in state right-of-way; and
 - 7. Railroad Permit for construction in railroad right-of-way.

Failure to pre-qualify before doing any construction shall constitute grounds for legal action.

- B. Contractors Working for the City. Bids for City projects will only be awarded to the lowest responsible bidder with current contractor's license specified for the project type according to the Utah State Code. The City's contractor qualifications and experience forms shall be completely filled out and submitted with bid. Failure to do so is basis to reject the bid. Spanish Fork City reserves the right to determine a non-responsible bidder based upon these forms or any other research conducted by the city.
- C. Status Verification System. Contractor agrees that it, and its subcontractors, will register with and use a Status Verification System to verify the federal employment authorization status of all employees hired after July 1, 2009. Contractor, and its subcontractors, will comply, in all respects, with Utah Code Annotated §63-99a-103, as it may be amended from time to time.

39.30.020. Insurance.

- A. General. A Contractor must acquire the insurance stipulated in this section to prequalify to do construction work. The city must receive and accept proof of the insurance before any work may begin. The submittal of said evidence to the City shall not relieve or decrease the liability of the Contractor hereunder.
- B. Workers' Compensation. Contractor shall obtain workers compensation insurance as required by State law.

39.30.060. Materials Submittals.

- A. General. Contractors are required to provide materials submittals for all materials to be used to the City for review and approval.
 - 1. For pre-manufactured items, documentation must be submitted a minimum of 2 weeks before installation and must include sufficient information, including shop drawings, if applicable, to establish models, colors, sizes, installation requirements, etc. that will be used.
 - 2. For on-site manufactured items, such as asphalt, concrete or base courses, submit mix designs, hot/cold weather installation plans, and materials certifications a minimum of 5 working days prior to planned installation.
 - 3. Submittals for the following, at a minimum, should be submitted:
 - a. All pre-manufactured items meeting city standards such as light fixtures, electrical components, utility fixtures and piping, landscaping, etc.
 - b. Hot Mix Asphalt Mix Designs
 - c. Portland Cement Concrete Mix Designs
 - d. Treated Base Course Mix Designs
 - e. Untreated Base Course Job Mix Formulas
 - f. Tack and Prime Coats
 - g. Concrete Curing Compounds
 - 4. Submit copies of all Quality Control testing and inspection reports within 48 hours of placement of materials.

39.30.070. Quality Control.

- A. General. Perform Quality Control work in accordance with applicable materials sections of the APWA Standard Specifications unless otherwise directed.

The contractor is responsible for performing quality control work sufficient to meet requirements of APWA Standard Specifications and to demonstrate compliance with acceptance criteria. The City will perform assurance functions at their discretion and inform the contractor of acceptance or rejection.

- B. Materials Production Use UDOT certified facilities for asphalt and Portland cement concrete.
 - 1. Submit verification of Plant Certifications with mix designs.
- C. Testing and Inspection. Use UDOT certified laboratories and personnel.
 - 1. Submit names, certificate levels and years of experience of testing agency's Field Technician that are assigned to work. Laboratory must comply with ASTM Standards. Use AMRL certified laboratory and WAQTC/UDOT TTQP certified technicians.
 - 2. Submit verification of lab and personnel with mix designs.

C. Commercial General Liability Insurance. The following commercial general liability insurance must be obtained and submitted on ISO Form CG 00 01 (11/85) or equivalent, occurrence policy, with limits not less than:

- 1. General Aggregate \$1,000,000
- 2. Products - Comp/OPS Aggregate \$1,000,000
- 3. Personal and Advertising Injury \$ 500,000
- 4. Each Occurrence \$ 500,000
- 5. Fire Damage (any one fire) \$ 50,000
- 6. Medical Expense (any one person) \$ 5,000

Also include the follow endorsements or their equivalents attached thereto:

- 1. ISO Form CG 25 03 (11/85), Amendment of Limits of Insurance (Designated Project or Premises), describing the subject contract and specifying limits as shown above.
- 2. ISO Form CG 20 10 (11/85), Additional Insured -- Spanish Fork City, Lessees, or Contractors (Form B), naming the City as additional insured and containing the following statement, "This Endorsement Also Constitutes Primary Coverage in the Event of any Occurrence, Claim, or Suit".

D. Automobile Liability Insurance. Contractor shall obtain automobile liability insurance with limits of not less than \$500,000 Combined Single Limit per accident. Coverage shall apply to any auto.

39.30.030. Bonding.

A. General. The owners and/or developers of property shall deposit security with the City prior to recording the final plat to guarantee proper installation of all required improvements in accordance with the plans, specifications, time limitations, and conditions relating thereto as meets with the approval of the City Council or such personnel as the City Council shall designate. Security shall be in the form of cash in the minimum amount of 10% of the City's bond amount. The balance of the security shall be in the form of cash, an irrevocable letter of credit, or an escrow bond. The amount of the security shall be 125% of the City's estimated costs of the improvements.

Irrevocable letters of credit or escrow bonds shall be executed by financial institutions acceptable to the City and authorized to conduct business in the State of Utah, and must be in the form approved by the City. The bond or letter of credit as required by this section must be posted prior to recording. Upon completion of the punch list for the end of construction inspection, the security less the 10% cash bond and the amount estimated for the asphalt preservation coat shall be released to the Developer. Ten percent (10%) of the security amount shall be held for a period of one (1) year following final inspection and acceptance to warrant improvements for this time period. The ten percent retained shall be the cash amount required as the minimum security.

39.30.040. Excavation Permits.

A. General. Contractors are required to qualify before obtaining an excavation permit to do construction work unless a project is already approved, bonded and insured. The permit must be approved 48 hours prior to construction. The permittee is given a copy of the permit and plan after the City Engineer or his/her designee has approved and signed them.

The City may stipulate time limits for completion of work and suspend permits for non-compliance. A copy of the excavation permit shall be on site during construction. The following fee factors shall be applied toward excavation permits for more recently paved streets:

FEE FACTORS

Fee Factor	Age of Pavement
4.00	Less than 1 Year
3.00	1 to 3 Years
2.00	3 to 5 Years
1.50	5 to 10 Years

If utilities are bored then the excavation permit fee shall be reduced by one half.

- B. Contractors. Contractors are required to submit the following information to obtain an excavation permit:
1. Copy of Contractors license;
 2. Certificate of Insurance;
 3. License and permit bond of \$10,000.00;
 4. Detailed drawing of proposed work and traffic control (4 copies).
- C. Property Owners. Individual property owners doing his/her own work for drive approaches and other similar, minor concrete work in the City right-of-way are required to submit the following information to obtain an excavation permit:
1. Proof of homeowners or similar insurance;
 2. Detailed drawings of the proposed work, including safety, barricades, traffic and pedestrian control.

Any cuts or changes to the curb shall be performed by a licensed contractor who has obtained an excavation permit or building permit.

39.30.050. Inspection Fee.

- A. General. For bonded developments an inspection fee will be collected. The fee will be for city costs relating to the construction. These costs include but are not limited to survey, inspection, testing and administration. The fee will be estimated based upon previous projects. Portions of the fee not used shall be refunded to the Developer after the punch list of the final acceptance inspection is completed.

If City costs relating to inspection exceed the inspection fee, these costs will be paid for by the developer or they will be deducted from the 10% cash bond.

Chapter 39.35. Earthwork and Trenches.**39.35.010. Excavation.**

- A. General.
- B. Safety.
- C. In Gravel and Paved Surface Areas.
- D. In Areas with Concrete.
- E. Rock Excavations.
- F. Site Clearing and the Disposal of Excess Materials.

39.35.020. Sub-surface Pipe Installation.

- A. General.
- B. Boring or Jacking.
- C. Tunneling.

39.35.030. Sub-grade.

- A. Preparation.
- B. Soft and Yielding Areas.
- C. Trenches.
- D. Roads.
- E. Structures.

39.35.040. Fill Material.

- A. General.
- B. Bedding Material.
- C. Engineered Fill.
- D. Untreated Base Course.
- E. Cement Treated Fill.
- F. Defective Fill.

39.35.050. Slopes, Embankments, Fills and Open Channels.

- A. Preparation.
- B. Material.
- C. Grading.
- D. Slope Safety.
- E. Erosion and Sedimentation Control.
- F. Gabions.
- G. Rip Rap and Rock Lining.

39.35.060. Installation and Compaction of Earth Materials.

- A. General.
- B. Streets.
- C. Soft and Yielding Spots.
- D. Backfill in Trenches.
- E. Pipe Zone.

39.35.070. Geotextiles, Geogrids and Geocomposites.

- A. General.

39.35.010. Excavation.

- A. General. Excavation shall meet the requirements and specifications of APWA 31 23 16 (Excavation) unless otherwise indicated.
- B. Safety. All construction shall be done in accordance with the provisions of the Utah State Industrial Commission, OSHA regulations and APWA 31 23 16 (Excavation). No trenches deeper than 4 feet shall be left open at any time unless construction is in process. When construction is in process only 200 feet of trench may be open at one time and must be completely backfilled before proceeding. No trenches shall be left open at any time unless guarded with adequate barricades, warning lamps and signs.

Any injury or damage resulting from lack of adequate bracing and shoring shall be the responsibility of the Developer/Contractor and the Developer/Contractor shall, at his/her own expense, effect all necessary repairs or reconstruction resulting from such damage. No inspections will be done in unsafe trenches and

will be the cause for immediate shutdown at the project until the trench is deemed to be safe by the City Engineer or his/her designee.

- C. In Gravel and Paved Surface Areas. Where any excavation occurs in a gravel or paved surface area such as a road, driveway or parking area, the surface shall be restored according to the requirements and specifications of APWA 33 05 25 (Pavement Restoration) and the following conditions:
1. *Base.* Only engineered fill may be used as backfill or sub-base material under gravel and paved surfaces. A minimum of 8 inches of untreated base course shall be placed over backfill or sub-base. All fill material shall be placed and compacted to City standards. Flowable fill shall not be allowed for backfill unless authorized by the City.
 2. *Surface Maintenance.* The surface shall be maintained by blading, sprinkling, rolling, adding gravel, etc., to maintain a safe uniform surface satisfactory to the City.
 3. *Cutting of Pavement.* Before any excavation in a paved area, the surface along the entire excavation shall be cut to provide a vertical joint in the surface. Cut shall be made 6 inches from the edge of excavation in straight lines parallel or perpendicular to the trench or edge of pavement. A pavement saw shall be used for all pavement cutting. If excavation damages the cut pavement, pavement shall be cut again before patching. A roto-milled edge shall be acceptable as a cut.
 4. *Time Limitation.* All road cuts shall be repaired within 2 working days of excavation unless otherwise authorized by the City Engineer or his/her designee.
 5. *Cold Weather Patching.* Trenches cut during winter months or when asphalt plants are not operating, shall be patched the same day of the cut with a good quality cold mix according to the requirements and specifications of APWA 32 12 17 (Cold-Mix Asphalt Paving). These trenches shall be maintained until asphalt plants open. When asphalt plants open, the temporary cold patch shall be removed and a new patch of hot mix asphalt shall be placed. All cold mix patches shall be replaced with hot mix patches within 20 days of the opening of the hot mix plant.
 6. *Adjust Incidental Structures to Grade.* Adjust incidental structures to grade according to APWA 33 05 14 (Utility Grade Adjustment). City standard concrete collars around valves and manholes shall be installed 1 year from the time that pavement is placed or at the time of an overlay.
- D. In Areas with Concrete. When damaged, existing concrete improvements shall be removed and replaced to the next joint or scoring line beyond the damaged or broken sections. In the event that joints or scoring lines do not exist or are three or more feet from the removed or damaged section, the damaged portions shall be removed and reconstructed to neat, plane faces. All concrete work shall meet the requirements and specifications of Chapter 39.65. Portland Cement Concrete Work and APWA 33 05 25 (Pavement Restoration).
- E. Rock Excavations. Rock excavations shall meet the requirements and specifications of APWA 31 23 17 (Rock Removal).
- F. Site Clearing and the Disposal of Excess Materials. Site clearing shall be conducted according to APWA 31 11 00 (Site Clearing). All excavation material, which is not required for construction or is unsuitable for fill material, shall be immediately disposed of by the Contractor. All roads, sidewalks, curbs, gutters and ditches shall be kept clean of excavated material except as outlined in Title 12.04.050 of the Spanish Fork City Municipal Code.

All demolition work shall meet the requirements and specifications of APWA 02 41 13 (Selective Site Demolition), APWA 02 41 14 (Pavement Removal) and APWA 02 41 15 (Pavement Pulverizing).

Removal and disposal of Asbestos Cement Pipe shall be per the Utah Department of Environmental Quality (DEQ) Division of Air Quality (DAQ) guidance document, *How to Handle Non-friable Asbestos Cement Pipe, A Guide for Meeting Utah Department of Environmental Quality/Division of Air Quality Rules* ("Guidance").

39.35.020. Sub-surface Pipe Installation.

- A. General. Pipes, conduits or casings, 4 inches in diameter or less, may be bored, jacked, augured or jetted under sidewalk, curb, gutter if authorized by the City Engineer or his/her designee. The resulting hole diameter shall not exceed 1 inch plus the outside diameter of the pipe or sleeve installed.
- B. Boring or Jacking. Boring or jacking work shall meet the requirements and specifications of APWA 33 05 23 (Trenchless Utility Installation).
- C. Tunneling. Where sidewalk, curb, and gutter exists, excavation may be made by tunneling provided the following requirements are met:

1. Excavation shall be vertical and as near to the curb or sidewalk as possible;
2. The length of the tunnel shall not exceed the width of the sidewalk, curb, and gutter;
3. Where a separate sidewalk and curb exist, an excavation shall be made between the sidewalk and the curb;
4. At least three feet of undisturbed earth shall be left under the sidewalk or curb; and
5. Where the sidewalk has been tunneled, the hole shall be filled from each end with flowable fill. Where the excavation cannot meet these requirements, a section of sidewalk, curb, or gutter, from joint to joint shall be removed and replaced.

39.35.030. Sub-grade.

- A. Preparation. All sub-grade shall be shaped and compacted in reasonably close conformity with lines, grades and typical cross section as established by the City Engineer or his/her designee. All grading shall be based on an engineered survey, accepted by Spanish Fork City.

In trenches and cut or fill areas the subgrade shall be scarified to a depth of 8 inches and compacted according to the compaction standards of this chapter. No rocks larger than 4 inches in diameter, organic material, soft clay, spongy material, or other deleterious material will be permitted in this scarified sub-grade layer.

- B. Soft and Yielding Areas. Soft and yielding areas which do not compact to City standards shall be removed and replaced with enough compacted engineered fill to bridge the area. Trenches excavated within 10 feet of the lip of gutter shall be removed and replaced as part of the trench asphalt pavement repair, or otherwise approved by the City Engineer.
- C. Trenches. When the sub-grade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, the trench shall be over-excavated to a sufficient depth and backfilled with enough compacted fill as approved by the City to bridge the area.
- D. Roads. Road sub-grades shall be shaped and graded to within a tolerance of 0.15 feet of design grade. Drainage shall be maintained at all times.
- E. Structures. Sub-grade material for all concrete structures, regardless of type or location, shall be firm, dense, thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen engaged in sub-grade surfacing, laying reinforcing steel, and depositing concrete.

Coarse gravel or crushed stone may be used for subsoil reinforcement if results are satisfactory to the City Engineer or his/her designee. Such material shall be applied in layers, not exceeding 6 inches in thickness, each layer being embedded in the sub-soil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone and the finished elevation of any subsoil reinforced in this manner and shall not be above the specified sub-grade.

The City Engineer may require a soil analysis and design for any area.

39.35.040. Fill Material.

- A. General. All fill material shall be placed on sub-grade prepared according to the specifications of this chapter. All fill material shall be compacted according to the specifications of this chapter.

Only engineered fill or untreated base course may be used as fill material under and within a foot of streets, future street areas, driveways, and concrete unless otherwise specified. All fill material under and within a foot of electrical and communications boxes shall be untreated base course. In other areas native excavated material may normally be used unless such material cannot be properly compacted according to specifications in this chapter. All fill material, including native fill material, must be free from debris, organic material, and rocks larger than 6 inches in diameter and have a liquid limit not to exceed 35 and plastic limit not to exceed 15.

- B. Bedding Material. Use APWA No. 4 sewer rock for gravity pipe bedding material. Use sand as a bedding material for pressure pipe and electrical and communication conduit. Bedding sand must compact sufficiently to support the pipe and shall meet the following gradation:

SAND GRADATION

Sieve/Screen Size	% Passing
No. 4	100
No. 200	10 to 20

- C. Engineered Fill. Engineered fill shall be used for all imported material unless otherwise specified. Engineered fill shall be granular and well graded meeting the following gradation:

ENGINEERED FILL GRADATION

Sieve/Screen Size	% Passing
4"	100
¾"	70 to 100
No. 200	0 to 15

On that portion of the aggregate passing the No. 40 sieve, the liquid limit shall not exceed 30, nor shall the plasticity index exceed 15 when tested in accordance with AASHTO T89 and T90. Imported material under city streets shall have a minimum CBR of 25.

Reclaimed asphalt pavement (RAP) that meets the requirements and specifications of APWA 32 01 16 (Recycled Asphalt Paving) may be used as engineered fill.

- D. Untreated Base Course. All untreated base course shall meet the requirements and specifications of APWA 32 11 23 (Crushed Aggregate Base) Grade 3/4 for untreated base course. The use of slag as an untreated base course shall not be permitted.
- E. Cement Treated Fill. Cement treated fill shall meet the requirements and specifications of APWA 31 05 15 (Cement Treated Fill). Cement treated fill includes following fill materials:
 1. Controlled low-strength material (CLSM) (flowable fill),
 2. Lime treated fill,
 3. Asphalt treated fill.
- F. Defective Fill. Fill not conforming to the requirements of this specification shall be reworked to the requirements or removed and replaced with acceptable fill.

39.35.050. Slopes, Embankments, Fills and Open Channels.

- A. Preparation. Unsuitable materials that occur in the foundation for slopes, embankments, and fills shall be removed by clearing, stripping, and/or grubbing. Where suitable materials occur, after stripping, the foundation shall be scarified to a depth of not less than 8 inches. All materials in slopes, embankments, and fills, including the scarified foundation layer, shall be placed, moistened, and compacted according to the compaction standards in this chapter.
- B. Material. When the slope, embankment, or fill exceeds the amount of excavation, sufficient additional material shall be obtained from borrow pits provided by the Contractor. All material proposed to be imported shall be subject to the review and approval of the City Engineer or his/her designee prior any hauling operations.

The materials used for slope, embankment and fill construction shall be free from sod, grass, trash, rocks larger than 6 inches in diameter and all other material unsuitable for construction of compacted fills.

- C. Grading. Grading of completed slope, embankment, or fill shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1 foot of the design grade. All grading shall be done to an engineered red-head.
- D. Slope Safety. All slope construction shall be in accordance with all City, State and Federal regulations. Plans and Specifications for structures must be approved by the City if the excavation is greater than five (5) feet. No permanent slopes steeper than 3:1 shall be allowed without a retaining structure unless otherwise approved in writing by the City Engineer or his/her designee. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring and/or other supporting installations. Unsafe slopes will be the cause for immediate shutdown of the project
- E. Erosion and Sedimentation Control. Erosion and sedimentation control shall meet the requirements and specifications of APWA 31 25 00 (Erosion and Sedimentation Control).
- F. Gabions. Gabions shall meet the requirements and specifications of APWA 31 36 00 (Gabions)
- G. Rip Rap and Rock Lining. Rip rap and rock lining work shall meet the requirements and specifications of APWA 31 37 00 (Riprap or Rock Lining).

39.35.060. Installation and Compaction of Earth Materials.

- A. General. The installation of all fill material shall meet the requirements and specifications of APWA 33 05 20 (Backfilling Trenches), APWA 31 23 23 (Backfilling Structures), APWA 32 05 10 (Backfilling Roadways) and APWA 31 23 26 (Compaction). Fill material outside of pavement areas, as defined by APWA 32 05 10 (Backfilling Roadways), and more than 24 inches from any utility box shall be compacted to not less than 90% of the maximum dry density.
- B. Streets. Sub-base and road-base shall be graded to an engineered red head. Loose rock, roots, brush, and other materials that may be encountered in shaping the sub-base must be removed.
- C. Soft and Yielding Spots. Any soft and yielding spots in the fill or sub-grade which do not compact to the specified density shall be removed and replaced with engineered fill installed and compacted to City standards.
- D. Backfill in Trenches. Backfill shall be carefully placed around and over pipes and shall not be permitted to fall directly on a pipe from such a height or in such a manner as to cause damage.
- E. Pipe Zone. The pipe zone includes the full width of trench from 3 inches below the pipe to 6 inches above the pipe for all pipes except for large reinforced concrete pipe (RCP). Large RCP includes RCP with internal diameters larger than 24 inches. The pipe zone for large RCP shall include the full width of trench from 6 inches below the pipe to 6 inches above the pipe. The pipe zone shall extend horizontally a minimum of 6 inches from either side of the pipe except for electrical and communication conduit. Electrical and communication conduit may be placed against the sides of trenches. Trenches shall be wide enough to compact fill material according to the specifications in this chapter.

The pipe zone for all pipes shall be filled with compacted bedding material. Pipe zone materials shall be placed and compacted under and around the pipe in horizontal layers not to exceed 8 inches and tamped by hand or pneumatic tampers.

39.35.070. Geotextiles, Geogrids and Geocomposites.

- A. General. All geotextile work shall meet the requirements and specifications of APWA 31 05 19 (Geotextiles). Geogrid and geocomposite work shall meet the requirements and specifications of APWA 31 05 21 (Geogrids/Geocomposites). Geotextile, geogrid and geocomposite work includes but is not limited to the following geotextile applications:
 - 1. Stabilization-separation,
 - 2. Silt fence,
 - 3. Erosion control,
 - 4. Roadway pavements,
 - 5. Drainage,
 - 6. Weed barrier
 - 7. Granular base reinforcement,
 - 8. Asphalt concrete reinforcement, and
 - 9. Soil reinforcement.

Chapter 39.40. Drinking Water.**39.40.010. General.**

- A. Specifications.
- B. Pipe.
- C. Size.
- D. Location.
- E. Unusual Piping and Plumbing.

39.40.020. Installation.

- A. General.
- B. Pipe Cleanliness.
- C. Identification Tape.
- D. Lateral Displacement.
- E. Restraining.
- F. Connections to Existing Drinking Water Lines.

39.40.030. Pipe and Fittings.

- A. Polyvinyl Chloride Pipe (PVC).
- B. Ductile Iron Pipe.
- C. Polyethylene Pipe.
- D. Steel Pipe - Lined and Coated.
- E. Fittings.

39.40.040. Valves and Couplings.

- A. General.
- B. Resilient Seated Gate Valve.
- C. Butterfly Valve.
- D. Valve Boxes.
- E. Couplings.
- F. Pressure Regulation Valves.
- G. Tapping Valves.
- H. Air Vacuum and Release Valves.

39.40.050. Fire Hydrants.

- A. General.
- B. Placement and Location.

39.40.060. Meters and Services.

- A. General.
- B. Placement and Location.
- C. Meters.

39.40.070. Flushing.

- A. General.
- B. Velocity.

39.40.080. Disinfection of Drinking Water Lines.

- A. Cleaning.
- B. Methods.

39.40.010. General.

- A. Specifications. These specifications cover the installation of drinking water lines. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to water.
- B. Pipe. Polyvinyl Chloride (PVC) pipe shall be used for all drinking water mains 12 inches in diameter and smaller unless otherwise authorized by the City Engineer or his/her designee. Ductile iron, PVC, or polyethylene pipe shall be used for culinary drinking water mains larger than 12 inches in diameter as approved by the City Engineer or his/her designee. Only PVC or polyethylene pipe may be used in corrosive soils.

- C. Size. The City Engineer or his/her designee must approve the sizes of all proposed drinking water lines. The minimum size of drinking water pipe is 8 inch diameter for main lines and 1 inch diameter for services.
- D. Location. Drinking water mains shall be located on either the north or east sides of a street 10 feet from the centerline. See standard drawings for utility locations.
- E. Unusual Piping and Plumbing. Special and unusual piping and plumbing for equipment or structures are treated as separate items and are not included in these standards. They shall be approved by the City Engineer or his/her designee.

39.40.020. Installation.

- A. General. Drinking water distribution and transmission systems shall be installed according to the requirements and specifications of APWA 33 11 00 (Water Distribution and Transmission). PVC pipe shall also be installed according to the requirements and specifications of AWWA C605.
- B. Pipe Cleanliness. All foreign matter or dirt shall be removed from the inside of the pipe before it is placed and it shall be kept clean during and after laying. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a water-tight plug.
- C. Identification Tape. All drinking water mains shall be installed with identification tape that meets the requirements and specifications of APWA 33 05 20 (Backfilling Trenches). Tape shall be buried 12 inches below grade.
- D. Lateral Displacement. All pipes shall be protected from lateral displacement resulting from impact or unbalanced loading during backfilling operations.
- E. Restraining. Either thrust blocks or mechanical restraining devices shall be used for all tees, valves, plugs, caps and bends. Restraining shall be accomplished according to the standard drawings.
- F. Connections to Existing Drinking Water Lines. The Contractor will be responsible to verify actual size, type of material and location of existing utilities in the field. The fittings and materials required for construction must be approved by the City Engineer or his/her designee.

Where fitting sizes, such as tees and crosses, are shown on the plans, those sizes will be used. However, no attempt has been made to show all needed fittings or materials.

Tapping tees may only be installed when authorized by the City Engineer or his/her designee and when the existing main is at least one size larger than the proposed intersecting line.

39.40.030. Pipe and Fittings.

- A. Polyvinyl Chloride Pipe (PVC). PVC pipe shall meet the standards and specifications of APWA 33 05 07 (Polyvinyl Chloride Pipe), AWWA C900 and C905. Only blue or white, SDR-18 pressure class 150 psi PVC pipe may be used for drinking water mains.
- B. Ductile Iron Pipe. Ductile iron pipe shall meet the standards and specifications of APWA 33 05 05 (Ductile Iron Pipe). Only a pressure class of 150 psi or larger may be used. A tubular black polyethylene encasement must be installed according to AWWA C105 over all ductile iron pipe and fittings. Flanges, when required, shall meet the requirements and specifications of AWWA C115.
- C. Polyethylene Pipe. Polyethylene pipe shall meet the standards and specifications of APWA 33 05 06 (Polyethylene Pipe) and AWWA C906 which includes NSF-61 certification.
- D. Steel Pipe - Lined and Coated. Steel pipe shall meet the standards and specifications of APWA 33 05 09 (Steel Pipe - Lined and Coated).
- E. Fittings. Use Ductile Iron fittings that conform to the provisions of ANSI/AWWA C110/A21.10 or C153/A21.53 unless otherwise recommended by the manufacturer and authorized by the City Engineer or his/her designee. All PVC pipe being inserted into fittings shall have the bevel end removed. All the bolts and nuts of all fittings shall be greased. All fittings shall have an 8 mil vinyl wrap plastic cover.

Minimum pressure Class will be 250 for pipes larger than 12 inch diameter. Pipes of 12 inch diameter and smaller shall be pressure Class 350.

FLOW REQUIREMENTS FOR FLUSHING

Pipe Diameter	Flow in Gallons Per Minute
4 inch	100
6 inch	220
8 inch	390
10 inch	610
12 inch	880
16 inch	1,567
18 inch	1,980
20 inch	2,450
24 inch	3,525
30 inch	5,507

39.40.040. Valves and Couplings.

- A. General. All valves shall meet the requirements of APWA 33 11 00 (Water Distribution and Transmission) and APWA 33 12 16 (Water Valves).
- B. Resilient Seated Gate Valve. All valves on 4 inch to 10 inch drinking water mains shall be resilient seated gate valves. Valves shall also be of iron body have non-rising bronze stems and meet the following specifications:
1. Mechanical Joint. When valves are Mechanical Joint, they shall be furnished with all necessary glands, followers, and bolts and nuts to complete installation.
 2. Valve Stems. Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.
- C. Butterfly Valve. All valves 12 inches and larger shall be butterfly valves which meet the requirements and specifications of APWA 33 11 00 (Water Distribution and Transmission) and APWA 33 12 16 (Water Valves) and the following specifications:
1. General. Valve bodies shall be cast iron, ASTM A-126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C111. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands). All valves shall conform to AWWA Standard C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
 2. Disc. Valve disc shall be ductile iron ASTM A-536, grade 65-45-12. Valve disc shall be of the offset design providing 360 degree uninterrupted seating.
 3. Shaft Bearings. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
 4. Coating. All valves shall be coated with epoxy in conformance to AWWA Standard C-550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum of 3 to 4 mils coating thickness in order to provide superior base for field-applied finish coats.
- D. Valve Boxes. Valves shall be bolted to the cross in the intersection of streets as a cluster valve set. Earth fill shall be carefully tamped around the valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet.

All top of valve boxes located in streets shall be installed 1/4 inch below grade. When a 1 inch overlay is required a year after the road construction, the pavement surrounding the valve box shall be neatly cut to form a 30 inch round opening with the valve box centered, and a concrete collar shall be cast around the box 1/4 inch below grade and the valve box set 1/2 inch below grade. Valve boxes in off-road areas shall extend 6 inches above grade. Lid detail shall be similar to Comco C-6517.

- E. Couplings. Couplings shall be equal to the product of Smith-Blair or Dresser with cast iron couplings being used on all cast iron and PVC pipe. Couplings shall be of the straight, transition, or reducing style as

required by the specific installation. All steel fittings and bolts shall be coated with a non-oxide coating and wrapped with polyethylene.

- F. Pressure Regulation Valves. Pressure regulation valves (PRV) which are required in a development shall be designed by the Developers engineer and the design shall be submitted to the City Engineer or his/her designee for review and approval prior to starting construction. All PRV's shall be Cla-Val with a 4" bypass or approved by the City Engineer, be placed in a concrete vault and have telemetry included.
- G. Tapping Valves. Tapping valves may only be used when approved by the City Engineer or his/her designee. Tapping saddles with an "O" ring may be used if the drinking water main line to be tapped is larger than the new drinking water main line. Where the tap is the same size as the existing main, cast iron or stainless steel tapping sleeves shall be used, which encase the full perimeter of the pipe. The valve shall be a tapping valve with a guide lip on the flanged side. The opposite side of the valve shall have a mechanical joint connection.
- H. Air, Vacuum and Release Valves. Combination air, vacuum and release valves shall be installed according to the standard drawings at high points in the system as required by the City Engineer or his/her designee.

39.40.050. Fire Hydrants.

- A. General. Fire hydrants shall meet the requirements and specifications of APWA 33 12 19 (Hydrants). All fire hydrants shall be Waterous WB-67 or approved equivalent and red in color. They shall have a 5 ¼ inch barrel diameter and 6 inch mechanical joint connection. The six inch gate valve will be mechanical joint by flange connected to the main line tee. The valve box complete for 4 foot 6 inch trench with lid that read "FIRE" with one 4 ½ inch streamer nozzle and two 2 ½ inch hose nozzles. Hydrants shall be frost proof. The threads shall be National Standard Fire Hose Thread. Spacing of fire hydrants shall be according to the Uniform Fire Code.
- B. Placement and Location. Fire hydrant location to be determined by the City Engineer or his/her designee. Fire hydrants shall be set vertical and held in place by adequate concrete blocking which shall be left in the trench. Hydrants shall be set at a height that will allow approximately 2 inches exposed between the finished ground and the sidewalk flange. A gravel filled drip area shall be provided. See standard drawing for fire hydrants.

The relocation of fire hydrants shall meet the requirements and specifications of APWA 33 11 11 (Relocate Water Meters and Fire Hydrants) and related sections.

39.40.060. Meters and Services.

- A. General. See the standard drawings for drinking water services. The minimum size of new drinking water service lines is 1 inch. All drinking water services shall have dual check valves. Drinking water services shall extend 14 feet beyond the back of sidewalk until connected to a building.
- B. Placement and Location. All meter boxes shall have their location and grade staked prior to installation. No meter boxes shall be set in sidewalks or driveways. Service taps shall be a minimum of 36 inches apart. No taps will be allowed within 36 inches of the end of the pipe.

Service laterals shall extend perpendicular from the main to the meter box. If a meter must be moved it may only be displaced a maximum of 24 inches to either side. If it must be moved more than 24 inches, a new service line must be installed. When a new service line is installed the old corporation stop shall be shut off at the main and the old service line cut two feet from the main.

Drinking water service lines shall meet the separation from sanitary sewer requirements in this chapter. Drinking water services shall extend 14 feet beyond the back of sidewalk and plugged until connected to a building.

The relocations of drinking water meters shall meet the requirements and specifications of APWA 33 11 11 (Relocate Water Meters and Fire Hydrants) and related sections. Services 1 inch and larger shall be polyethylene pipe conforming to the requirements and specifications of APWA 33 05 06 (Polyethylene Pipe). Only CTS SDR9 200 psi blue polyethylene pipe shall be used for service lines. All connections shall have stainless steel stiffeners. Pipe damaged by scratches, cuts, kinks, or buckled areas shall not be installed. Deflection in joints shall meet manufacturer's specifications and shall be approved by the City Engineer or his/her designee, or shall be replaced with the proper fitting.

- C. Meters. All meters shall be paid for by the Contractor and supplied by the City. Meter boxes shall be in good repair. They shall not be set at an angle, crushed, or dented. The inside of boxes must be free from obstructions such as dirt, rocks or debris.

39.40.070. Flushing.

- A. General. All drinking water lines shall be flushed after the high chlorine test and prior to the pressure test. See Chapter 39.25. Testing and Inspection for testing information. Flushing shall be accomplished through hydrants and at the end each line.
- B. Velocity. The Contractor shall install a tap sufficient in size to provide for 2½ foot per second flushing velocity in the line. The following is the flow quantity required to provide a 2½ foot per second flushing velocity.

FLOW REQUIREMENTS FOR FLUSHING

Pipe Diameter in Inches	Flow in Gallons per Minute
4 inch	100
6 inch	220
8 inch	390
10 inch	610
12 inch	880
16 inch	1,567
18 inch	1,980
20 inch	2,450
24 inch	3,525
30 inch	5,507

39.40.080. Disinfection of Drinking Water Lines.

- A. Cleaning. The pipe shall be clean prior to disinfection. If in the opinion of the City, contamination is such that it cannot be removed by flushing, the pipe shall be cleaned by mechanical means and then swabbed with a 1% hypochlorite disinfection solution.
- B. Methods. All drinking water pipeline shall be disinfected as outlined in AWWA C651 by one of the following methods:
 - 1. *Tablet Method.* The tablet method shall consist of placing calcium hypochlorite tablets at the specified rate in the main during construction at the upstream end of each section of pipe. The tablet shall be attached with an adhesive, such as Permatex No. 1 or equivalent as approved by the City Engineer or his/her designee. The line shall then be filled slowly (velocities less than 1 ft/sec), expelling all air pockets and maintaining the disinfection solution in the line for at least 24 hours, 48 hours if the water temperature is less than 41° F. The disinfection solution shall have a concentration of at least 25 mg/l of available chlorine.
 - 2. *Continuous Feed Method.* The continuous feed shall be done exactly as outlined in AWWA C651 and shall have a twenty-five mg/l available Chlorine after 24 hours.

Under both methods the Contractor shall not be allowed to flush the line until the chlorine residual test has been passed by the City. If necessary drinking water lines shall be re-chlorinated until satisfactory bacteriological testing is obtained. See Chapter 39.25. Testing and Inspection for testing information.

Chapter 39.45. Pressurized Irrigation.**39.45.010. General.**

- A. Specifications.
- B. Pipe.
- C. Size.
- D. Location.
- E. Unusual Piping and Plumbing.

39.45.020. Installation.

- A. General.
- B. Pipe Cleanliness.
- C. Minimum Cover.
- D. Identification Tape.
- E. Lateral Displacement.
- F. Restraining.
- G. Connections to Existing Pressurized Irrigation Lines.

39.45.030. Pipe and Fittings.

- A. Polyvinyl Chloride Pipe (PVC).
- B. Ductile Iron Pipe.
- C. Polyethylene Pipe.
- D. Steel Pipe - Lined and Coated.
- E. Fittings.

39.45.040. Valves and Couplings.

- A. General.
- B. Resilient Seated Gate Valve.
- C. Butterfly Valve.
- D. Valve Boxes.
- E. Couplings.
- F. Pressure Regulation Valves.
- G. Tapping Valves.
- H. Air, Vacuum and Release Valves.

39.45.050. Meters, Boxes and Services.

- A. General.
- B. Placement and Location.
- C. Meters and Boxes.
- D. Polyethylene Pipe.

39.45.060. Flushing.

- A. General.
- B. Velocity.

39.45.010. General.

- A. Specifications. These specifications cover the installation of pressurized irrigation lines. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to pressurized irrigation.
- B. Pipe. Polyvinyl Chloride (PVC) pipe shall be used for all pressurized irrigation mains 12 inches in diameter and smaller unless otherwise authorized by the City Engineer or his/her designee. Ductile iron, PVC, or polyethylene pipe shall be used for pressurized irrigation mains larger than 12 inches in diameter as approved by the City Engineer or his/her designee. Only PVC or polyethylene pipe may be used in corrosive soils.
- C. Size. The City Engineer or his/her designee must approve the sizes of all proposed pressurized irrigation lines. The minimum size of pressurized irrigation pipe is 6 inch diameter for main lines and 1 inch diameter for services. A dual service shall be 1½" to the service tee.

- D. Location. Pressurized irrigation mains shall be located on either the south or west sides of a street 5 feet from the centerline. See standard drawings for utility locations.
- E. Unusual Piping and Plumbing. Special and unusual piping and plumbing for equipment or structures are treated as separate items and are not included in these standards.

Tapping tees may only be installed when authorized by the City Engineer or his/her designee and when the existing main is at least one size smaller than the proposed main.

39.45.020. Installation.

- A. General. Pressurized irrigation distribution and transmission systems shall be installed according to the requirements and specifications of APWA 33 11 00 (Water Distribution and Transmission). PVC pipe shall also be installed according to the requirements and specifications of AWWA C605.
- B. Pipe Cleanliness. All foreign matter or dirt shall be removed from the inside of the pipe before it is placed and it shall be kept clean during and after laying. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a water-tight plug.
- C. Minimum Cover. All pressurized irrigation mains shall have a minimum cover of 2 feet to the top of the pipe.
- D. Identification Tape. All pressurized irrigation mains shall be installed with identification tape that meets the requirements and specifications of APWA 33 05 20 (Backfilling Trenches). Tape shall be buried 12 inches below grade.
- E. Lateral Displacement. All pipes shall be protected from lateral displacement resulting from impact or unbalanced loading during backfilling operations.
- F. Restraining. Either thrust blocks or mechanical restraining devices shall be used for all tees, valves, plugs, caps and bends. Restraining shall be accomplished according to the standard drawings.
- G. Connections to Existing Pressurized Irrigation Lines. The Contractor will be responsible to verify actual size, type of material and location of existing utilities in the field. The fittings and materials required for construction must be approved by the City Engineer or his/her designee.

Where fitting sizes, such as tees and crosses, are shown on the plans, those sizes will be used. However, no attempt has been made to show all needed fittings or materials.

39.45.030. Pipe and Fittings.

- A. Polyvinyl Chloride Pipe (PVC). PVC pipe shall meet the requirements and specifications of APWA 33 05 07 (Polyvinyl Chloride Pipe) and AWWA C900 and C905. Only purple, SDR-18 pressure class 150 psi pipe may be used for pressurized irrigation mains.
- B. Ductile Iron Pipe. Ductile iron pipe shall meet the standards and specifications of APWA 33 05 05 (Ductile Iron Pipe). Only a pressure class of 150 psi or larger may be used. A tubular purple polyethylene encasement must be installed according to AWWA C105 over all ductile iron pipe and fittings. Flanges, when required, shall meet the requirements and specifications of AWWA C115. Ductile iron may be directed tapped for the use of corporation stops.
- C. Polyethylene Pipe. Polyethylene pipe shall meet the standards and specifications of APWA 33 05 06 (Polyethylene Pipe).
- D. Steel Pipe - Lined and Coated. Steel pipe shall meet the standards and specifications of APWA 33 05 09 (Steel Pipe - Lined and Coated).
- E. Fittings. Use Ductile Iron fittings that conform to the provisions of ANSI/AWWA C110/A21.10 or C153/A21.53 unless otherwise recommended by the manufacturer and authorized by the City Engineer or his/her designee. All PVC pipe being inserted into fittings shall have the bevel end removed. All the bolts and nuts of all fittings shall be greased. All fittings shall have an 8 mil vinyl wrap plastic cover.

39.45.040. Valves and Couplings.

- A. General. All valves shall meet the requirements of APWA 33 11 00 (Water Distribution and Transmission) and APWA 33 12 16 (Water Valves).
- B. Resilient Seated Gate Valve. All valves on 4 inch to 10 inch water mains shall be resilient seated gate valves. Valves shall also be of iron body have non-rising bronze stems and meet the following specifications:
1. *Mechanical Joint.* When valves are Mechanical Joint, they shall be furnished with all necessary glands, followers, and bolts and nuts to complete installation.
 2. *Valve Stems.* Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.
- C. Butterfly Valve. All valves 12 inches and larger shall be butterfly valves which meet the requirements and specifications of APWA 33 11 00 (Water Distribution and Transmission) and APWA 33 12 16 (Water Valves) and the following specifications:
1. *General.* Valve bodies shall be cast iron, ASTM A-126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C111. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands). All valves shall conform to AWWA Standard C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
 2. *Disc.* Valve disc shall be ductile iron ASTM A-536, grade 65-45-12. Valve disc shall be of the offset design providing 360 degree uninterrupted seating.
 3. *Shaft Bearings.* Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
 4. *Coating.* All valves shall be coated with epoxy in conformance to AWWA Standard C-550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum of 3 to 4 mils coating thickness in order to provide superior base for field-applied finish coats.
- D. Valve Boxes. All buried valves shall be installed complete with two-piece, cast iron, slip type, 5-1/4-inch shaft valve box with drop lid. The lid shall have the word "IRRIGATION" or "DRAIN" according to the standard drawing cast in the metal.

Valves and valve boxes shall be installed where shown on the drawings. Valves and valve boxes shall be set plumb. Valve boxes shall be centered directly over the valve. Valves shall be aligned with property lines where possible. Earth fill shall be carefully tamped around the valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet. Valves shall have the interiors cleaned of all foreign matter before installation.

All top of valve boxes located in streets shall be installed 1/4 inch below grade. When a 1 inch overlay is required a year after the road construction, the pavement surrounding the valve box shall be neatly cut to form a 30 inch round opening with the valve box centered, and a concrete collar shall be cast around the box. Valve boxes in off-road areas shall extend 6 inches above grade. Lid detail shall be similar to Comco C-6517.

- E. Couplings. Couplings shall be equal to the product of Smith-Blair or Dresser with cast iron couplings being used on all cast iron and PVC pipe. Couplings shall be of the straight, transition, or reducing style as required by the specific installation. All steel fittings and bolts shall be coated with a non-oxide coating and wrapped with polyethylene.
- F. Pressure Regulation Valves. Pressure regulation valves (PRV) which are required in a development shall be designed by the Developers engineer and the design shall be submitted to the City Engineer or his/her designee for review and approval prior to starting construction. All PRV's shall be Cla-Val with a 4" bypass, be placed in a concrete vault and have telemetry included.
- G. Tapping Valves. Tapping valves may only be used when approved by the City Engineer or his/her designee. Tapping saddles with an "O" ring may be used if the water main line to be tapped is larger than the new water main line. Where the tap is the same size as the existing main, cast iron or stainless steel tapping sleeves shall be used, which encase the full perimeter of the pipe. The valve shall be a tapping valve with a guide lip on the flanged side. The opposite side of the valve shall have a mechanical joint connection.

- H. Air, Vacuum and Release Valves. Combination air, vacuum and release valves shall be installed according to the standard drawings at high points in the system as required by the City.

39.45.050. Meters, Boxes and Services.

- A. General. See the standard drawings for pressurized irrigation services. The minimum size of new pressurized irrigation service lines is 1 inch for single service and 1 ½" for dual service. Pressurized irrigation services shall be installed after electric services and shall sit on the opposite side of the lot from any electric type boxes.
- B. Placement and Location. All meters and boxes shall have their location and grade staked prior to installation. No meters or boxes shall be set in sidewalks or driveways. Service taps shall be a minimum of 36 inches apart. No taps will be allowed within 36 inches of the end of the pipe.

Service laterals shall extend perpendicular from the main to the meter or box. For dual pressurized irrigation services, laterals shall extend perpendicular from the main to the tee.

If a meter must be moved it may only be displaced a maximum of 24 inches to either side. If it must be moved more than 24 inches, a new service line must be installed unless otherwise approved by the City Engineer or his/her designee. When a new service line is installed the old corporation stop shall be shut off at the main and the old service line cut two feet from the main.

- C. Meters and Boxes. All meters shall be paid for by the developer and purchased by the City. Meter boxes and pressurized irrigation boxes shall be in good repair. They shall not be set at an angle, crushed, or dented. The inside of boxes must be free from obstructions such as dirt, rocks or debris. Meters shall be installed by the Developer or Contractor.
- D. Polyethylene Pipe. Only CTS SDR9 200 psi purple polyethylene pipe shall be used for pressurized irrigation service lines. Pipe damaged by scratches, cuts, kinks or buckled areas shall not be installed.

The bottom of trench shall be flat with no hollows, no lumps and no rock. If these conditions do not occur pipe must be bedded in coarse sand. No rocks shall be allowed within six inches of pipe.

Pipe shall be cut with either a wheel or scissor type tubing cutter with a blade specifically designed for plastic. Cuts shall be square and clean. Cutter manufacturer instructions shall be followed when cutting pipe. All connections shall have stainless steel stiffeners.

There shall be no unnecessary bending of pipe. Taps shall be exactly horizontal to the pressurized irrigation main. If bending cannot be avoided maximum bending radius shall be 25 times the pipe diameter. There shall be no bending within 3 feet of a fixed point and no "S" shape curves.

39.45.060. Flushing.

- A. General. All pressurized irrigation lines shall be flushed before placed in service. Flushing shall be accomplished through the end of each line.
- B. Velocity. The Contractor shall install a tap sufficient in size to provide for 2 ½ feet per second flushing velocity in the line. The following is the flow quantity required to provide a 2 ½ foot per second flushing velocity.

FLOW REQUIREMENTS FOR FLUSHING

Pipe Diameter	Flow in Gallons Per Minute
4 inch	100
6 inch	220
8 inch	390
10 inch	610
12 inch	880
16 inch	1,567
18 inch	1,980
20 inch	2,450
24 inch	3,525
30 inch	5,507

Chapter 39.50. Sanitary Sewer.

39.50.010. General.

- A. Specifications.
- B. Pipe.
- C. Size.
- D. Locations.
- E. Minimum Slopes.
- F. Sanitary Sewer Lift Stations.
- G. Unusual Piping and Plumbing.

39.50.020. Pipe and Fittings.

- A. General.
- B. Concrete Pipe.
- C. Polyvinyl Chloride Pipe (PVC).

39.50.030. Services.

- A. General.
- B. Clean-outs.

39.50.010. General.

- A. Specifications. Sanitary sewer facilities shall meet the requirements and specifications of APWA 33 31 00 (Sanitary Sewerage Systems). These specifications cover the installation of sanitary sewer lines. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to sanitary sewers.
- B. Pipe. All sanitary sewer pipe 18 inches in diameter and larger shall be ADS Sanitite HP pipe or approved equivalent unless otherwise approved by City Engineer or his/her designee. All other sanitary sewer pipe shall be constructed with polyvinyl chloride (PVC) pipe.
- C. Size. The City Engineer or his/her designee must approve the sizes of all proposed sanitary sewer lines. Minimum size of pipe is 8 inch diameter for main lines and 4 inch diameter for services.
- D. Location. Sanitary Sewer mains shall be located on either the south or west sides of a street 10 feet from the centerline. A maximum of 400 feet of pipe shall be allowed between manholes.
- E. Minimum Slopes. Slopes shall be designed to have a 2 foot per second velocity unless otherwise approved by the City Engineer. The following table lists minimum slopes for sanitary sewer for each size of pipe:

MINIMUM SANITARY SEWER SLOPES

Pipe Diameter (inches)	Minimum Slope (%)
4	2.000
6	1.000
8	0.334
10	0.248
12	0.194
14	0.158
15	0.144
16	0.132
18	0.113
21	0.092
24	0.077
27	0.066
30	0.057
36	0.045
48	0.031
54	0.027
60	0.023

- F. Sanitary Sewer Lift Stations. Sanitary sewer lift stations which are required in a development shall be designed by the Developer's engineer and the design shall be submitted to the City Engineer or his/her designee for review prior to starting construction. Lift stations will be the wet well / dry well type, will have standby power, proper ventilation, telemetry, and will be designed for large areas, not individual subdivisions.
- G. Unusual Piping and Plumbing. Special and unusual piping and plumbing for equipment or structures are treated as separate items and are not included in these standards.

39.50.020. Pipe and Fittings.

- A. General. ADS Sanitite HP pipe or approved equivalent shall be used for all sanitary sewer lines larger than 18 inches in diameter. All other sanitary sewer lines shall be constructed with polyvinyl chloride (PVC) pipe.

Pipe buried more than 12 feet deep shall require manufacturing and engineering specifications to be submitted to the City Engineer or his/her designee for written approval.

- B. Polyvinyl Chloride Pipe (PVC). PVC pipe shall meet the requirements and specifications of APWA 33 05 07 (Polyvinyl Chloride Pipe) and shall have a minimum rating of SDR-35.
- C. ADS Sanitite HP Pipe. Sanitite HP pipe with sizes up to 30 inches shall meet the requirements and specifications of ASTM F2732. Sanitite HP pipe with sizes over 30 inches shall meet the requirements of ASTM F2764.

39.50.030. Services.

- A. General. All sanitary sewer services shall be connected to existing sanitary sewer mains by use of an Inline Y or approved equivalent Insert-a-Tee type connection, and shall be approved by the City Engineer. Sewer services shall extend 14 feet beyond the back of sidewalk and plugged until connected to a building. The minimum cover of sewer laterals is at 3' 6" at the property line.
- B. Clean-outs. There shall be no bend in a service line between the main line. A clean-out shall be installed on all service lines located at the property line according to Standard drawings. Clean-outs shall be installed every 75 feet on all service lines.

Chapter 39.55. Storm, Land and Groundwater Drains.**39.55.010. General.**

- A. Specifications.
- B. Size.
- C. Location.
- D. Minimum Slopes.
- E. Unusual Piping and Plumbing.
- F. Groundwater Drains.

39.55.020. Pipe and Fittings.

- A. General.
- B. Concrete Pipe.
- C. Polyethylene Pipe.
- D. Polyvinyl Chloride Pipe.
- E. Corrugated Metal Pipe.

39.55.030. Sumps and Appurtenances.

- A. Connecting to Existing Drains Lines.
- B. Sumps.
- C. Inlet and Clean Out Structures.
- D. Headwalls.

39.55.040. Retention/Detention Basins.

- A. General.
- B. Retention Basins.
- C. Detention Basins.

39.55.050. Low Impact Development.

- A. General.
- B. Bioretention Swales.
- C. Underground Storage
- D. Landscaping.

39.55.010. General.

- A. Specifications. Storm, land and groundwater drain facilities shall meet the requirements and specifications of APWA 33 41 00 (Storm Drainage Systems). These specifications cover the installation of storm, land and groundwater lines. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to storm, land and groundwater drains. Land and groundwater drains shall be approved by the City Engineer and shall be installed lower in elevation than the sewer mainline.
- B. Size. The City Engineer or his/her designee must approve the sizes of all proposed drain lines. The minimum size of pipe is 15" diameter for main lines and 12" diameter for laterals.
- C. Location. Drain lines shall be located along the centerline of the street. A maximum of 500 feet of pipe shall be allowed between manholes.
- D. Minimum Slopes. Slopes shall be designed to have a 2 foot per second velocity unless otherwise approved by the City Engineer. The following table lists minimum slopes for drain lines for each size of pipe:

MINIMUM DRAIN LINE SLOPES

Pipe Diameter (inches)	Minimum Slope (%)
12	0.194
14	0.158
15	0.144
16	0.132
18	0.113
21	0.092
24	0.077
27	0.066
30	0.057
36	0.045
48	0.031
54	0.027
60	0.023

- E. Unusual Piping and Plumbing. Special and unusual piping and plumbing for equipment or structures are treated as separate items and are not included in these standards.
- F. Groundwater Drains. All plans for groundwater drains must be designed and stamped by a licensed professional civil engineer in the State of Utah. Only rigid pipe may be used.

39.55.020. Pipe and Fittings.

- A. General. Reinforced concrete pipe shall be used for all main drain lines 15" or larger in diameter and for all drain lines of smaller size with less than 2 feet of cover or more than 8 feet of cover. Non-reinforced concrete pipe may be used for pipe sizes with inside diameters smaller than 18 inches. Corrugated metal pipe (CMP) may only be used when authorized by the City Engineer or his/her designee.
- B. Concrete Pipe. Concrete pipe shall meet the requirements and specifications of APWA 33 05 02 (Concrete Pipe and Culvert). Reinforced concrete pipe (RCP) shall be Class III. Only new pipe may be used unless otherwise authorized by the City Engineer or his/her designee.
- C. Polyethylene Pipe. Polyethylene pipe shall meet the requirements and specifications of APWA 33 05 06 (Polyethylene Pipe) Type S for storm drains and Type SP for land or groundwater drains.
- D. Polyvinyl Chloride Pipe (PVC). PVC pipe shall meet the requirements and specifications of APWA 33 05 07 (Polyvinyl Chloride Pipe).
- E. Corrugated Metal Pipe (CMP). CMP shall meet the requirements and specifications of APWA 33 05 04 (Corrugated Metal Pipe).

39.55.030. Sumps, and Appurtenances.

- A. Connecting to Existing Drain Lines. Manholes and sumps used to connect proposed storm drain to existing storm drain shall be plumb and centered on the existing storm drain. The new pipe shall be placed against the existing pipe at the elevation designated by the project engineer and the base poured as specified above. Care shall be taken not to disturb the alignment of the existing storm drain during the excavation procedure. Any damage to the existing storm drain shall be repaired.
- B. Sumps. Sumps may only be constructed of reinforced concrete, precast sections and shall meet the requirements of ASTM C478-73. Sumps shall have eccentric lids to ensure adjustments in alignment.
- C. Inlet and Clean Out Structures. Surface water must enter the City storm drain system through standard City inlet boxes. In no case may water inlet directly into storm manholes, clean-outs, or sumps. Inlets and clean out structures shall not exceed 500 ft spacing.

All inlet and clean out structures shall be reinforced concrete boxes. They may be precast or cast-in-place. Grate and Frame Material. All castings shall be of ASTM A-48, Class 35 iron free from blowholes and shrinkage defects. Castings shall be free from fins and burrs and shall be shot-blasted to remove sand and

other foreign matter. Freedom from cracks and defects shall be ascertained by the engineer prior to installation.

- D. Headwalls. A headwall shall be installed at all ditch to pipe transitions. Headwall designs must be stamped by a licensed professional civil engineer in the State of Utah and approved by the City Engineer or his/her designee.

39.55.040. Retention/Detention Basins.

- A. General. Basin designs shall be designed with the following side depths and slopes:

Depth	Slope
18"	2:1
3'	3:1
Above 3'	4:1

- B. Retention Basins. All retention basins shall have a freeboard of 12 inches. Design of retention basins shall be according to the Storm Water Drainage Design Manual. All retention basins shall have a series of interconnected sumps connected to curb inlet boxes or storm drain main lines. All retention basins shall be landscaped in accordance with City Standards.

All retention basins shall be constructed for drainage areas designated in the Storm Drain Master Plan. Basins for smaller areas may be allowed only with prior written approval of the City Engineer or his/her designee.

- C. Detention Basins. All detention basins shall have 12 inches of freeboard. Design of detention basins shall be according to the Storm Water Drainage Design Manual. Detention basins may be constructed in landscape or parking areas. Each detention basin shall incorporate LID storm drain principles and have an overflow to the City storm drain system.

39.55.050. Low Impact Development.

- A. General. All new development and roadways shall incorporate LID storm drain in the form of bioretention swales, underground retention cells and other methods as approved by the City Engineer or his/her designee. LID systems shall be designed to handle the 100 year, 24 hour storm.
- B. Bioretention Swales. Roadway design shall include bioretention swales as detailed in the City standard drawings. Swales along roads with slopes greater than 2.5% shall be designed with check dams to decrease runoff velocity and allow proper storm water retention and infiltration. Side slopes shall be designed with a slope of 4:1. An overflow structure must be provided at all low points in the system.
- C. Underground Storage. Underground storage and infiltration shall be installed under the bioretention swales as shown in the City standard drawings. R-Tank^{HD}, StormTech chambers, or approved equivalent shall be used to provide underground storage. R-Tank^{HD} and StormTech chambers shall be installed per the manufactures specifications. All underground storage cells shall be wrapped in an approved non-woven filter fabric.
- D. Landscaping. A landscape plan for the bioretention swales shall be submitted and approved by the City. All landscaping shall be designed and installed per City standard drawings and specifications. The developer shall provide financial assurance in the form of a bond to assure that all landscaping is installed per the approved plan. Landscaping of the bioretention swale shall be completed in approved sections for uniformity. All bioretention swale landscaping shall be complete by the second summer following completion of the development.

Chapter 39.60. Streets and Pavements.**39.60.010. General.**

- A. Street Designations.
- B. Time Limitation after Curb and Gutter.
- C. Geotextiles, Geogrids and Geocomposites.
- D. Pavers.
- E. Painted Traffic Lines and Markings.
- F. Traffic Barriers.
- G. Vehicle Delineators.

39.60.020. Street Section.

- A. Soils Investigation.
- B. Pavement Section.
- C. Road-base Section.
- D. Sub-base Section.
- E. Grading.

39.60.030. Trail Section.

- A. General.
- B. Survey.
- C. Weed Abatement.
- D. Geotextile Fence.
- E. Sub-grade.
- F. Weed Barrier.
- G. Limestone Crusher Fines.
- H. Trail Markings.
- I. Clean-up.

39.60.040. Bituminous Surface Course.

- A. Paving Asphalts.
- B. Asphalt Concrete.
- C. Prime Coat.
- D. Tack Coat.
- E. Overlays and Patches.
- F. Slurry Seal.
- G. Chip Seal.
- H. Micro-Surfacing.
- I. Pavement Crack Seal.

39.60.010. General.

- A. Street Designations. Street designations include: local streets, collector streets and arterial streets. Designations shall be assigned by the City.
- B. Time Limitation after Curb and Gutter is Placed. Pavement shall be placed at least 7 days after and before 45 days after the placement of curb and gutter unless an extension is granted by the City Engineer or his/her designee.
- C. Geotextiles, Geogrids and Geocomposites. All geotextile work shall meet the requirements and specifications of APWA 31 05 19 (Geotextiles) and APWA 32 12 16 (Plant-Mix Asphalt Paving). Geogrid and geocomposite work shall meet the requirements and specifications of APWA 31 05 21 (Geogrids/Geocomposites) and APWA 32 12 16 (Plant-Mix Asphalt Paving).
- D. Pavers. Pavers and installation shall meet the requirements and specifications of APWA 32 14 13 (Precast Concrete Unit Paving) and APWA 32 14 16 (Brick Unit Paving).
- E. Painted Traffic Lines and Markings. Painted traffic lines and markings shall meet the requirements and specifications of APWA 32 17 23 (Pavement Markings) and the MUTCD.
- F. Traffic Barriers. Vehicle barriers shall meet the requirements and specifications of APWA 34 71 13 (Vehicle Barriers) and the MUTCD.

- G. Vehicle Delineators. Vehicle delineators shall meet the requirements and specifications of APWA 34 71 19 (Vehicle Delineators) and the MUTCD.

39.60.020. Street Section.

- A. Soils Investigation. A soils investigation shall be performed for all new roads and those roads for which work will be performed. The results of this investigation and a design of the road cross section shall be submitted to and accepted by the City Engineer or his/her designee.

The following guidelines shall be used as a minimum requirement for street cross sections. They should be used unless the soils investigation indicates they are not adequate. Any variations from these standards must be approved by the City Engineer or his/her designee.

- B. Pavement Section. All roads shall be paved with asphalt concrete according to City standards unless authorized by the City Engineer or his/her designee. The following table shall be used for minimum asphalt pavement surfacing depths:

ASPHALT PAVEMENT COURSE THICKNESS

Application	Minimum Pavement
Parking Lots and Driveways	3 inch
Local Streets	3 inch + preservation coat after 1 year
Commercial Local	4 inch + preservation coat after 1 year
Collector Streets	4 inch + preservation coat after 1 year
Arterial Streets	5 inch + preservation coat after 1 year

Streets shall have an approved slurry seal installed 1 year after the end of construction inspection. At the City's discretion, the contractor may arrange to have the City install the preservation coat at the Contractor's expense.

- C. Road-base Section. All roads shall have a minimum 8 inches of road-base under the pavement section. Road-base shall be an untreated base course installed according to City standards. See Chapter 39.35. Earthwork and Trenching. Road-base shall be finished to a smooth uniform line and grade and shall extend a minimum of 12" beyond the pavement surface for placements without curb and gutter.
- D. Sub-base Section. All sub-base shall be an engineered fill that meets and is installed according to City standards. See Chapter 39.35. Earthwork and Trenching. Sub-base shall be finished to a smooth uniform line and grade. The thicker section shall be used in the case where CBR may be in conflict. The following table shall be used for minimum sub-base course thicknesses for the following California Bearing Ratio (CBR) values of sub-grade:

PARKING LOTS AND DRIVEWAYS
MINIMUM SUB-BASE COURSE THICKNESSES

Sub-grade CBR	Minimum Sub-base Thickness (inches)
Less than 2	12
2.1 to 8.0	8
More than 8	No Sub-base Required

LOCAL STREET
MINIMUM SUB-BASE COURSE THICKNESS

Sub-grade CBR	Minimum Sub-base Thickness (inches)
Less than 2	15
2.1 to 3.0	12
3.1 to 10.0	8
More than 10	No Sub-base Required

COLLECTOR STREET
MINIMUM SUB- BASE COURSE THICKNESS

Sub-grade CBR	Minimum Sub-base Thickness (inches)
Less than 2.0	18
2.1 to 3.0	15
3.1 to 5.0	12
5.1 to 15.0	8
More than 15	No Sub-base Required

ARTERIAL STREET
MINIMUM SUB-BASE COURSE THICKNESS

Sub-grade CBR	Minimum Sub-base Thickness (inches)
Less than 2.5	24
2.5 to 3.5	18
3.5 to 6.0	12
6.1 to 25.0	8
More than 25	No Sub-base Required

- E. Grading. The sub-grade, sub-base, and road base shall all be graded to an engineered red-head and accepted by the City. Red-heads shall be placed every 50 feet at the crown of the road. If the distance between red-heads and edge of pavement exceeds 25 feet additional redheads shall be installed half way between the crown and edge of pavement.

39.60.030. Trail Section.

- A. General. A pavement and soils investigation shall be performed for all new trails. The results of this investigation and a design of the trail section shall be submitted to and accepted by the City Engineer or his/her designee.

The following guidelines shall be used as a minimum requirement for trail cross sections. They should be used unless the soils investigation indicates they are not adequate. Any variations from these standards must be approved by the City Engineer or his/her designee. All trail materials shall be placed according to City standards.

1. *Engineered Fill.* Compacted engineered fill shall be placed in all areas where fills are required to meet grade or the requirements of the soils investigation.
 2. *Untreated Base Course.* 6 inches of compacted untreated base course shall be placed under the surface course of all trails.
 3. *Bituminous Surface Course.* A minimum of 2 1/2 inches of APWA DM-1/2, PG 58-28, 50 Blow or SP-3/8, PG58-28, 75Nd bituminous surface course shall be placed across 10 feet of the trail section.
 - a. A maximum of 15% RAP or 15% Recycled Binder Replacement, whichever is less, will be allowed.
 4. *Limestone Crusher Fines.* When required, 2 1/2 inches of limestone crusher fines shall be placed along the edges of the trails to the top of the bituminous surface course.
- B. Survey. Both sides of a trail shall be laid out by a survey and approved by the City before construction. Lath shall be placed at 100 foot intervals and at bends and obstacles the trail comes near.

- C. Weed Abatement. All weeds shall be sprayed and killed with Roundup or an approved equivalent one week before any work may be performed, and within 3 weeks of the placement of untreated base course.
- D. Geotextile Fence. An APWA 31 05 19 (Geotextiles) silt fence shall be installed along the limits of the trail construction at hillsides and river embankments.
- E. Sub-grade. The sub-grade shall be grubbed of all trees, bushes and other organic matter. Sub-grade shall be graded to meet the following ADA requirements for walkways:
 - 1. *Maximum Slope.* Sub-grade shall not have a slope greater than 8.33%.
 - 2. *Maximum Run for Steep Slopes.* For slopes between 5.00% and 6.25% the maximum run shall be 40 feet. For slopes between 6.25% and 8.33% the maximum run shall be 30 feet.
- F. Weed Barrier. Weed barrier geotextile shall meet the requirements and specifications of APWA 31 05 19 (Geotextiles).
- G. Limestone Crusher Fines. The compacted limestone crusher fines shall meet the following gradation:

LIMESTONE CRUSHER FINES GRADATION	
Sieve	Passing
3/8 inch	100%
No. 4	70 to 90%
No. 10	30 to 70%
No. 40	5 to 30%
No. 200	5 to 15%

- H. Trail Markings. Trail lanes shall be delineated by a center single dashed yellow line. Painted traffic lines and markings shall meet the requirements and specifications of APWA 32 17 23 (Pavement Markings) and the MUTCD.
- I. Clean-up. Upon completion of the trail section all windrows, survey and construction debris shall be removed from along the edges of the trail.

39.60.040. Bituminous Surface Course.

- A. Paving Asphalts. Paving asphalts shall meet the requirements and specifications of APWA 32 12 03 (Paving Asphalts). Recycled Asphalt Pavement (RAP) or Recycled Asphalt Binder (RAB) content may not exceed 15% in any mix design.

For all local, commercial local and collector streets, use a minimum PG 58-28 conforming to the requirements of Section 02741, UDOT Standard Specifications.

For all arterial streets use a minimum PG 64-28 conforming to the requirements of Section 02741, UDOT Standard Specifications.

For parking facilities use a minimum PG 58-28 conforming to the requirements of Section 02741 of UDOT Standard Specifications.

For all repair and maintenance work utilizing hand applications (spreader box or grader) use a PG 58-28 or PG 64-22 conforming to the requirements of Section 02741 of UDOT Standard Specifications.

- B. Asphalt Concrete. Asphalt concrete shall meet the specifications and requirements of APWA 32 12 05 (Asphalt Concrete), APWA 32 12 16 (Plant-Mix Asphalt Paving) and APWA 32 12 17 (Cold-Mix Asphalt Paving). Use PG 64-22 unless otherwise specified.

Cold-mix asphalt concrete shall only be installed when allowed by the City Engineer or his/her designee. All cold-mix asphalt concrete shall be replaced with hot-mix within 30 days of when it becomes available.

Superpave performance graded asphalt concrete that meets the specifications and requirements APWA 32 12 06 (Superpave) shall be used in all arterial streets. All other streets and asphalt concrete applications shall meet the specifications and requirements of the APWA medium traffic classification.

- C. Prime Coat. Prime coat only as required by the plans or the City. Prime coat shall meet the requirements and specifications of APWA 32 12 13 (Prime Coat).
- D. Tack Coat. Install tack coat as required and according to APWA 32 12 14 (Tack Coat). Use CSS-1 or CSS-1h tack emulsion diluted 2:1 (concentrate to water).
- E. Thin Overlays and Patches. Use binder and bituminous concrete as defined in Article A based on paver or hand applications. Apply tack coat to all horizontal and vertical surfaces sufficient to achieve minimum 95% coverage prior to placement of overlay or patch.
- F. Slurry Seal. Slurry seals shall meet the requirements and specifications of APWA 32 01 13 (Slurry Seal). The type of slurry seal applied to a City street shall be approved and specified by the City Engineer.
- G. Chip Seal. Chip seals shall meet the requirements and specifications of APWA 32 01 14 (Chip Seal).
- H. Micro-Surfacing. Micro-surfacing shall meet the requirements and specifications of APWA 32 01 15 (Micro-Surface Seal).
- I. Pavement Crack Seal. Pavement crack seals shall meet the requirements and specifications of APWA 32 01 17 (Pavement Crack Seal).

Chapter 39.65. Portland Cement Concrete and Masonry Work.**39.65.010. General.**

- A. Specifications.
- B. Allowable Grades.
- C. American Disabilities Act (ADA) Requirements.
- D. Slip Forming.
- E. Combination Curb, Gutter, and Sidewalk.
- F. Cold Weather Concrete.
- G. Debris in Gutters.
- H. Sidewalk.
- I. Drive Approaches.
- J. Protection of Wet Concrete.
- K. Repair.

39.65.020. Installation.

- A. Cutting Pavement.
- B. Forms and Joints.
- C. Base Material.
- D. Mixing and Conveying.
- E. Finishing.
- F. Curing.

39.65.030. Materials.

- A. Coarse Aggregate.
- B. Fine Aggregate.
- C. Cement.
- D. Water.

39.65.040. Concrete Mixes.

- A. Mix Design.
- B. Proportioning.
- C. Control.
- D. Water Adjustments.

39.65.050. Masonry.

- A. General.

39.65.010. General.

- A. Specifications. These specifications cover the installation of concrete work including but not limited to curbs, gutters, sidewalks, boxes, and thrust blocks. All concrete work shall meet the requirements and specifications of APWA Division 03 Concrete and related sections. Concrete driveway, sidewalk, curb and gutter work shall meet the requirements and specifications of APWA 32 16 13 (Driveway, Sidewalk, Curb, Gutter). See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. Also, see standard drawings related to concrete work.

All concrete work shall be constructed where indicated on the plans or as directed by the project engineer and shall conform in all respects to the specified lines, grades, and dimensions and City standards.

- B. Allowable Grades. The minimum grade allowed for any gutter is 0.45%. The City Engineer or his/her designee may allow a minimum grade of 0.35% if the roadway has incorporated Low Impact Development (LID) systems. See Chapter 39.20. Improvement and Design Requirements for maximum allowable grades of City streets.
- C. American Disabilities Act (ADA) Requirements. All pedestrian facilities will conform to the current federal ADA standards.
- D. Slip Forming. In each drive approach and at each pedestrian ramp, 12 inch #4 rebar shall be placed at 24 inches on center with 4 inches extending into the curb, 2 ½ inches below the top back of curb.

- E. Combination Curb, Gutter, and Sidewalk. Combination curb, gutter, and sidewalk will not be allowed unless authorized by the City Engineer or his/her designee.
- F. Cold Weather Concrete. Concrete shall not be placed when a descending air temperature in the shade and away from artificial heat falls below 35°F. Concrete shall not be poured on frozen ground. Where temperatures are projected to descend below 32°F within 72 hours after placement, concrete shall be covered or otherwise protected against freezing. No calcium based add mixtures may be used. Any other add mixtures must be approved by the City Engineer or his/her designee.

If concrete is not protected by insulation blankets for 72 hours following installation and the temperature drops below 45 degrees a pay factor of 0.50 shall apply.
- G. Debris in Gutters. Once curb and gutter and surface course is in place they shall be kept as clean as possible. Dirt and gravel shall not be placed in gutter or on street. Gutter shall flow freely at all times.
- H. Sidewalk. When equipment is required to cross over sidewalk, bridging will be provided to protect concrete.
- I. Drive Approaches. All concrete for a drive approach shall be 5 inches thick in the public right-of-way.
- J. Protection of Wet Concrete. The Contractor shall be responsible to protect wet concrete. Any concrete that is vandalized before setting up shall be replaced at the contractor's expense.
- K. Repair. When authorized by the City Engineer or his/her designee, Contractor may repair concrete damage with Concrete Solution's Ultra Surface Concrete Polymer installed to manufacturer's specifications or an equivalent that is approved by the City Engineer or his/her designee.

39.65.020. Installation.

- A. Cutting Pavement. When replacing gutter, the pavement shall be cut along the entire excavation to provide a vertical joint in the surface. Cut shall be a minimum of 12 inches from lip of gutter. A pavement saw shall be used for all pavement cutting. If excavation damages the cut pavement, pavement shall be cut again before patching. All road cuts shall be repaired within 2 working days.
- B. Forms and Joints. When pouring concrete along a curve, flexible forms with enough stakes to hold the forms at an even curve shall be used.

Curb and gutter contraction joints shall be constructed every 10 feet by using steel templates 1/8 inch in thickness. Sidewalk contraction joints shall meet APWA requirements with the minimum distance between joints being 5 feet.
- C. Base Material. A minimum of 4 inches of untreated base course shall be installed under all concrete and shall extend out 1 foot in all directions from concrete unless otherwise specified. Untreated base course shall be compacted and installed according to City standards. See chapter 39.35. Earthwork and Trenches.
- D. Mixing and Conveying. Concrete transported in a truck mixer, agitator, or other transportation device shall be discharged at the job and placed in its final position in the forms within 1 hour after the introduction of the mixing water to the cement and the aggregate, or the cement to the aggregate, except that in hot weather or under other conditions contributing to quick stiffening of the concrete, the maximum allowable time may be reduced by the City Engineer or his/her designee. The maximum volume of mixed concrete transported in an agitator shall be in accordance with the specified rating. During adverse weather conditions the City Engineer or his/her designee may deem it necessary for the use of a concrete pump truck.
- E. Finishing. As soon as the concrete has set sufficiently to retain its shape without support of the face form, the clamps, spreaders and face forms shall be removed. While the concrete is still green, the surface shall be thoroughly floated with a magnesium or moist wooden float to provide an even smooth surface, then broomed lightly.
- F. Curing. As soon as possible after final finishing, the finished surface shall be coated with a curing compound. The compound shall be an ASTM C-1315 Type 2 curing compound that meets the APWA 03 39 00 (Concrete Curing) specifications. The compound shall be applied in accordance with the manufacturer's recommendations. During the months of October through February exposed concrete shall be covered with an insulated curing blanket that meets the ACI 306 specification for 3 days when temperatures remain at 15 degrees Fahrenheit or higher and for 7 days for temperatures below 15 degrees Fahrenheit. Insulated curing

blankets shall only be removed during the warmest parts of the day. The curing compound shall then be applied within 24 hours of the blankets being removed.

39.65.030. Materials.

- A. Coarse Aggregate. A coarse aggregate shall consist of hard durable particles of a mixture of crushed and natural gravel possessing at least 50% of broken surface area. The coarse aggregate shall be free from substances which are chemically active relative to hydrated cement and shall be subject to particularly the following:
 - 1. Loss on abrasion by Los Angeles Abrasion Test not more than 40% by weight.
 - 2. Loss on exposure to 5 cycles of sodium sulfate soundness test, not more than 8% by weight.
 - 3. Deleterious substances shall not exceed the values in the following table:

PORTLAND CEMENT CONCRETE
COURSE AGGREGATE DELETERIOUS SUBSTANCES

Substance	Maximum % by Weight
Soft Fragments	3.0
Coal Lumps	1.0
Clay Lumps	0.5
Material passing 39 100 Sieve	1.5
Organic Material	0.1
Total for All of the Above	3.0

The maximum size of aggregate to be used shall not exceed 1 1/2 inches in terms of this size definition contained in ASTM Standards except that the maximum size shall not exceed 1/4 of the least dimension of the finished concrete in which the aggregate is to be used.

Coarse aggregate shall be uniformly graded within the following range:

PORTLAND CEMENT CONCRETE
COURSE AGGREGATE GRADATION

Sieve Size	Minimum Retained (%)	Maximum Retained (%)
1 1/2 inch	0	10
3/4 inch	30	70
1/4 inch	75	100
No. 4	95	100

- B. Fine Aggregate. Fine aggregate shall consist of clean, hard durable particles of natural sands, subject to the following limitations:
 - 1. Organic Calorimetric Test using sodium hydroxide shall result in a color not darker than Number 2 in the acceptance range.
 - 2. Loss on exposure to 5 cycles of the sodium sulfate soundness tests shall not exceed 8% by weight.
 - 3. Deleterious substances shall not exceed the values in the following table:

PORTLAND CEMENT CONCRETE
FINE AGGREGATE DELETERIOUS SUBSTANCES

Substance	Maximum % by Weight
Soft Fragments	3.0
Coal Lumps	1.0
Material passing 39 100 Sieve	3.0
Micaceous or Flaky Particles	3.0
Total for All of the Above	5.0

Fine aggregate shall be uniformly graded within the following range:

PORTLAND CEMENT CONCRETE
FINE AGGREGATE GRADATION

Sieve Size	Minimum Retained (%)	Maximum Retained (%)
No. 4	0	5
No. 8	0	20
No. 16	20	50
No. 30	50	75
No. 50	75	90
No. 100	95	100

- C. Cement. All cement used shall be Type II unless otherwise allowed by the City Engineer or his/her designee. All cement and dry additives shall be stored in damp-proof conditions. Shipments of cement shall be marked and stored in such a manner as to provide positive identification. The supplier shall keep and have available for inspection at all times an accurate record of supplies and use of cement of the various types and shipments. No cement shall be used which has been subject to dampness or exposure.
- D. Water. Water used for concrete shall be potable and free from excess salts, organic material, or other deleterious substances. Addition of water to the mixed concrete after specified workability has been obtained will not be allowed, nor shall any concrete be re-tempered or re-mixed.

39.65.040. Concrete Mixes.

- A. Mix Design. Concrete mix designs shall meet the following requirements:

PORTLAND CEMENT CONCRETE MIX DESIGN REQUIREMENTS

Property	Standard Requirement	Thrust Block Material
Cement Content	6.5 Bags per Cubic Yard (Minimum)	3.5 Bags per Cubic Yard (Minimum)
28 Day Compressive Strength	4000 psi (Minimum)	2000 psi (Minimum)
Slump Range	1 to 3 inches	1 to 6 inches
Flatwork Slump Range	3 to 4 inches	NA
Air Content	5% to 7%	NA

- B. Proportioning. The supplier shall determine proportions by weight of aggregates, cement, additives, and water required to comply with strength, workability, and other requirements detailed herein. Such proportions shall be submitted to the City Engineer or his/her designee in three copies annually along with the following tests on materials and shall be subject to his/her approval.
 - 1. Coarse aggregate
 - a. Source
 - b. Deleterious substances
 - c. Los Angeles Abrasion Test
 - d. Sodium Sulfate Soundness Test
 - e. Sieve
 - 2. Fine aggregate
 - a. Source
 - b. Deleterious substances
 - c. Calorimetric Test for Organics
 - d. Sodium Sulfate Soundness Test
 - e. Sieve and fineness modulus
 - 3. Cement
 - a. Type
 - b. Supplier
 - c. Analysis

Upon approval, all concrete shall be prepared in terms of the proportions so approved unless variation becomes necessary by reason of materials or conditions to achieve the requirements of these specifications, in which case such variation shall be approved in writing by the City Engineer or his/her designee. Approval

by the engineer of mix proportions shall not relieve the supplier from the responsibility for obtaining the concrete strengths specified or complying with all other provisions of this specification.

- C. Control. Measurements of materials except water shall be by weight. Equipment used shall be capable of controlling weight within 1% of each ingredient. Water may be measured either by volume or weight provided that an accuracy of 1% is maintained. Cement may be assumed to weigh 94 pounds per sack but proportioning aggregates for fractional sacks of cement will not be permitted unless the fractional amount is weighed for each batch.
- D. Water Adjustments. Compensation for the water contained in the aggregates shall be made at least once daily or as often as inspection of the concrete may indicate that variation from this cause has occurred. The Pycnometer Method of assessing water in aggregate may be used for its determination for the purposes of this paragraph.

39.65.050. Masonry.

- A. General. All masonry work shall meet the requirements and specifications of APWA Division 04 Masonry and related sections.

Chapter 39.70. Electrical Service.**39.70.010. General.**

- A. Standards and Specifications.
- B. Construction Costs.
- C. Attaching to Existing City Facilities Prohibited.
- D. Unusual Service Extensions.
- E. Permits and Inspections.
- F. Access to Premises.
- G. Electrical Plan Drawings.
- H. Electrical Box Clearance.
- I. Overhead Electrical Power Line Clearances.

39.70.020. Voltage and Energy Regulation.

- A. Available Voltages.
- B. 3 Phase Service.
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39.70.030. Materials.

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- B. Service Entrance Requirements.
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39.70.080. Lighting and Signals.

- A. General.
- B. Location.
- C. Orientation.
- D. Grounding and Bonding.
- E. Wiring and Fusing.

39.70.010. General.

- A. Standards and Specifications. All electrical work shall be installed in accordance with these development standards, the most current edition of the National Electrical Code (NEC) and the National Electric Safety Code (NESC), and applicable State, County and OSHA codes and ordinances.

These specifications cover the installation of the electrical system. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to electrical system.

- B. Construction Costs. All costs to install or relocate facilities to provide electrical service shall be paid by the Customer.
- C. Attaching to Existing City Facilities Prohibited. Customer shall install no wiring or attachments on poles or other equipment of City unless specifically authorized, in writing, by the City.
- D. Unusual Service Extensions. Special and unusual service extension requirements for equipment or structures are treated as separate items and are not included in these standards.
- E. Permits and Inspections. Service will not be established until all necessary permits have been obtained and not until Customer's wiring installation has been inspected and approved by the City Engineer or his/her designee. The City reserves the right to inspect wiring and to refuse service to any installation that is, in the opinion of the City Engineer or his/her designee, unsafe or if the operation of same may be detrimental to the service furnished to other Customers or the City. All conduits shall be inspected prior to backfilling. All concrete street light bases, concrete transformer pads and other required concrete shall be inspected prior to pouring concrete. A compaction test shall be taken by City or an approved engineering firm prior to setting any electrical enclosures, cabinets, or other structures. In addition, a test shall be taken on the concrete used for electrical pole bases, pads.
- F. Access to Premises. Any properly identified representative of the City shall, at all reasonable hours, have free access to and from the premises of the Customer for the purpose of inspecting Customer's installations and electric equipment and for the purpose of reading, repairing, testing, or removing the City's meter or its other property. When, in the opinion of City Engineer or his/her designee, emergency conditions exist with respect to City's service, City's representative shall have immediate and free access to Customer's premises.
- G. Electrical Plan Drawings. Electrical Utility Planner shall design the electrical system and provide approved electrical plan drawings. Requests for any changes to these drawings can be made by contacting the Electrical Utility Planner with a proposal. Approved electrical drawings must be initialed by an approved electrical division supervisor, and signed by the Electrical Utility Planner in order to be valid for construction of the electrical system improvements. Photo-copies of approved drawings will not be considered valid. Revisions, if needed, must also include the date the revision was approved.
- H. Electrical Box Clearance. All electrical boxes shall have 12 feet clearance to the front and 3 feet clearance to the back and on either side. Secondary pedestals shall only require 3 feet of clearance on all sides. Switchgears shall have 12 feet clearance in front of the doors and 3 feet of clearance on the sides. Meters, metering cabinets & enclosures, service disconnect cabinets & enclosures, & CT cabinets, shall have a minimum of 8 feet of clearance in front of said cabinets & enclosures. All electrical sectionalizers, transformers, switchgear, etc. shall have a clear and level working space around them. The area shall be backfilled and leveled a minimum of 12 feet in all directions from the respective electrical device.

Meters, meter cabinets, services and related electrical cabinets shall not be enclosed by carports, sheds, out buildings, additions or remodels or other such buildings. Spanish Fork Electric Division shall have ready access to such equipment for safety & maintenance. The City reserves the right to disconnect the City electrical service to meter bases, services, etc. if in the opinion of the City the service is inaccessible or

unsafe until the service & safety issues are resolved to the City's satisfaction. This may include, but is not limited to; relocating the service, upgrading the service to meet current City codes.

- I. Overhead Electrical Power Line Clearances. As set forth in Section 54-8c-1 through Section 54-8c-7 of the Utah Code, no person or thing may be brought within 10 feet of any high voltage overhead power line unless:

The responsible party has notified the Electric Division or Utility operating the high voltage line of the intended activity; and

The responsible party and the Electric Division or Utility have completed mutually satisfactory safety precautions for the activity; and

The responsible party has made prior arrangements to pay the Electric Division or Utility for the mutually satisfactory safety precautions (if applicable)

No building, dwelling, sign, bridge, antennae, or structure shall be constructed, or placed underneath any overhead electrical power lines, and shall meet current NESC and City clearance requirements, both vertically and horizontally, from said power lines. Variances shall only be allowed at the City's discretion.

If existing buildings or structures exist under power lines, those same buildings or structures shall not be modified, remodeled or constructed so as to further encroach upon the clearances from said power lines.

In general, for overhead high voltage open supply conductors operating from 750 volts to 22,000 volts nominal, the space extending from grade level to the height of the conductor vertically and 15 feet horizontally from the further most outside conductor from the pole shall be kept clear from the power lines. Furthermore, for overhead high voltage open supply conductors operating from 22,001 volts to 46,000 volts nominal, the space extending from grade level to the height of the conductor vertically, and 30 feet horizontally from the further most outside conductor from the pole shall be kept clear from the power lines. Open water, swimming pools, combustible materials or hazardous locations may have additional clearances required.

Additional clearances may be required depending on the installation or application.

39.70.020. Voltage and Energy Regulation.

- A. Available Voltages.

STANDARD ELECTRICAL SERVICES	
Residential	Commercial and Industrial
1 Phase	3 Phase
3 Wire	4 Wire
120/240 Volts	120/208Y or 277/480Y Volts

Developer must contact the City Engineer or his/her designee for the availability of other service options.

City Engineer or his/her designee reserves the right to deny a Customer 3-phase service if the City Engineer or his/her designee determines that single-phase service will adequately supply Customer's load requirements. City Engineer or his/her designee reserves the right to deny a Customer 1-phase service if the City Engineer or his/her designee determines 3-phase service is in the best interest and beneficial to the City's electrical system.

- B. 3 Phase Service. 3 phase service may, at the City's option, be furnished where 3 phase facilities of adequate capacity are already installed immediately adjacent to the point where service is to be delivered to Customer, or where, as determined by City, it is economically feasible to extend such 3 phase facilities.

City reserves the right to refuse to extend or install 3 phase facilities to serve motors individually rated at 20 HP or less and to furnish only 1 phase service for such motors. In such an event, Customer may elect to install 1 phase to 3 phase conversion equipment to operate 3 phase motors.

- C. Power Factor Correction. City reserves the right to require the Customer to install power factor corrective equipment. This equipment shall maintain the power factor on all of Customers electric power meters to not less than 90% lagging at all times.

- D. Load Control. The City Engineer or his/her designee reserves the right to require developers to install equipment to limit load and reduce voltage fluctuations.
- E. Voltage Control. Where Customer installs power factor corrective equipment, the City reserves the right to require Customer to install controls and equipment to prevent voltage, frequency, and/or harmonics problems that may be detrimental to other Customers or the City.
- F. Fluctuating Load Limitations. Where large fluctuating 1 phase loads, such as spot welders, are involved, the City reserves the right to require such loads to be supplied by means of a 3 phase to a single-phase converter or other similar equipment. All conversion equipment shall be installed, owned, operated and maintained by the Customer.

In the event a separate service or transformer installation or additional transformer capacity is required to adequately serve fluctuating loads (such as X-ray equipment, welders, etc.). Such equipment costs and installations shall be the responsibility of the Customer.

- G. Penalties. If, such voltage control equipment is not installed by Customer, Customer may be required to pay a power factor penalty and/or all electric service shall be subject to disconnection as provided by Title 13.44 of the Spanish Fork Municipal Code. Customer's wiring used to supply such fluctuating loads shall be installed in a continuous run of rigid conduit and cable as approved by the City.

39.70.030. Materials.

- A. Materials. Only electrical grade materials and appurtenances shall be used. The materials and appurtenances shall be UL Listed and designed for their purpose.
- B. Conduit. All conduits shall be electrical grade conduit. Conduit shall be schedule 40 PVC unless otherwise specified by the City Engineer or his/her designee. Electrical grade rigid metal or schedule 40 fiberglass conduit shall be used under collector and arterial streets and for all sweeps. Fiberglass conduits shall not be used for riser poles. All conduits extending out of the ground outside of an enclosure shall be rigid metal from the elbow up a minimum of 10 feet. All conduits entering into any cabinet, enclosure, vault, or ground sleeve shall have end bells attached to the ends of conduits to protect wire from damage. All buried metal conduit shall be coated with anti-corrosion tape. Tape shall be a minimum of 2 inches wide. Tape shall extend 6" above finished grade. Fiberglass sweeps shall not be used on riser poles, or service entrance conduits.
- C. Enclosures. All enclosures including, primary and secondary junction boxes, shall be level. Opening mechanisms and locking devices on all transformer equipment shall be 4 to 6 inches above final grade. Opening mechanisms and locking devices on all primary sectionalizers, switchgear and secondary junction boxes shall be 10 inches above final grade. Only approved enclosures, pads, vaults shall be used.
- D. Soils & Compaction. All soils under enclosures shall be approved road base and be compacted to 95% of dry density. The compaction area must extend at least 1 foot past the enclosure in all directions and be a minimum of 1 foot in depth under the enclosure. A compaction test shall be required before any enclosure, box, sleeve, or pad is set into place. The compaction test shall be taken by the City or by the City's approved engineering firm. If ground sleeves or pads settle, Developer shall be required to re-level to the above specifications. If primary enclosures or transformers settle after being energized, the City shall re-level the equipment at the Developer's expense.

39.70.040. Installation.

- A. General. All electrical facilities shall be installed under the supervision of a licensed electrical contractor or journeyman lineman. A certified journeyman electrician or lineman shall be on site during all conduit installation, cable pulling and connecting of electrical wiring. All electrical installation & equipment shall be installed in a neat and workmanlike manner.

Curb & gutter shall be installed before excavation of electrical trenches. The curb should have property corners pinned in the top of the curb by approved methods. The curb will give reference for proper conduit depths & locations, and proper placement of electrical and communications boxes.

Contractor shall construct all electrical facilities in a development except for the following which shall be completed by the Utility:

1. Pulling high voltage underground cable;
 2. Installing high voltage cable terminations;
 3. Setting transformers and switch gears (contractor shall furnish & install sectionalizers);
 4. Secondary connections shall be connected in transformers (exception: contractor shall connect secondary connectors in 3 phase transformers);
 5. All overhead facilities, including extension of risers as shown in the standard drawings.
- B. Underground Lines. All new facilities shall be constructed underground unless otherwise authorized by the City. Existing buildings & facilities that have a change of use, or extensive remodeling, may, at the City Engineer or his/her designee's discretion, be required to install underground power lines. No overhead power will be allowed unless required or approved by the Utility.
- C. Conduit Depths. High voltage (12.47kV) primary conduits shall always be installed below secondary (600 volts or less) conduits & communications conduits if installed in a joint trench application. No primary high voltage conduits shall be installed at less than 4 feet in depth to top of conduits unless otherwise approved.

In general, the following table of depths shall be used for electrical conduit: *(Note: depths are to the top of conduits)*

Table 39.70.040.C1
ELECTRICAL CONDUIT DEPTHS

Conduit Size	Depth to Top of Conduit
1 Inch Street Light	4 Feet
2", 3" Service lateral	4 Feet
3 Inch Secondary	4 Feet
3 & 4 Inch Primary	4 Feet
6 Inch Primary	6 Feet*

* Depths may increase depending upon application.

- D. Pull Strings. All primary conduits shall have a 1,350 lb. mule tape in the conduit securely tied off in each pad or enclosure.
- E. Identification Tape and Stub Markers. All conduits shall have a caution tape taped directly on the conduit, and another tape buried 12 inches below grade. Tape shall meet the requirements and specifications of APWA 02320. The end of each stubbed conduit, including service laterals, shall be marked to the surface according to the standard drawings.
- F. Underground Metal Conduit. All buried metal conduit shall be coated with anti-corrosion protective tape. Tape shall extend 6" above finished grade.
- G. Berms, Slopes, and Hillside Conditions. For installation instructions around berms, slopes, and hillsides contact the City Electric Division.
- H. Labels. An imprinted, plastic label shall be securely taped to the end of each conduit run where it emerges into any cabinet or enclosure. The label shall indicate whether the conduit run is primary or secondary, the direction & footage of conduit. The label shall also include the address of where the run ends.

39.70.050. System Requirements.

- A. Additional Capacity Requirements. In the event a Customer makes application for additional capacity, subject to provisions of the applicable rate schedule, Customer shall install the necessary transformer capacity, service wires and other equipment required to adequately serve Customer's requirements.

All applications for service involving the furnishing of additional capacity or equipment by the City may be required of the Customer. The application shall state that any service entrance wiring and main switches required for the utilization of such additional capacity to be furnished by Customer, shall be considered as permanent fixtures belonging to the property being served and property except for replacement or enlargement if necessary.

- B. Substations. Substation may be required of Customer. The City reserves the right, where unusual substation capacity or voltage is involved, to require the Customer to install the necessary complete

substation as provided for in City's rate schedule. In such an event, the Customer will receive the substation ownership discount specified in the applicable rate schedule.

Where the Customer furnished the necessary complete substation equipment to take service at primary service voltage, such equipment shall be owned and maintained by the Customer and shall include the necessary transformers, structure, controls, and protective equipment, and shall be of such quality and construction as meets City approval.

39.70.060. Services.

- A. Point of Service. The City Engineer or his/her designee determines the point of delivery for all developments. City Engineer or his/her designee reserves the right to meter service at either primary or secondary voltage. For large or unusual loads, City Engineer or his/her designee reserves the right to require Customer to take service at primary voltage and to require Customer to furnish the necessary complete substation equipment. In such an event, the substation ownership discount shall apply. The City Engineer or his/her designee will decide if multiple buildings, business and residential, or portions of buildings will be metered from one or from multiple metering points. Each building or structure served shall be supplied by only one service. Multiple services are only allowed at the City Engineer or his/her designee's discretion.
- B. Service Entrance Requirements. The service entrance shall be defined as the facilities that consist of approved service entrance conduit and cable enclosing conductors and appurtenances. Said conductors shall extend from the point of contact with the City's secondary point of service and thence to and including Customer's service entrance safety switch or disconnection means.

Customer shall install all conduit and wire from the building to the pole or transformer according to the City standards.

- 1. Service Entrance Safety Switch or Main Disconnect. A residential service safety switch shall be a combination meter base and main disconnect device. For commercial & industrial installations a service safety switch shall be an **exterior service main disconnect device or devices, which will remain accessible at all times.** This device shall be a main breaker, but minimum requirement shall be a safety switch, which will disconnect all service power from the premise wiring to the entire facility. The location of the main disconnecting device shall be approved by the City.
- 2. Identification. (Current NEC*) *Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each.
- 3. Service Entrance Conductors. All service entrance conductors and any conduit enclosure shall be continuous, unbroken, and completely exposed for external inspection throughout their entire length, extending from said point of contact with City's service wires to the meter socket (or meter cabinet if installed) and thence to Customer's service entry safety switch or main disconnecting means. Service entrance conductor type & size shall meet current NEC, NESC, and City Standards.

Underground service lateral conductors from the City's Secondary service point up to the line side of the main disconnecting means shall be installed, maintained, and owned by the Customer. The City assumes no liability for replacement of secondary service lateral conductors.

- C. Underground Residential Service Requirements.
 - 1. Conductor*, conduit sizes, & conduit depths

Refer to following table:

Service Size	Service Conductor Size (AWG)	Conduit Size	Conduit Depth (ft)
100 amp	#2 alum.	2"	4'
125 amp	1/0 alum.	2"	4'
150 amp	2/0 alum.	2"	4'
200 amp	4/0 alum.	2 1/2"	4'
201- 400 amps	See Electric Division		

**Table 39.70.060.C Note:* The current National Electric Code may supersede these conductor sizes based upon service size. Refer to current NEC for service conductor sizes for other types of conductors & installations.

2. Conduit. Only continuous factory lengths of conduit shall be used. Conduit may be cut or spliced, however the couplers & bends shall be kept to a minimum. Conduit shall be installed in a neat and workman-line manner. All service lateral conduits shall be inspected prior to backfilling.
 3. Materials. Only electrical grade materials shall be used. Rigid metal conduits (RMC) & schedule 40 fiberglass shall be used for any elbows or bends 45 degrees or greater. RMC shall be coated with an anti-corrosion tape below grade and tape shall extend 6" above finished grade. RMC or shall be used for all above grade service entrance conduits. Customer shall provide service wire from house to junction box, transformer or pole according to City standard drawings.
 4. Trenching. Service lateral trenches shall be 4' in depth. Trenches shall be as straight as possible from the secondary service point to the Customer disconnect or meter base. The bottom of the trench shall be as level as possible and free from rocks & debris. Backfill placed directly on conduits shall be free from large rocks.
 5. Service Entrance Conduits Support and Attachments. Service Entrance conduits shall be securely attached to the foundation of house or building by means of unistrut, concrete anchors, and unistrut type clamps. Unistrut shall be securely attached to foundation by a minimum 3/8"x 3" concrete anchors. Unistrut shall be long enough to attach communications conduits, typically 36". Communication conduits shall be spaced six inches apart and one foot to either side of the meter base. Service entrance conduits shall be one continuous, unbroken conduit from the elbow to the point of attachment at the meter base hub.
 6. Location(s). Note: **Refer to 39.70.070. Metering for additional requirements.** Meter/main disconnect shall be located within the front 6' of the side of a residential dwelling. Meter/main disconnect shall be accessible at all times. Meter/main disconnect shall be kept a minimum of 36" from any natural gas meters, window wells, windows, doors, stairs and any material deemed to be combustible or hazardous. For remodels, service upgrades, building additions or other instances or applications affecting the existing electrical service, meter base, meter and disconnect, contact the Electric Division for requirements. The service, meter, meter base, or disconnect may be required to be relocated to meet current Standards and Codes. Meter/main disconnect shall meet any and all applicable NEC, NESC codes. The City Engineer or his/her designee reserves the right to accept or reject any locations of meter base/main disconnects.
- D. Overhead Residential Service Requirements.
1. General. Overhead services shall also include mast knob and service grips. Wiring shall meet load and installation requirements as indicated in the NEC.
 2. Service Drop Support and Attachments. For one story buildings, or where conditions will not permit proper ground clearance to be maintained by City's service wires, Customer shall install, at Customer's expense, suitable conduit or service entrance mast pipe or other structure or support that will properly support the City's service drop conductors and to maintain the minimum ground clearance as required by the NESC. If clearances cannot be met, the service may be required to be relocated or otherwise rerouted underground.
 3. Service Entrance Weatherhead Clearance. The service entrance weatherhead shall be located so as to meet or to exceed NESC clearance from readily accessible windows, doors, or porches. The weatherhead must also be located so that when the service drop conductors are attached to the building structure or other service drop support, adequate clearance will be maintained away from telephone or other wires, windows, awnings, drainpipes, chimneys, or other obstructions.
 4. Service Entrance Mast Pipe. This installation shall be made by Customer, at his/her expense, and shall conform to City's specifications. The service entrance mast pipe shall be of electrical grade galvanized rigid steel-of not less than 2 1/2" inch inside diameter and shall be attached to the wall of the building by means of an adequate number of approved fastening devices. All service conduits shall be 2 1/2" inches in diameter, or larger.

The mast pipe and/or conduit shall be continuous, extending from the service entrance weatherhead located at the top of the mast pipe to Customer's meter socket base.

The service entrance mast pipe shall extend above the roof surface (through weatherproof roof flashing) so that the point of attachment of City's service wires to the mast pipe will be not less than 18 inches above said roof line, plus such additional height as is necessary so that the point of attachment of City's service wires will maintain minimum ground clearance, specified in the NESC.

5. Service Drop Attachment to Buildings. The Customer will furnish and the City will install the necessary attachment brackets and appurtenances to attach City's service wires to Customer's service drop termination facilities.

City further reserves the right to require that the installation of the necessary mast pipe or equivalent facilities required supporting City's service wires, be made by Customer during the course of building construction.

Where the exterior of buildings is finished with brick facing, concrete, plastered metal lathe, sheet iron, stucco, tile or similar material, suitable facilities of adequate strength to hold City's wires and attachments, shall be installed by Customer at Customer's expense.

6. Service Drop Conductor Ground Clearance. The service drop conductors must be located at such height as will enable adequate clearance to be maintained through the entire service drop length. The minimum ground clearance shall be as specified by the NESC, but not less than 12 feet over driveways not subject to truck traffic; 16 feet over commercial areas, parking lots and other areas subject to truck traffic; and 22 feet over public streets, alleys and roads. The final height attachment determination shall take into consideration conductor sag due to weather fluctuations & lengths of spans.
7. Service Entrance Conductor Specifications. The service entrance conductors may be either copper or aluminum, and shall be continuous without any joints, splices or connections, extending from the point of connection with service drop conductors to the termination of same at the meter socket or meter cabinet and thence same shall continue without joints, etc., to Customer's service entrance safety switch.

The Customer shall have electrical Contractor provide at the service entrance weatherhead, sufficient excess service entrance conductor length or "tails" (18 inch minimum) so that City can connect same directly to the service drop conductors.

The service entrance installation shall conform in every respect to City's specifications, as to conductor connectors, and the method of making connections and all other related matters involved.

The service entrance conductor size for the ampere load to be carried shall be based on a maximum conductor operating temperature of 75°C (type RH, RHW, XHHW, or equivalent.)

Note: Refer to Table 39.70.060.1C for service conduit & conductor sizes.

8. Main Breaker or Disconnect. The entrance safety switch or main breaker ampacity shall be not less than the rated ampacity of the service conductors. Other specifications, including conductors, shall conform to the latest edition of the National Electrical Code.

Upon special application, City may permit 2 or 3 wire service entrance installations of less than 100 ampere capacity for signs, etc., where the load requirements, as determined by City, justify the same. In no event will 2 wire service be furnished except at City's option.

9. Temporary Service Drops. For temporary service furnished to individual small single phase loads, such as house trailers, small construction projects (such as house and small buildings, portable tools, etc.) City will install a standard temporary service drop, at Customer's expense. City's General Service Rate shall apply.

Where the temporary service installation requires additional facilities in excess of the previously mentioned standard service drop (such as an extension of City's primary line), such installation will be at the Customers expense.

10. Service to Mobile Homes and Trailer Courts. Through One Meter. For service to trailer courts where more than 1 dwelling unit, mobile home, or trailer is supplied through 1 meter, the furnishing of such service shall be provided and installed by the facility owner.
11. Load to be Balanced on Circuits. The Customer shall use reasonable care in designing electric wiring and circuits; also, the connection of the loads to the circuits, so that the loads on the individual phases and circuits of City's service are properly balanced at all times.
12. Temporary Service to be Installed on Customer's Pole. All such temporary service drops shall be supported on a pole or post as approved by City and shall be installed by Customer at his/her expense.

- E. Underground Service Requirements for Multi-Family Dwelling Units.
1. General. Service lateral conduits from the City's point of secondary service shall be 3 inch minimum for multi-family dwelling units. A load calculation study shall be performed for multi-family dwellings units and submitted to the Electric Division. All other residential service requirements apply.
- F. Underground Service Requirements for Commercial & Industrial Applications.
1. General. Service entrance conductors & conduits shall be sized according to applicable NEC, NESC codes. The City shall approve all locations & installations of conduits, service disconnection means, and meters.
 - a. All commercial & industrial buildings shall have an accessible, exterior main disconnecting means that is capable of disconnecting (opening) all service entrance conductors from the building or structure premises wiring.
 - b. All services rated 801 amps or more supplied by a 4-wire three phase 277/480 volt wye connected system shall have a ground fault test performed for protection of equipment.
 - c. All services, equipment, cabinets, conduits, etc. shall be grounded & bonded according to applicable NEC & City codes.
 - d. The service disconnecting means shall be identified as suitable for use as service equipment.
 - e. A building or structure may only be served by one service lateral or service drop, unless otherwise approved by the Electric Division.
 - f. There shall not be more than 6 service disconnects for each service. Each service disconnect shall be permanently marked to identify it as part of the service disconnecting means. All service disconnecting means for each service shall be grouped together.
 - g. The center of the operating handle of switch or breaker, when in its highest position, shall not be more than 6 ft. 7 in. above finished grade.
 2. Materials. Only electrical grade & listed materials shall be used. Rigid metal conduits (RMC) shall be used for any elbows or bends 45 degrees or greater. RMC shall be coated with an anti-corrosion tape below grade and tape shall extend 6" above finished grade. RMC shall be used for all above grade service entrance conduits. Customer shall provide service wire from building to utility transformer or pole. All electrical equipment, cabinets, panels, etc. shall be listed and approved for the installation.
 3. Trenching. Service lateral trenches shall be 4' in depth. Trenches shall be as straight as possible from the secondary service point to the Customer disconnect or meter base. The bottom of the trench shall be as level as possible and free from large rocks & debris
 4. Service Entrance Conduits Support and Attachments. Service Entrance conduits shall be securely attached to the foundation of building by means of unistrut concrete anchors, unistrut type clamps or other approved methods. Unistrut shall be securely attached to foundation by a minimum 3/8"x 3" concrete anchors. Service entrance conduits shall be one continuous, unbroken conduit from the elbow to the point of attachment at the meter base, ct cabinet, or main disconnect cabinet. Service lateral conduits shall be installed at a depth of 4 feet to top of conduits. All installations shall be installed in a neat and workman-like manner.
 5. Locations. Locations of service lateral conduits shall be approved by City Engineer or his/her designee. Locations of outside main disconnecting equipment shall be approved by City Engineer or his/her designee. Meter/main disconnect shall be accessible at all times. Meter/main disconnect shall be kept a minimum of 36" away from any natural gas meters, window wells, windows, doors, stairs and any material deemed to be combustible. Meter/main disconnect shall meet any and all applicable NEC, NESC codes. The City Engineer or his/her designee reserves the right to accept or reject any locations of meter base main disconnects. If the City Engineer or his/her designee determines the service location is inaccessible or otherwise unsafe, the Customer shall relocate or upgrade service to City standards. The City Engineer or his/her designee further reserves the right to disconnect electrical power to the Customer's service until the service is brought into compliance.
 6. Ownership of Conductors. For commercial underground installations the secondary service conductors shall be owned & maintained by the Customer from the secondary connections inside the transformer up to the termination point of the service disconnect. For commercial overhead installations the secondary service conductors shall be owned & maintained up to the overhead secondary connection point. City shall own the overhead drop up to the connections at the service mast.

39.70.070. Metering.

- A. General. The City will furnish and install all electric revenue meters. Normally outdoor socket-mounted meters will be used by City whenever practical. The meter base will be furnished and installed by Customer's electrical contractor for all normal residential installations. The meter base with test switch shall be provided by City and installed by Customer's electrical contractor for commercial or industrial applications.

If instrument transformers are required, City reserves the right to require Customer to furnish and install a suitable steel cabinet to house City's instrument transformers and accessories. Said cabinet shall contain only the City's metering equipment and shall be equipped so that it can be sealed and locked by the City. The City shall have sole access to this cabinet.

- B. Location. The City shall approve the location of service entrance and meter. The following conditions must be met for the location of all meters & services:
1. Visibility. All entrance wiring connections shall not be concealed and shall always be in plain view for inspection by City.
 2. Protection. No meter or service equipment shall be installed in any location where it may be unnecessarily exposed to heat, cold, dampness or other cause of damage, or in any unduly dirty or inaccessible location.
 3. Height. The meter socket shall be mounted at a height of not less than 4½ feet, no more than 6 feet above finished grade, as the case may be. Where multiple meters are installed, care shall be taken to ensure the lowest meter is no less than 4 ½' and no higher than 6' from finished grade.

When a combination 3 phase and 1 phase service is supplied to the same premises, all meters and service entrance switches shall be at the same location.

- C. Meter Base. Residential meter bases shall be furnished and installed by the Contractor according to City standard drawings. No smaller than a 100 amp service entrance will be accepted other than by approval from the Electrical Superintendent. The meter base shall be kept sealed and under the control of the City at all times.
- D. Commercial Meters. Single-phase and three-phase self-contained meter bases shall be installed by the Developer, and shall have bypass capability in the meter base. For details and specific information regarding this requirement, please contact the Electric Metering Office. For services rated 200 amps up to 800 amps, the Electric Division will supply the meter base & test switch for contractor to install. No smaller than a 200 amp 3 phase service entrance will be accepted unless otherwise approved by the Electrical Superintendent or his/her designee. For services rated over 800 amps, contact Electric Division.

The Contractor's portion shall be completely installed, inspected, and the electrical hook-up fee paid before the City will complete the final electrical hookup.

- E. Location of Multiple Meters. Where more than one meter is required for a building, such as an apartment house, all of the meter sockets shall be located side by side at an outside location as determined by the City Engineer or his/her designee.
- F. Meter Location Regarding Remodeling. When remodeling, where 2 or more houses or dwelling units are combined to form one building, the meter socket shall be moved to a single location. Meter and service locations shall first be approved by the Electric Division. Existing meters and services may require relocation to meet current City standards. In all remodeling where the meter is changed or moved, or wiring changes made, outdoor meter sockets and an approved new service entrance shall be installed by Customer at Customer's expense.
- G. Meter Accessibility. In the event a structural change is made by the owner that results, in the opinion of City Engineer or his/her designee, to be an undesirable meter location, the meter socket, meter cabinet, and/or service entrance installation shall be moved by the Customer at his/her expense to an accessible location as determined by City.

Whenever the construction of a building on an adjacent lot prevents proper access to any meter, or access to the point of attachment of service drop conductors, or results in inadequate service drop clearance, the Customer shall move, at Customer's expense, the meter socket and service entrance to a location that is acceptable to City. The meter shall not be enclosed by any portion of a building. The meter shall not be

placed under carports or enclosed by sheds, garages, outbuildings or other buildings. The meter shall remain readily accessible to the City at all times.

- H. Outdoor Meters for Non-Residential General Service. All single phase meters installed for Non-residential use shall be socket type. The meter base shall have bypass links installed. The meter socket shall be furnished and installed by Customer at Customer's expense.
- I. Instrument Transformer for Metering. In all outdoor installations requiring current transformers, whether 1 phase or 3 phase, the Customer shall provide an approved meter loop for meter connections. The City shall furnish any instrument transformers, meter bases, or other devices required, to properly meter the Customer's electrical needs. Such instrument transformers and devices shall be installed by City.
- J. Current Transformer Cabinet. Any cabinets required to house said instrument transformers and accessory equipment shall be furnished and installed by Customer at Customer's expense. This requirement applies to all installations. All cabinets shall be approved by City.

Such metering or instrument cabinets are for the exclusive use of City, and shall, at all times, be under the control of, and kept sealed by City.

39.70.080. Lighting and Signal Poles.

- A. General. The City shall provide the street light poles, fixtures & associated parts to install the street lights. The contractor is responsible for transport of the street lights from the City Public Works Department to their respective developments. Furthermore, the contractor shall be responsible for pouring the concrete bases, assembling and erecting the street lights. All street light bases shall be grouted and a rubbed finish shall be applied to the exposed base.

All local streets, minor & major collectors, and arterial streets shall have the decorative street light as shown in the standard drawings or as designed. 25-foot steel galvanized poles with a 6-foot arm, and either a 100 watt or a 250 watt equivalent LED cobra head type fixture may be used or substituted for a decorative type pole & fixture at the City's discretion. All fixture types will be of the Luminaire type with 90 degree cutoff lens.

All traffic signal poles shall be powder coated black.

- B. Location. In general, street lights will be installed at all intersections except where a four way intersection has an offset of less than 100 feet from another intersection. Street lights shall be installed on the top of all traffic signal poles. Street lights for local streets will be installed with a minimum of 250 feet and a maximum of 400 feet between. Any street that extends more than 600 feet without an intersection shall have street lights placed at equal intervals not to exceed 400 feet. All mid-block street lights shall be installed 18 inches from a property line. Collector and arterial streets shall have lights spaced at 175 feet apart on alternating sides of the street. In addition to the typical location design and layout, street light locations may also be designed by the Electrical Division.

Each street light will be installed so that the street light pole is centered in the planter strip or within 18 inches of the sidewalk if no planter strip exists.

- C. Orientation. Street lights at intersections of local streets shall aim to the center of the intersection. On collector or arterial streets street lights shall be set at a 90 degree angles at regular intervals determined by the City. The bolt pattern shall be oriented on a diamond to the street.
- D. Grounding & Bonding. A bonding wire shall be connected from the rebar "Ufer" rings in the concrete pole base to the street light pole grounding/bonding screw or termination point using NEC approved methods and a separate grounding wire will be installed from the pole to the closest secondary pedestal or transformer. The grounding conductor shall be terminated with the neutral conductor.
- E. Wiring & Fusing. A 10 amp in-line fuse & fuse holder shall be installed in the junction box or transformer, on the 120/240 volt ungrounded conductors.

Chapter 39.75. Communication Service.**39.75.010. General.**

- A. Standards and Specifications.
- B. Construction Costs.
- C. Attaching to Existing City Facilities Prohibited.
- D. Unusual Service Extensions.
- E. Permits and Inspections.
- F. Access to Premises.
- G. Communication Plan Drawings.

39.75.020. Materials.

- A. Conduit.
- B. Enclosures.

39.75.030. Installation.

- A. General.
- B. Underground Lines.
- C. Depth.
- D. Tracer Wire and Pull Strings.
- E. Caution Tape and Stub Markers.
- F. Underground Metal Conduit.
- G. Labels.

39.75.040. Services.

- A. Point of Service.
- B. Underground Service Requirements.

39.75.050. Inside Wiring Recommendations.

- A. General.
- B. Coax Wire and Fittings.
- C. Home Communications Panel.

39.75.010. General.

- A. Standards and Specifications. These specifications cover the installation of the communication system being installed to provide a wide range of communication services to include high speed internet service, cable television, telephone, and metering reading for electric, water, and pressurized irrigation meters, etc. See Chapter 39.20 for improvement and design requirements, Chapter 39.25 for inspection and testing requirements, and Chapter 39.35 for earthwork and trench requirements. See standard drawings related to electrical system.
- B. Construction Costs. The underground conduit in to provide communication service shall be paid for by the Developer or Customer. In the event a Customer or property owner requests relocation of communication facilities, the costs shall be the responsibility of the Customer.
- C. Attaching to Existing City Facilities Prohibited. Customer shall install no wiring or attachments on poles or other equipment of City unless specifically authorized, in writing, by the City.
- D. Unusual Service Extensions. Special and unusual service extension requirements for equipment or structures are treated as separate items and are not included in these standards.
- E. Permits and Inspections. Service will not be established until all necessary permits have been obtained and not until Customer's wiring installation has been inspected and approved by the City. The City reserves the right to inspect wiring and to refuse service to any installation that is, in the opinion of the City, unsafe or if the operation of same may be detrimental to the service furnished to other Customer's or the City.
- F. Access to Premises. Any properly identified representative of the City shall, at all reasonable hours, have free access to and from the premises of the Customer for the purpose of inspecting Customer's on premise box (OPB) and cable installation for the purpose of repairing, testing, or removing the City's OPB or other City property.

- G. Communication Plan Drawings. Utility shall provide communication plan drawings. Requests for any changes to these drawings can be made by contacting the Spanish Fork City Community Network (SFCN) superintendent with a proposal. Approved communication drawings must be initialed by an approved SFCN division supervisor, and signed by the SFCN superintendent in order to be valid for construction of the communication system improvements. Photo-copies of approved drawings will not be considered valid. Revisions, if needed, must also include the date the revision was approved.

39.75.020. Materials.

- A. Conduit. All conduit shall be electrical grade PVC conduit or orange SDR 11 HDPE pipe meeting ASTM-3035 specifications unless otherwise specified in these standards or by the City Engineer or his/her designee. Rigid metal conduit (RMC) or fiberglass (FG) conduit shall be used under collector and arterial streets. Rigid metal conduits shall be coated with a 2" anti-corrosion tape below grade. Tape shall extend 6" above finished grade. Fiberglass sweeps shall not be used on riser poles.

At no time shall the pipe be deformed to make any bend. The minimum radius for any bend or sweep in the conduit shall be 36 inches. When sweeps are required, they shall be rigid metal or fiberglass. The total number of bends in any conduit run shall not exceed 360 degrees.

- B. Enclosures. All enclosures shall be level and set according to utilities construction standards. If ground sleeves or pads settle, Developer shall be required to re-level to the above specifications. Ground rods shall be installed in SFCN boxes as called out on the communication design plans. Ground rods shall be 5/8 inch by 8 foot copper clad. The City will provide the SFCN boxes for the developer to install.

39.75.030. Installation.

- A. General. Contractor shall construct all communication facilities in a development except for the following which shall be completed by the Utility:
1. Pulling underground or overhead cable;
 2. Installing communication cable terminations;
 3. Setting of large communications pedestals which house Nodes, and Fiber Optic Equipment;
 4. Installing communication connections and terminations;
 5. All overhead facilities, including extension of risers as shown in the standard drawings.
- B. Underground Lines. All new facilities shall be constructed underground unless otherwise authorized by the City. No overhead communication lines will be allowed unless required by the Utility.
- C. Depth. Conduit depth shall be a minimum of 24 inches to top of pipe. When installed with electric conduit it shall be installed 6 to 12 inches above electric conduit.
- D. Tracer Wire and Pull Strings. A 12 gauge solid THWN tracer wire shall be installed with all stubbed conduits according to standard drawings. Wire shall be pulled tight along the pipe. All fiber and main communication conduits shall have a pull string in the conduit securely tied off in each pad or enclosure.
- E. Caution Tape and Stub Markers. All conduits shall have a 3 inch identification tape attached to each conduit and a 6 inch tape buried 12 inches below grade above the conduit. Tape shall read "Caution - SFCN Fiber Optics Buried Below" or "Caution - SFCN CATV Buried Below" as applicable. The end of each stubbed conduit, including service laterals, shall be marked to the surface according to the standard drawings.
- F. Underground Metal Conduit. All buried metal conduit shall be coated with 2" corrosion protective tape. Tape shall extend 6" above finished grade.
- G. Labels. An imprinted, plastic label shall be securely taped to the end of each conduit run. The label shall indicate whether the conduit run is fiber or coax. The label shall also include the address of where the run ends.

39.75.040. Services.

- A. Point of Service. The City Engineer or his/her designee will determine the point of delivery for all developments. The City Engineer or his/her designee will decide if multiple buildings, business and residential, or portions of buildings will be serviced using single or multiple distribution unit (MDU) enclosures.
- B. Underground Service Requirements. Customer shall, install all conduit from the building to the pole or pedestal according to the City standards.

39.75.050. Inside Wiring Recommendations.

- A. General. The following information is for informational purposes only, but provides wiring information adequate to facilitate either Comcast or SFCN communication services inside the home.
- B. Coax wire and fittings. Only use RG-6 coax cable. The following are recommended specifications for a home communication panel.
 1. Coax Wire. Only use RG-6 coax cable.
 2. Center Conductor. Center conductor should be copper covered steel center.
 3. Dielectric Insulation. Dielectric insulation should be flame retardant polyethylene with a low dissipation factor of 0.00015, a low dielectric constant of 2.3, and foam velocity of propagation greater than 80% and manufactured using micro cell technology for greater strength, to resist deformation, and to prevent moisture ingress.
 4. Shielding. Shielding should consist of a foil layer which is to be bonded to the insulation with a wire shielding of 60% braid coverage on the outside of the foil shielding. The material for both the braid, and the foil should be all aluminum.
 5. Non-Plenum Jacket. Non-plenum jacket should be PVC material, and rated for general indoor use, and must meet NEC article 820 for flame 5 retardant protection.
 6. Crimp Fittings. Crimp fittings should incorporate a 360 degree compression type crimp.
 7. Splitters. Splitters should be 1GHz or broader.
- C. Home Communications Panel. The following are recommended specifications for a home communication panel.
 1. Mounting. The minimum necessary for a communications center would be a simple 2'X2' piece of ½" ply wood securely attached to the wall in the basement, although manufactured panels are available for a more professional, and finished look. The manufactured panels would be a good choice in a finished closet, in a furnace room, or in other visible areas.
 2. Location. The location of the communication center should be readily accessible, either in the furnace or utility room, or under the stairs, in a closet, or other similar area. The consumer will need access to this panel in order to reset their cable modem, network hub, or pre-amp for their cable TV where applicable.
 3. Electrical Outlet. A standard electrical outlet would need to be adjacent to the communications center to power the cable modem, network hub, or pre-amp when multiple computers, or televisions are used.
 4. Wiring. Two RG-6 wires should be run from the On Premise Box (OPB) to the home communications panel for the internet and cable hookup. An RG-6 wire should be run from the panel to each cable television outlet. A CAT5 cable should be run from the panel to each internet access outlet. See standard drawings. It is also recommended that telephone wiring be run out of the panel as well.
 5. Conduit. One 1 inch PVC or equivalent conduit should be run from OPB to the Home Communication Panel for Fiber Optic Installation. FTTH

Chapter 39.85. Surface Irrigation Systems.**39.85.010. General.**

- A. Specifications.
- B. Adopted Policy.
- C. Approval.

39.85.010. General.

- A. Specifications. These specifications cover the installation of irrigation systems. See standard specifications for storm, land and groundwater drains for construction standards.
- B. Adopted Policy. The irrigation ditch policy, Title 13, requires a Developer to pipe an irrigation ditch if it is on the development or adjacent to the development. If the ditch carries greater than 50 cubic feet per second average flow the City Council has the discretion to require piping, fencing, and/or landscaping.

Any ditch carrying less than 50 cubic feet per second will be required to be piped. The Development Review Committee may waive this requirement for commercial and industrial areas.

- C. Approval. The City has no direct control over irrigation works and will require written approval from the irrigation company or ditch owner involved. All irrigation system plans shall be prepared by a professional engineer and approved by the City and the irrigation company or ditch owner. Construction shall meet requirements and specifications of the City standards for storm drains unless otherwise authorized by the City Engineer or his/her designee. The irrigation company or ditch owner must accept in writing any work related to surface irrigation systems before the end of construction inspection.

Chapter 39.90. Landscaping.**39.90.010. General.**

- A. Specifications.
- B. Appurtenances.
- C. As-Built Drawings.
- D. Government Regulations.
- E. Source.
- F. Fences and Walls.
- G. Tree Grates.
- H. Vegetation Control.

39.90.020. Lawns and Grasses.

- A. General.
- B. Grading.

39.90.030. Ground Cover.

- A. General.

39.90.040. Trees.

- A. General.
- B. Tree Sizes.
- C. Labels.

39.90.010. General.

- A. Specifications. These specifications are for landscape work completed on public property or private property that will become public property.
- B. Appurtenances. Any minor items of labor or materials not specifically noted on the drawings or specifications; but obviously necessary for the proper completion of the work, are to be considered as incidental to and are to be included in the contract.
- C. As-Built Drawings. The contractor must furnish as-built drawings to the City. These drawings should be updated whenever a change from the design is made to assure accuracy. The drawings must show a record of all departures from the contract drawings that occur during construction. These shall be kept on a clean set of prints of the contract drawings.

The Project Manager/Owner will review the "as-built drawings" to verify that changes are being recorded as construction occurs. These drawings and maintenance manuals must be submitted at the time of final inspection or in accordance to the general conditions.

- D. Government Regulations. Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.
- E. Source. Provide trees and shrubs, and other plants grown in a recognized nursery in accordance with good horticultural practice. Provide healthy, vigorous stock grown under climatic conditions similar to the locality of the project and free of disease, insects, eggs, larvae, and defects such as knots, sun-scale, injuries, abrasions, or disagreement.

Plant Materials and other landscape items will be evaluated according to compliance with drawings, schedules, and specifications; as well as overall aesthetic quality, grower or supplier reputation, physical inspection, and American Association of Nurseryman Standards (AANS). Select plants that will not be adversely affected by the existing soil chemistry at the planting location.

The source or supplier for all plant materials shall be furnished to the City prior to the delivery of any plant materials on site or stored elsewhere.

- F. Fences and Walls. All fences and walls except those for individual single family lots must be approved by the City. Chain link and field wire fencing shall meet the requirements and specifications of APWA 32 31 13 (Chain Link Fences and Gates) and APWA 32 31 16 (Welded Wire Fences and Gates) respectively. The relocation of fences and gates shall meet the requirements and specifications of APWA 32 01 10 (Relocate Fences and Gates) and related sections.

- G. Tree Grates. Only 4 foot square D&L O-8644 or approved equivalent grates shall be used. Grates shall be set to grade with the top back of curb and sidewalk. Grates shall be set in metal frame manufactured specifically for grate. Frame shall be set in concrete extending a minimum of 6 inches from sides of frame. Concrete shall be installed to City standards for Portland Cement Concrete.
- H. Vegetation Control. Vegetation control shall meet the requirements and specifications of APWA 31 31 19 (Vegetation Control).

39.90.020. Lawns and Grasses.

- A. General. Lawns and grasses shall meet the requirements and specifications of APWA 32 92 00 (Turf and Grasses).
- B. Grading. Till soil to a depth of 4 inches and remove rocks and debris over 1 inch in diameter. The elevation of top soil relative to walks, hard surfaces or edges shall be:
1. Seeded Areas. 1/2 inches below.
 2. Sodded Areas. 1 1/2 inches below.

39.90.030. Ground Cover.

- A. General. Ground cover shall meet the requirements and specifications of APWA 32 93 13 (Ground Cover) and APWA 32 01 90 (Plant Maintenance). Install according to APWA plan number 683.

39.90.040. Trees.

- A. General. Tree and work relating to trees shall meet the requirements and specifications of APWA 32 93 43 (Tree), APWA 32 01 91 (Tree Root Cutting), APWA 32 01 93 (Pruning Trees) and 32 01 90 (Plant Maintenance). Install according to APWA plan number 681. Use 6 foot posts for any tree staking. Trees may be planted without a certified arborist when authorized by the City Engineer or his/her designee.
- B. Tree Sizes. City ordinance specifies deciduous trees to be at least 2 inch caliper and evergreen trees to be at least 8 to 10 feet in height. Plants of a larger size may be used pending approval by the City Engineer or his/her designee. Sizes of root balls or containers shall be increased proportionately.
- C. Labels. Label at least one plant of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

Chapter 39.95. Irrigation Sprinkler Systems.**39.95.010. General.**

- A. Specifications.
- B. Appurtenances.
- C. Pressure Verification.
- D. Plan Modifications.
- E. As-Built Drawings.
- F. Final Inspection.

39.95.020. Pipe and Fittings.

- A. Pipe.
- B. Main Line Fittings.
- C. Circuit Pipe Fittings.
- D. Sleeves.

39.95.030. Sprinkler Heads.

- A. General.
- B. Spray Heads.
- C. Rotary Heads.

39.95.040. Controller, Valves and Flow Meters.

- A. Controller.
- B. Manual Main Line Isolation Valve.
- C. Manual Circuit Isolation Valve.
- D. Automatic Valves.
- E. Master Valves and Flow Meters.
- F. Automatic Drain Valves.
- G. Back Flow Preventer.
- H. Stop and Waste Valves.
- I. Quick Coupler Valves.
- J. Valve Boxes.
- K. Control Wire.

39.95.050. Installation.

- A. Schedule.
- B. Depth and Location.
- C. Trench Backfill Material.
- D. Thrust Blocks.
- E. Flushing.

39.95.010. General.

- A. Specifications. These specifications are for landscape work completed on private property that will become public property. All underground irrigation systems shall meet the requirements and specifications of APWA 32 84 23 (Underground Irrigation Systems).
- B. Appurtenances. Any minor items of labor or materials not specifically noted on the drawings or specifications; but obviously necessary for the proper completion of the work, are to be considered as incidental to and are to be included in the contract.
- C. Pressure Verification. The Contractor, prior to installing the system, must verify existing water pressure. If there is a failure to obtain the needed pressure or if an excess of pressure exists for normal operation, the Contractor shall contact the City for any adjustments to the system. Failure to report any discrepancies in pressure due to whatever reason, and installation done prior to notification of City Parks Department shall be done at the expense of the Contractor.
- D. Plan Modifications. The plans show the general arrangement of all piping. Should local conditions necessitate the rearrangement of some, or if piping can be run to better advantage, the contractor, before proceeding with the work, shall prepare and submit drawings of such to the office of the Spanish Fork City Parks Department Representative and obtain written approval before commencing work shown by these drawings.

- E. As-Built Drawings. Before the final inspection is complete, the contractor must furnish as-build drawings. These drawings should be updated on a daily basis to assure accuracy. The drawings must show the location of all valves, pipe, heads, controller control lines, and drain valves used on the job. These drawings and maintenance manuals must be submitted at the time of final inspection or in accordance to the general conditions.
- F. Final Inspection. The Contractor shall operate, maintain, and guarantee the irrigation sprinkler system until all landscaping on the project is approved by the City Parks Department at a final inspection. Contractor shall submit manufacturer's technical product maintenance data and installation instructions for irrigation sprinkler system materials and products to the City before final inspection.

39.95.020. Pipe and Fittings.

- A. Pipe. Use solvent weld schedule 40 PVC for main line pipe 3 inches in diameter and smaller. Use Class 200 PVC for main line pipe larger than 3 inches in diameter.
- B. Main Line Fittings. Use solvent weld schedule 40 PVC fittings for pipe smaller than 3 inches in diameter. All fittings for pipe 3 inch and larger pipe shall be ductile iron, grade 65-45-12 in accordance with ASTM A-536.

Fittings shall have deep bell push on joints with gaskets meeting ASTM F977. Fittings shall be Harco Deep Bell as manufactured by the Hanington Corporation of Lynchburg, VA or approved equivalent. Transition gaskets are not allowed.

- C. Circuit Pipe Fittings. Use solvent weld schedule 40 PVC fittings.
- D. Sleeves. Pipe and control wiring and tubing under walks, roads and other hard surfaces shall be installed in solvent weld Class 40 PVC sleeves of adequate size. Sleeves for pipes shall be a minimum of 3 inches in diameter or one and a half times the size of the pipes whichever is greater. Sleeves shall be straight and level or less than 2% grade. All wiring shall be placed in its own conduit. Wire conduit may be ran inside of sprinkler pipe sleeves. Conduit for control wires shall have minimum inside diameters according to the following chart:

MINIMUM SLEEVE CONDUIT SIZES	
Number of Wires	Conduit I.D.
1 to 7	1 inch
8 to 11	1 ½ inch
12 to 22	2 inch
23 to 31	2 ½ inch
32 to 36	3 inch

39.95.030. Sprinkler Heads.

- A. General. Install according to APWA plan number 621 and 622, but do not install PVC elbow and riser.
- B. Spray Heads. All spray type sprinkler heads shall be Rainbird "1800" series or approved equivalent. All lawn spray heads shall be installed on swing pipe with two spiral barbed ells.
- C. Rotary Heads. All rotary type sprinkler heads shall be Hunter "I" series or approved equivalent. All stream rotary and impact heads capable of distributing 10 gallons per minute or more shall be installed on pre-assembled swing joint by Spears or an approved equivalent.

39.95.040. Controller, Valves and Flow Meters.

- A. Controller. Controller and pedestal shall be the same type as those used in the City central control system. The controller shall be as described in the irrigation legend on the drawings.
- B. Manual Main Line Isolation Valve. See standard drawing for pressure pipe main line valves.
- C. Manual Circuit Isolation Valve. Brass ball valve with handle.
- D. Automatic Valves. Automatic valves shall be Rainbird PEB electric remote control valves or an approved equivalent. A manual circuit isolation valve shall be installed on the supply side of each automatic valve. Install according to APWA plan number 633, but do not install schedule 80 PVC union.

- E. Master Valves and Flow Meters. Master valves and flow meters must be installed on main supply line and/or according to design and must be compatible with the City central control system.
- F. Automatic Drain Valves. Install according to APWA plan number 632.
- G. Back Flow Preventer. Shall be required on connections to the drinking water system. Install according to APWA standard plan number 631.
- H. Stop and Waste Valves. Stop and waste valves shall be Mueller H - 10288 Oraseal or an approved equivalent. Stop and Waste valve shall be of manual type for operation by handle key.
- I. Quick Coupler Valves. Quick coupler valves shall be installed with brass riser and pre-manufactured swing joint. At least 2 quick coupler valves shall be installed, one at each end of main line. Valves shall be 1 inch standard.
- J. Valve Boxes. Valves shall be located in lawn or planted areas. Avoid locating valves in areas of high pedestrian and vehicular circulation. Valve boxes shall be at finished grade with valve stems 4 inches minimum and 12 inches maximum below top of box and with 3 inches of pea gravel or 3/4 inch minus crushed gravel under the valve. Valve boxes shall be rectangular, heavy duty and green in color. Valve boxes for automatic valves shall be large enough to enclose manual circuit isolation valve and automatic valve.
- K. Control Wire. Install wire according to APWA plan number 651. Add two extra blue control wires per controller to the longest run for emergency use and mark it in the control box as an extra wire.

39.95.050. Installation.

- A. Schedule. Contractor shall submit a construction schedule of anticipated work time to facilitate timely visits for review of work. Schedule must be submitted to the City before any landscaping may begin
- B. Depth and Location. Lines bordering curbs or sidewalks shall be 6 inches away to allow for maintenance and access to the lines. Control wires must be buried at least 12 inches below finished grade and bundled with a plastic tape every 20 feet.
- C. Trench Backfill Material. All trenches shall be backfilled in 12 inch lifts and tamped sufficiently to insure no settling of the surface. No rocks larger than 1 inch shall be allowed within 3 inches of the pipe. The Contractor, in placing the irrigation lines, and appurtenances, may uncover material not suitable for finished grading. This material shall be removed from the site. After the installation of the lines, the finished grading shall be smoothed over and restored to its original condition, using additional topsoil where necessary.
- D. Thrust Blocks. All mainlines greater than 2 inches in size shall be installed with thrust blocks wherever a change of direction occurs. Thrust blocks shall be installed as follows:
 - 1. Bearing area of concrete thrust-block based on 200-PSI pressure and safe soil bearing load of 2,000 pounds per square foot.
 - 2. Concrete blocking shall be cast in place and have a minimum of 1/4 square foot bearing against the fittings.
 - 3. Block shall bear against fittings only and shall be clear of joints.
 - 4. Contractor shall install block adequate to withstand full test pressure as well as to continuously withstand operation pressure under all conditions of service.
- E. Flushing. When the pipe lines are connected and the sprinkler risers in place but before any heads are installed, the control valves shall be opened and flushed with a full head of water to clean out the system.