

City of Woodland Hills

DEVELOPMENT AND CONSTRUCTION STANDARDS

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Policy 2 - Development Standards

2.1 - General Improvement Requirements

2.1.1 - General

The provisions of these Development Standards are supplementary to the Subdivision Ordinance of the City of Woodland Hills found in Section 11 of the municipal code. These standards provide general requirements for improvements to be built by the developer, sub-divider, owner or contractor for all types of construction.

The improvements shall include all street improvements in front of all lots and along all dedicated streets and any public utility easement to a connection with existing improvements of the same kind or to the boundary of the subdivision nearest existing improvements. Layout must provide for future extension to adjacent development and to be compatible with the contour of the ground for proper drainage. All improvements and any buried conduit shall be installed to the boundary lines of the subdivision or development.

The City adopts the American Public Works Association (APWA) standards for infrastructure development to include roadways, storm drains, water systems, sewer systems, underground electrical, landscaping and traffic control, along with any existing or future amendments that are made to it. (Ord. passed 04-28-20)

2.1.2 - Fees

Fees may be charged by the Mayor and City Council for the purpose of defraying expenses of all work performed by the city or its agent in connection with processing or approving the application for subdivision or for inspecting or installing any fixtures or apparatus in any subdivision. Such fees shall in no case be less than the fee charged for similar services provided by the city to persons who are not sub-dividers

2.1.3 - Improvement Installations

All improvements shall be installed in accordance with the "Development Standards". The expense of all such improvements and installations, including but not limited to expenses for all of the foregoing items and for area-wide topographical drainage, engineering, ecological or other work or study, shall be borne by the owner or sub-divider or developer subject to such terms and conditions as may be required by the City Council by way of ordinance, resolution, contract, development agreement, or otherwise.

The failure of any owner or sub-divider to comply with the terms of this provision or his/her failure to complete the installation of all of the foregoing installations, fixtures or improvements or such others as may be required by the City Council from time to time, shall upon declaration of the City Council result in the forfeiture of the bond or other security posted.

No building, installation, improvement or other permit shall be issued to any developer, builder, owner, sub-divider or to any business entity having a full or limited partner, owner, shareholder or officer who has once failed to comply with the provisions hereof or who has failed to complete the installation of all improvements, fixtures and installations required by this section or by the City Council on any previous construction or improvement project or subdivision. Any subdivision not in full compliance with this section shall not be connected to or receive any of its municipal services, including but not limited to water, sewer, electricity or refuse removal services.

2.2 - Concept Plan, Preliminary Plan, and Final Plat

2.2.1 - Concept Plan

The subdivider may submit to the planning commission a concept plan of a subdivision, including all items listed in the Concept Plan Application and Checklist. The purpose of the concept plan is to provide the subdivider an opportunity to meet with the planning commission for advice and assistance from the planning commission.

2.2.2 - Preliminary Plan

Whenever a subdivision is filed, one (1) 24x36 copy and one (1) 11x17 copy and one electronic copy of the Preliminary Plan shall be prepared and submitted. All other required documentation and fees shall be submitted along with the Preliminary Plan as outlined in the Preliminary Plan Application and Checklist.

2.2.3 - Final Plat

Within one (1) year after the approval of the preliminary plan or within the time for which an extension to make such filing has been granted, one (1) 24x36 copy and one (1) 11x17 copy and one electronic copy of the Final Plat shall be prepared and submitted. All other required documentation and fees shall be submitted along with the Final Plat as outlined in the Final Plat Application and Checklist.

2.3 - Streets

2.3.1 - General

The developer shall construct all streets required by the subdivision as specified by the City Council in accordance with the City "Development Standards". All public and private streets shall be constructed pursuant to standards recommended by the City engineer or his/her designee. The developer shall be responsible to construct all streets required in the final plat and as a condition of the final plat approval to the standard required by the City engineer or his/her designee. The developer shall be required to provide an engineered design for the street sub-grade construction.

2.3.2 - Street Widths

Arterial and collector streets shall conform to the width assigned on the major street plan whenever applicable to the proposed subdivision. For territory where such street plan has not been completed at the time of submission of the preliminary plan, street width shall be provided as directed by the Planning and Zoning Committee:

1. Minor street dedications shall have a minimum width of *fifty six (56) feet.
2. Collector street dedications shall have a minimum width of fifty-six (56) feet.
3. Arterial street dedications shall have a minimum width of sixty six (66) feet.
4. Minimum width of the paved portion of a street shall be as follows:
 - A. Minor Streets: 25 feet
 - B. Collector Streets: 25 feet
 - C. Arterial Streets: 42 feet
 - D. Cul-de-sacs: 25 feet

**Dedication of minor streets in the real property described in the Annexation and Development Agreement for the Villages at Woodland Meadows Project Woodland Hills, Utah County, Utah, dated December 19, 1997 shall have a minimum width of 50 feet.*

2.3.3 - Trails and Walkways

All trails shall conform to the width and type assigned in Woodland Hills City's general plan. Refer to the City's standard detail for construction and design details of an asphalt trail. Any deviations must be approved by the city engineer.

All hiking trails as designated in the general plan shall conform to standards as set forth by the United States Forest Service.

2.3.4 - Access to Property

Access to property shall be in accordance with 11-5-2-D of the Woodland Hills City

Code.

2.3.5 - Cul-De-Sacs

Where required for the full and best utilization of the property, cul-de-sacs may be utilized. The maximum permissible length of a cul-de-sac shall be 1000 feet and shall have a minimum width of *56 feet right-of-way for the entrance. Each cul-de-sac shall be provided at its closed end with a turn-around having a diameter at the outside of the roadway pavement of at least 84 feet, and a property line diameter of at least one hundred (100) feet. Surface water must drain away from the turn-around or toward catch basins at the discretion of the City Engineer. Emergency exits shall be required at the end of any cul-de-sac at the discretion of the City Engineer. The maximum grade on a cul-de-sac bulb shall not exceed 5%.

The length of a cul-de-sac shall be measured from the centerline of the adjoining street to the center of the bulb of the cul-de-sac.

**Cul-de-sacs within the real property described in the Annexation and Development Agreement for the Villages at Woodland Meadows Project Woodland Hills, Utah County, Utah, dated December 19, 1997 shall have a minimum right-of-way of 50 feet.*

2.3.6 - Half Streets

Half streets shall be in accordance with 11-5-2-E of the Woodland Hills City Code.

2.3.7 - Dead-End Streets/Temporary Turn-Arounds

Temporary turn-arounds are to be provided on all streets which are more than one (1) lot from road intersection. The turn-around is to be 80' in diameter and recorded as an easement with the final plat. The turn-around must be constructed consistent with the asphalt, road-base and sub-base of the adjoining street with the following exception:

If the roadway is expected to continue before the end of the durability period, the developer may choose to install a turn-around consisting of 6" road-base and 2.5" of asphalt. Should the roadway not be extended prior to the end of the durability period, the developer, will be responsible to re-install the turn-around consistent with the asphalt, road-base, and sub-base of the adjoining street prior to release of the durability retainer.

2.3.8 - Curves

Reverse curves shall have a tangent of at least one hundred (100) feet unless, in the opinion of the Planning Commission, such is not necessary. Two curves in the same

direction shall be separated by a tangent of at least 200 feet except that the Planning Commission may authorize a tangent of less than 200 feet where it can be shown that no appreciable traffic hazard will result there from.

2.3.9 - Street Intersections

Streets shall intersect each other as near as possible at right angles. Street jogs with centerline offsets of less than 125 feet shall be prohibited. Where streets intersect major arteries, their alignment shall be continuous. Minor streets shall approach arterial or collector streets at an angle of not less than 80 degrees for a distance of at least one hundred (100) feet. Streets convening at one point shall be reduced to the least practical number.

2.3.10 - Clear Vision Area

No fence, wall, structure, planting or topographic or grading arrangement shall be erected, or established on any corner lot which will obstruct the view of a driver of a vehicle approaching the intersection. The unobstructed corner shall mean a triangular area formed by the street property lines and a line connecting them at points thirty-five (35) feet from the intersection of the street lines or in the case of a rounded property corner, from the intersection of the street lines, produced along the sub-tangents of the curve to said point of intersection. Existing vegetation not in conflict with the Wild land Interface Ordinance of Woodland Hills or other ordinances regulating removal of vegetation need not be removed unless the Planning Commission determines that a hazard exists.

2.3.11 - Street Grades

Minimum street grades of 0.5% shall be required and a maximum grade of 10% will be allowed, except that the Planning Commission may allow up to a maximum of 12% for a total distance not greater than one thousand (1000') feet in any two thousand (2000') feet of street distance; and further provided that up to five hundred (500') feet of said one thousand feet may exceed 12% but not more than 14% when, in the opinion of the Planning Commission and the City Engineer, the best and safest development of the land is secured thereby. The maximum grade on a cul-de-sac bulb shall not exceed 5%.

Intersection shall be designed with a flat grade, where required by the City Engineer. In hilly or rolling areas, at the approach to an intersection, a leveling area shall be provided along minor streets having less than a two (2) percent slope for a distance of sixty (60) feet, measured from the nearest right-of-way line of the intersecting street.

2.3.12 - Street Curves

Where the street lines within a block deflect from each other at any one point more than ten (10) degrees, there shall be a connecting curve. The radius of the curve for the inner street line shall be not less than 350 feet for arterial streets, 250 feet for collector streets, and 100 feet for minor streets.

2.3.13 - Horizontal Alignment

The centerline of pavement shall coincide with centerline of the right-of-way, except for irregular rights-of-way.

2.3.14 - Survey Monuments

Survey monuments shall be placed in the subdivision as required by the City engineer.

All property corners shall be marked with a rebar corner marker. 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 T-post four feet out of the ground on the property line alignment. Where a curb is present, the alignment of the side property line for each lot in the subdivision shall be marked in the top back of curb with a lot line witness marker.

2.3.15 - Bridges and Culverts

All bridges and culverts shall be constructed to support gross vehicle weight of seventy five thousand (75,000) pounds minimum.

2.3.16 - Parking Lots and Driveways

Parking shall meet the requirements of the zoning ordinance.

Parking lots and drives shall be designed to meet appropriate engineering standards, including drainage and load capacity. All drive and parking lot drainage asphalt, and base design designs shall be reviewed by the City engineer or his/her designee prior to approval. Driveways shall provide a minimum unobstructed width, not including shoulders, of ten (10) feet and minimum unobstructed overhead clearance of 13.5 feet. Driveway grades shall not exceed 15% as measured along the center line of the driveway. The driveway grade requirement can be modified by the city council where observance of this standard is not feasible due to the terrain in which the driveway is to be constructed. On all lots, driveway approaches shall slope away from the edge of asphalt at 2% at least to the back of the rock lined ditch. Driveway approaches within the city right of way shall not exceed a grade of 4%. Drainage culverts shall be constructed beneath all driveways. Culvert size shall comply with the culvert sizing exhibit posted online.

The intersection of the driveway with the main road will be on a twenty foot radius that will start ten feet back from where the driveway intersects with the main road.

2.3.17 - Intersection Radius

All intersections are to have a radius of 25' as measured at the edge of the asphalt. All culverts are to be extended to provide and accommodate the asphalt radius and the installation of required road-base, shoulder, and rock-lined ditch.

2.3.18 - Geotechnical Design

All roadways to be constructed within Woodland Hills City shall be improved according to a Geotechnical Investigation and Pavement Design as prepared by a licensed professional geotechnical engineer in the State of Utah. All pavement designs shall include traffic study results and/or traffic assumptions which must be submitted to the City Engineer for review and approval. The City Engineer may require higher traffic counts based on future development and planning requirements.

2.4 - Inspection

2.4.1 - All Work Subject to Inspection

All construction work involving the installation of improvements in subdivisions that shall be dedicated to the City, shall be subject to inspection by the City. The developer shall be responsible to provide inspection and certified reports from a qualified testing lab or engineering firm for the following inspections:

1. Compaction of all trenches;
2. Pressure tests on water mains;
3. Inspection and testing of sewer and other utilities as required by the city
4. Slump tests and compression tests and air entrainment on all concrete work; and
5. Compaction test on all sub-base, untreated base course, and bituminous surface course.

Certain types of construction shall have continuous inspection while others may have only periodic inspections. It shall be at the discretion of the City Engineer on the continuous inspections. It is the responsibility of the developer/sub-divider to insure that all contractors give the City appropriate notice to allow scheduling of said inspections. Inspection shall be required on the following types of work:

- A. Laying of street surfacing.
- B. Laying of drainage pipe, water pipe, sewer lines, valves, hydrants and testing.

- C. Sub-grade.
- D. Street grading and gravel base.
- E. Excavations for structures.
- F. Trenches for laying pipe.
- G. Forms for structures. No work shall be started except in the presence of, or with the prior approval of the City engineer or his/her designee.

2.4.2 - Inspection Fees

Inspection fees and/or connection fees required by ordinance shall be paid and permits required shall be obtained prior to the recording of final plat.

2.4.3 - Security for Improvements Required

All requirements for the security for improvements shall be in accordance to Section 11-4-4 of the Woodland Hills City Code.

2.4.4 - Acceptance of Improvements

Inspections made by the City to determine compliance with the specifications does not imply acceptance of the work. The City requires completion of all facilities before any are accepted for maintenance. Final acceptance of improvements will be made by City council action, following inspection and written approval by the City engineer. All improvements shall be free from defects or damage at the time of inspection. Specifically the following are required:

1. All water valve boxes shall be raised to pavement level.
2. All water valves and hydrants shall be operative.
3. Grades. All grades and cut sheets shall be approved by and obtained from the City engineer or his/her designee.
4. Construction signs. The contractor shall furnish and maintain adequate construction signs and barricades to protect the public and shall meet the requirements of the Manual of Uniform Traffic Control Devices.
5. Clean-up. Where excavations are made in City streets, the rock, etc., shall be removed and gravel base placed in the excavation the same day as backfill is placed.

2.4.5 - Underground Utilities

Utilities including electrical, telephone, and cable television lines, shall be underground except when the City feels that such underground lines are not in the best interest of the City. Refer to Section 11-5-9 of the Woodland Hills City code.

2.4.6 - Access to Premises

Utility Access to Premises - Any properly identified representative of the Utility shall, at all reasonable hours, have free access to and from the premises of the Consumer for the purpose of inspecting the Consumer's installations and electric equipment and for the purpose of reading, repairing, testing, or removing the Utility's meter or its other property. When, in the opinion of the Utility, emergency conditions exist with respect to the Utility's service, the Utility's representative shall have immediate and free access to the Consumer's premises.

2.4.7 - Requests for Inspection

Requests for inspection shall be made to the City by the person responsible for the construction. Requests for inspection on work requiring continuous inspection shall be made three (3) days prior to the commencing of the work. Notice shall also be given one (1) day in advance, (excluding weekends) of the starting of work requiring periodic inspection.

2.4.8 - Pre-Construction Meeting

The contractor must schedule a pre-construction meeting with the City Engineer 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 pre-construction meeting. Work must begin within three (3) weeks of the pre-construction meeting or the contractor must schedule a new pre-construction meeting.

2.4.9 - Construction Completion Inspection

An inspection shall be made by the City engineer or his/her designee after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work within a period of thirty (30) days of the date of City engineer's or his/her designee inspection report defining the faulty or defective work.

One (1) year after the Contractor or Developer passes the end of construction inspection, he or she must schedule a formal acceptance inspection.

If the contractor or developer does not pass inspection, a punch list of work items necessary to pass inspection will be given to the contractor or developer. The contractor or developer must reschedule an inspection with the city until the project or development passes the inspection

It is further agreed and understood that the determination for necessity of repairs and maintenance of the work rests with the City engineer or his/her designee. His/Her decision upon the matter shall be final and binding upon the developer, and the guarantee hereby stipulated shall extend to and include, but shall not be limited to the entire street base, and all pipes, joints, valves, backfill and compaction as well as the working surface, curb, gutter and other accessories that are, or may be affected by the construction operations, and whenever in the judgment of the City engineer or his/her designee, shall cause a written notice to be served to the developer and thereupon the developer shall undertake and complete such repairs, maintenance or rebuilding. If the developer fails to do so within ten (10) days from the date of the service of such notice, 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 twenty (20) percent in addition thereto for stipulated damages for such failure on the part of the developer to make the repairs.

2.4.10 - Work without Inspection

Any work performed without proper inspections, as required above, will give the City the option to hold the bond covering that portion of the improvements in violation or require removal and replacement of the un-inspected work. The City shall have the option of retaining part or the entire bond for two (2) years after installation of improvements in violation of this chapter. It is pertinent that the developer insure his/her contractors request all necessary inspections.

2.4.11 - As-Built Drawings

As-built drawing shall be submitted to the City engineer or his/her designee before final inspection and acceptance by the City. The portion of the bond generally released at final inspection will not be released until the as-builts are submitted and approved.

2.4.12 - Testing

1. Quality Assurance
 - A. The developer or Contractor shall be responsible for all sampling, delivery of samples to a qualified testing agency, testing, and delivery of test results or materials certifications to the City at no charge to the City. Testing and certifications reports shall be approved by the City as to conformance to City Standard Specifications prior to final inspection and/or acceptance by the City of any materials or workmanship.

2. Submittals

- A. Field Test Report: When possible, submit original report immediately to Engineer or inspector, but in no case later than end of current day.
 - B. Laboratory Test Report: Submit original report to Engineer within 48 hours after test results are determined.
3. Sampling
- A. 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.
 - B. The presence of a City Inspector shall not relieve the Developer/Contractor of any requirement in Section 2.4.9.
 - C. Each sample or test shall be accompanied by the following written data, which shall be reported to the City with test results:
 - a. Name of Project
 - b. Name of Developer/Contractor
 - c. Project Street Address
 - d. Appropriate Test Name
 - e. Date of Sampling
 - f. Sample Number (if more than one sample per day)
 - g. Name of technician who performed the testing
 - h. Location of sample
4. Testing Agency
- A. All materials testing, whether in a laboratory or in the field, shall be conducted by a testing agency approved by City.

2.4.13 - Occupancy

Occupancy shall be in accordance with 10-4-7 of the Woodland Hills City Code.

2.5 - Prerequisites of Contractors

2.5.1 - Licensed Contractor

All work performed in accordance with this title shall be performed by a contractor licensed to perform such work by the State of Utah.

2.5.2 - Prequalification

- 1. Insurance

- A. The contractor shall not commence work in City property, streets, easements, or right-of-ways until he has obtained, as a minimum, the insurance required hereunder and evidence of such insurance has been submitted to and approved by the City. The submittal of said evidence to the City shall not relieve or decrease the liability of the contractor hereunder.

- B. Workers' Compensation & Employers' Liability Insurance.
 - a. As required by State law.
 - b. Commercial General Liability Insurance - ISO Form CG 00 01 (11/85) or equivalent, occurrence policy, with the following information:
 - (I) Limits of not less than –
 - i. General Aggregate - \$1,000,000
 - ii. Products - Comp/OPS Aggregate - \$1,000,000
 - iii. Personal and Advertising Injury - \$500,000
 - iv. Each Occurrence - \$500,000
 - v. Fire Damage (any one fire) - \$50,000
 - vi. Medical Expense (any one person) - \$5,000
 - (II) Endorsements attached thereto including the following or their equivalent:
 - i. 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.
 - ii. ISO Form CG 20 10 (11/85), Additional Insured --Woodland Hills, 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".
 - iii. Automobile Liability Insurance, with
 - a. Limits of not less than \$1,000,000 Combined Single Limit per accident.
 - b. Coverage applying to any auto.

Woodland Hills requires all contractors doing work in or on any City property, street, easement, or right-of-way to pre-qualify. A current contractor's license, insurance information, and an information sheet must be on file with the engineer's office, prior to any construction in present or proposed City streets.

A bond will be required with each project. Prior to any construction being completed in or on City property, streets, easements, or right-of-ways, a permit must be picked up and approved. The permit must be completed forty-eight (48) hours prior to construction. A notice must be given to the City engineer or his/her designee 24 hours prior to inspections. Failure to obtain a permit or proceeding without notification shall constitute grounds for legal action. The City will inspect all work. The contractor must make

arrangements with the City for inspections. If work is performed without proper inspections or without pre-qualifying, the City may hold that portion of the bond for five (5) years after completion of improvements, or require reinstallation.

Prior to starting construction, the developer shall schedule with the City engineer or his/her designee a pre-construction meeting with all contractors and sub-contractors. Contractors are required to meet with the City engineer or his/her designee prior to commencing construction.

2.5.3 - Street Excavation Permits

In order for a street excavation permit to be approved, Woodland Hills needs the following information: (1) Copy of Contractors License; (2) Certificate of Insurance; (3) Cash Bond of \$5,000.00; and (4) Detailed drawing of proposed work and traffic control (4 copies).

The contractor is given a copy of the signed permit and the signed / approved plan after the City engineer or his/her designee has approved and signed the application. Time limits may be set; and the permit can be suspended for non-compliance.

2.6 - Earthwork

2.6.1 - General

This section defines the requirements for excavation and backfill for structures, construction requirements for embankments and fills and sub-grade preparation for pavements and other surface improvements.

2.6.2 - Sub-grade Soil

Sub-grade soil 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 (six) inches in thickness, each layer being embedded in the subsoil 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.

2.6.3 - Backfill around Structures

Backfill around structures shall be placed to the lines shown on the approved drawings, or as directed by the City engineer or his/her designee. After completion of foundation, footings and walls and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of excavated material or borrow of sand, gravel, or other suitable material, and shall be placed in layers not exceeding eight (8) inches in uncompacted thickness. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density equal to ninety-five (95) percent of maximum dry density as measured by AASHTO T180 Method C.

2.6.4 - Construction of Embankments and Fills

Unsuitable materials that occur in the foundation for 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 six (6) inches, and the loosened material shall be moistened and compacted as hereinafter specified for each layer. All materials in embankments and fills shall be placed, moistened, and compacted as provided in the following paragraphs.

When the 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 to starting of hauling operations.

The materials used for embankment and fill construction shall be free from sod, grass, trash, rocks larger than six (6) inches in diameter and all other material unsuitable for construction of compacted fills. Grading of completed embankments and fills shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1 foot of the design grade.

2.6.5 - Compacting Earth Materials

The material shall be deposited in horizontal layers having a thickness of not more than 6 (six) inches after being compacted as hereinafter specified; provided, that when mechanical equipment is used for placing and compacting the material on a sloping foundation, the layers may be placed parallel to the foundations. The distribution of materials shall be such that the compacted material will be homogeneous and free from lenses, pockets, or other imperfections. Prior to and during compaction operations the material shall have the optimum moisture content required for the purpose of compaction and the moisture content shall be uniform throughout the layers, insofar as practical. Moistening of the material shall be performed at the site of excavation, but such moistening shall be supplemented, as required by sprinkling at the site of construction. If the moisture content is more than optimum for compaction the

compaction operations shall be delayed until such time as the material has dried to the optimum moisture content. When the material has been conditioned as hereinbefore specified, the backfill or embankment shall be compacted as follows:

1. Under roadways and extending one foot beyond the proposed curb line the fill or embankment material shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO T-180, Method C or the modified proctor test ASTM D-1557.
2. Under driveways the fill or embankment material (to at least one foot each side of the edge of the slab) shall be compacted to a density equal to not less than 95% of maximum dry density as measured by AASHTO T-180, Method C or the modified proctor test ASTM D-1557.
3. Other fills and embankments not listed above shall be compacted to a density equal to not less than 90% of maximum dry density as measured by AASHTO T-180, Method C or the modified proctor test ASTM D-1557.

2.6.6 - Road Sub Grade Preparation

In both cut and fill areas the paving sub-grade shall be scarified to a depth of ten (10) inches and compacted to the equivalent of ninety-five (95) percent of maximum dry density as measured by AASHTO T-180, Method C or the modified proctor test ASTM D-1557. No rocks larger than two (2) inches in diameter, organic material, soft clay, spongy material or other deleterious material will be permitted in this scarified sub-grade layer. Rough sub-grades shall be shaped and graded to within a tolerance of 0.15 feet of design grade and drainage shall be maintained at all times. The developer shall provide to the City engineer or his/her designee the results of a sub-surface investigation performed by the developer's engineer and the recommendation as to whether existing material is adequate for road construction. Sub-surface investigations should be done to determine if bank run is needed under the road base.

During the rolling operation, moisture content of the sub-grade layer shall be maintained at no less than ninety-seven (97) or more than 105% of optimum moisture content. Rolling shall be continued until the entire road bed (to one foot back of road) is compacted to the specified density to a minimum depth of ten (10) inches.

2.6.7 - 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.

2.6.8 - Water Settling

Water settling may be permitted with pre-approval by the City engineer or his/her designee, depending upon the type of soil and location. When water settling is approved, a City representative shall be at the job site during the compaction. When the material has dried sufficient to allow compaction tests, the contractor shall dig test holes for compaction tests at locations and depths required by the City engineer or his/her designee.

2.6.9 - Removal and Replacement of Defective Fill

Fill not conforming to the requirements of this specification shall be reworked to the requirements or removed and replaced with acceptable fill.

2.7 - Excavation and Backfill for Trenches

2.7.1 - General

These specifications cover excavation and backfill of trenches for the installation of storm sewer, sanitary sewer, and water lines in streets and subdivisions.

2.7.2 - Trench Safety

All construction shall be done in accordance with the provisions of the Utah State Industrial Commission and OSHA regulations. No trenches shall be left open at any time unless guarded with adequate barricades, warning lamps and signs.

When required, excavation shall be braced and shored to support the walls of the excavation to eliminate sliding and settling and as may be required to protect the workers, the work in progress, and existing utilities and improvements. All such sheeting, bracing and shoring shall comply with the requirements of the Utah State Industrial Commission and OSHA.

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.

2.7.3 - Dewatering Excavation Area

All seepage or storm water that may occur or accumulate in the excavation during the progress of the work shall be removed. In areas where the nature of the soil and the hydrostatic pressures are of such a character as to develop a quick condition in the earth mass of the trench, the DEWATERING operation shall be conducted so that the hydrostatic pressure will be reduced to or near zero in the immediate vicinity of the trench. All excavations shall be kept entirely free of water at all times during the construction of the work or until otherwise directed by the City engineer or his/her designee.

2.7.4 - Gravel Foundation for Pipe

When the sub-grade material does not afford a sufficiently solid foundation to support the pipe and superimposed load; where water must be drained to maintain a dry bottom for pipe installation and at other locations as previously defined, the sub grade shall be excavated to the specified depth and replaced with crushed rock or gravel conforming to the following gradation:

Screen	% Passing
1"	100
1/2"	5

The gravel material shall be deposited over the entire trench width in six (6) inch maximum layers; each layer shall be compacted by tamping, rolling, vibrating, spading, slicing, rodding or by a combination of one or more of these methods. In addition the material shall be graded to produce a uniform and continuous support for the installed pipe.

2.7.5 - Disposal of Materials

All excavation material, which is not required for or is unsuitable for backfill, shall be immediately removed from the area and not obstruct streets, and driveways.

Storm ditches shall be kept clean of excavated material.

2.7.6 - Trench Backfill

1. General. The term backfill as hereafter used has reference to the filling of the trench to the natural ground level or to the grade line.
2. Backfill Around Concrete

- A. Granular material containing no rocks larger than two (2) inches for pipe sizes of eight (8) inches to twenty-four (24) inches in diameter.
 - B. Maximum rock size of three (3) inches for bedding of pipe over twenty-four (24) inches in diameter
 - C. Granular material shall be well graded as to participle size and distribution.
 - D. Granular materials shall be placed under and around the pipe in horizontal layers not to exceed 6 inches and tamped by hand or pneumatic tampers up to the lower one-sixth (1/6) of the outside diameter of the pipe and with a minimum of three (3) inches below the pipe. The pipe shall be covered to at least six (6) inches above the top of the pipe using the same material.
3. Backfill around Corrugated Steel, Plastic, Polyethylene or Other Fragile Materials
- A. Back fill around these types of pipe shall be minus one (1) inch granular material. It shall be placed at least three (3) inches below the pipe and to the center of the pipe and compacted to a minimum of ninety percent (90%) of the maximum density as per AASHTO T-180 method C. Then backfill will be placed in horizontal layers not to exceed six (6) inches or as approved in writing by the City engineer or his/her designee. The pipe shall be covered with the same material up to twelve (12) inches above the top of the pipe.
4. Backfill around Ductile Iron and Steel Pipe
- A. Under no circumstances shall the granular material around the pipe exceed two (2) inches in diameter.

2.7.7 - Backfill for Pipe on Hard Foundations

In no case shall pipe be laid directly on rock, hard clay, shale or other hard material. Where foundations are of this nature, the contractor shall excavate a space below the pipe and backfill it with bedding material. Under these circumstances the depth of the bedding material shall not be less than one-half inch (1/2") per foot of height of fill above the pipe with a minimum allowable thickness of four inches (4"). The remaining backfill shall be in accordance with the procedure outlined in Section 2.7.4.

2.7.8 - Backfilling above Pipe Zone and Consolidation of Backfill

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. In these specifications the process of preparing the trench bottom to receive the pipe and the backfilling on each side of the pipe to a level over the top of the pipe is defined as bedding. Bedding requirements are as defined in the specifications for each specific pipe material.

Trench backfilling above the level of the pipe bedding shall normally be accomplished with native excavated materials, unless such material cannot be properly compacted, and shall be free from rocks larger than six (6) inches in diameter and any organic material or debris.

The backfill in all utility trenches shall be either compacted or consolidated according to the requirements of the materials being placed. Under pavements, or other surface improvements the in place density shall be a minimum of ninety-five (95) percent of laboratory standard maximum dry density as determined by AASHTO T-180, method C or the modified proctor test ASTM D-1557 In shoulders and other areas the in place density shall be a minimum of ninety (90) percent of the maximum dry density as determined by the same laboratory method.

2.7.9 - Compaction and Consolidation of Backfill

1. Compaction of Backfill
 - A. Backfill shall be compacted by means of sheep foot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers of a size and type approved by the City engineer or his/her designee.
 - B. During compaction, the material shall be placed at moisture content such that after compaction, the required relative densities will be produced; also the material shall be placed in lifts which, prior to the compaction, shall not exceed twelve (12) inches or as approved in writing by the City engineer or his/her designee. Prior to compaction each layer shall be evenly spread, moistened, and worked by disk harrowing, or other means approved by the City engineer or his/her designee. If the required relative density is not attained, test sections will be required to determine any adjustments in compacting equipment, thickness of layers, moisture content and compactive effort necessary to attain the specified minimum relative density.
 - C. Approval of equipment, thickness of layers, moisture content and compactive effort shall not be deemed to relieve the contractor of the responsibility for attaining the specified minimum relative densities. The contractor in planning his/her work shall allow sufficient time to perform the work connected with the test sections and to permit the City engineer or his/her designee to make test for relative densities.
2. Consolidation of Backfill
 - A. When authorized by the City engineer or his/her designee, shall be accomplished by those methods in which water is used as the essential agent to produce the desired condition of density and stability. Water shall be applied by jetting unless flooding is specifically authorized by the City engineer or his/her designee. Authorization by the City engineer or his/her designee to use any consolidation method does not relieve the contractor of his responsibility to meet the specified

density requirements. Water for consolidation shall be furnished by the contractor at his/her own expense.

- B. In the jetting procedure the jets shall be inserted at not more than four-foot intervals (staggered) throughout the length of the backfilled area and shall be slowly forced down to the bottom of the trench or top of previously jetted lift and held until the trench backfill is completely saturated with water. Depth of jetted lift shall not exceed 5 feet. All water consolidation shall be performed as per Section 2.6.9.
- 3. Imported Backfill Material
 - A. In the event the native excavated material is not satisfactory for backfilling as determined by the City engineer or his/her designee, the contractor shall provide imported granular material. This granular material shall pass a 4-inch square sieve and shall not contain more than fifteen (15) percent of material passing a 200-mesh sieve, and shall be free from sod, vegetation and other organic or deleterious materials.
 - 4. Disposal of Excess Materials
 - A. All excess materials shall be hauled away from the construction site and disposed of by the contractor.
 - 5. Compaction Tests on Trenches shall be conducted at a minimum of each 150 linear feet of trench, around manholes, valve boxes, and each lateral per lift.

2.7.10 - Cutting of Asphalt

Where the excavation is made in a paved street, the asphalt surface shall be cut on each side of the trench prior to excavation to provide a vertical joint in the surface. Cutting of the asphalt will be made with an asphalt saw.

2.7.11 - Testing

Tests to determine acceptability of backfill placed will be done by a firm hired by the developer. The testing company/developer will use standard procedures of the American Society of Testing Materials (ASTM) and/or American Association of State Highway Transportation Officials (AASHTO). If the backfill so tested does not meet the requirements of these specifications, the trench shall be re-excavated and the backfill replaced in accordance with these specifications.

2.7.12 - Blasting

Blasting will not be allowed except by permission from the City engineer or his/her designee. The contractor shall comply with all laws, ordinances, and applicable safety

code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property. He/she shall be fully responsible for all damage attributable to his/her blasting operations.

Excessive blasting or overshooting will not be permitted and any material outside the authorized cross section which may be shattered or loosened by blasting shall be removed by the contractor.

2.8 - Water Lines

2.8.1 - General

These specifications cover the installation of culinary water lines. Special and unusual piping and plumbing for equipment or structures are treated as separate items and are not included in this item.

1. Inspection
 - A. All pipe used shall be carefully inspected prior to installation. Any or all defective pipe shall be rejected.
2. Care and Handling of Pipe
 - A. Adequate precautions shall be taken to prevent damage to piping and protective coatings. Proper implements, tools, and facilities shall be provided and used for safe and convenient prosecution of the work. Pipe placed in trenches shall be lowered in place piece by piece by means of ropes, booms, or any type of power equipment sufficient to handle each piece separately. In no case shall pipe be allowed to fall freely from the top to the bottom of the trench.
3. Pipe Cleanliness
 - A. 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.
4. Minimum Cover
 - A. All water mains and service laterals shall have a minimum cover of 4 feet to the top of the pipe.

2.8.2 - Pipe Installation

1. General
 - A. The pipe shall be installed in accordance with the best current practices. Under no circumstances will any pipe be laid until inspection is complete and selected samples have adequately passed the requirements of the applicable specification. All pipes shall be laid true to line and grade where indicated. A suitable

foundation of either sand or ¾” minus drain rock shall be used as pipe bedding. Pipe bedding shall maintain a slight excavation for the bell at the joints.

2. Rubber Gasket Joint
 - A. All rubber joints shall be completed in accordance with installation instructions supplied by the manufacturers of the pipe, taking particular care to avoid twisting of the pipe or otherwise causing damage to the gasket.
 - B. All joints to be deflected shall be laid straight and then deflected after the joint is completed.
 - C. Backfill may or may not be done prior to placing the next section of pipe at the option of the contractor, but subsequent adjustment or damage to jointing shall require the pipe section to be removed, cleaned and rejoined as for new pipe at the contractor's own expense.

3. Connection to Existing Water Lines
 - A. Information on the drawings regarding existing water lines is taken from "as-constructed" drawings from the City or utility company files and may or may not be accurate as to size, type of material or location.
 - B. The Contractor will be responsible to determine the proper fittings and materials required, obtain the City engineer or his/her designee's approval of the planned connection, and perform the construction in a suitable fashion.
 - C. 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.

2.8.3 - Ductile Iron Pipe

1. Materials
 - A. Ductile iron pipe shall conform to all requirements of ANSI/AWWA C151/A21.51, "American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined molds, for Water or Other Liquids." 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.
 - B. All pipe shall be made of good quality Ductile Cast Iron and of such chemical composition and structure as is required to meet the physical and mechanical property requirements of the standard and wrapped with polywrap as per AWWA C105.

2. Joints
 - A. Mechanical Joints
 - a. All mechanical joints shall meet requirements of ANSI/AWWA C111/A21.11. All gasket surfaces shall be smooth and free from

imperfections. Gaskets shall conform to tests in accordance with specifications and shall be less than one year old.

B. Push-on Joints

- a. All push-on joints shall meet the requirements of ANSI/AWWA C111/A21.11. Gaskets shall be free from defects and not over one year old. Lubricants shall be non-toxic and have no deteriorating effects on gasket materials. It shall not impart taste to water in a pipe. It shall conform in every way to ANSI 21.11.

C. Flanged Joints

- a. Flanges shall meet the requirements of ANSI/AWWA C110/A21.10, "American National Standard for Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch for Water and Other Liquids." Flanged joints shall be bolted firmly with machine; stud or cap bolts of proper size. Flange maybe cast integrally with the pipe or may be screwed on threaded pipe. Flanges shall be faced and drilled and of proper dimensions for size and pressure required. Bolts and nuts, unless otherwise specified, shall be made of the best quality refined iron or metal steel and have clean, well-fitting threads. Bolts will be provided with standard hexagonal nuts and standard hexagonal heads. Bolts shall be of the diameter required for each flange and when installed shall be of length so that no more than 3/8-inch or less than 1/8-inch extends past face of nut. [All buried fittings having steel bolts shall be coated with a non-oxide wax and wrapped with polyethylene].
- b. Gaskets shall be rubber, either ring or full face, and are 1/8th-inch thick. A gasket for each flanged joint of proper size as shown on the drawings.

3. Coatings and Linings for Ductile Iron Pipe

- A. All exterior surfaces of pipe and fittings shall be coated with hot coal tar approximately 1 mil thick. All interior surfaces shall be cement mortar lined with a standard thickness according to ANSI/AWWA C104/A21.4-80.

4. Flanges

- A. Flanges when required shall conform to ANSI/AWWA C115/A21.15-83.

5. Fittings

- A. Fittings for Ductile Iron Pipe shall conform to the provisions of ANSI/AWWA C110/A21.10-82 or C153/A21.53-58.

2.8.4 - Polyvinyl Chloride Pipe

This pipe may only be used when authorized by the City Engineer or his/her designee.

Materials - Pipe for the transmission and distribution of culinary water shall be manufactured in accordance with AWWA C900-97, "AWWA Standard for Polyvinyl

Chloride (PVC) Pressure Pipe, 8 inch through 12 inch, for Water”. The PVC pipe shall have a cast iron pipe equivalent outside diameter. PVC pipe 14 inches and larger shall be manufactured in accordance with AWWA C905-88, “AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 inch through 36 inch”. All PVC pipe 4 inch and larger shall be DR. 18 with a working pressure of 150 PSI.

Joints - Joints shall be push on rubber gasket type. Lubrication shall be water soluble, non-toxic, non-objectionable in taste and odor imparted to the water, non-supporting of bacteria growth, and have no deteriorating effect on the PVC pipe or rubber gaskets.

Fittings - All fittings to be used with the PVC pipe shall be the same as fittings for Ductile Iron Pipe and shall conform to the provisions of ANSI/AWWA C110/A21.10-82 or C153/A21.53-58. All PVC pipe being inserted into fittings shall have the bevel end removed. All fittings shall be polywrapped.

Color - All PVC pipe shall be blue or white for water mains.

Magnetic Locator Tape - All pipe shall include a 3 inch magnetic locator tape installed in the pipeline trench approximately 12 inches below the ground surface. Water tape shall be prepared with white or black printing on a blue field, having the words: WATER.

Tracer Wire - A 12 gauge solid THHN tracer wire shall be installed with all pipe. DBY 3M underground splices shall be made at all tees crosses and service lines. Wire shall be pulled tight along the pipe.

Restraining - Either thrust blocks or mechanical restraining devices shall be used for all tees, valves, plugs, caps and at bends deflecting 22½ degrees or more. Restraining shall be accomplished according to the standard drawings.

Cutting - Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method recommended by the manufacturer. After cutting, the pipe shall be beveled and filed to prevent gasket damage in joint assembly except when connecting to mechanical joint fittings.

2.8.5 - Valves

1. Resilient Seated Gate Valve
 - A. Valves in sizes 4" through 10" shall be of the iron body, non rising bronze stem, resilient seated type, manufactured to equal or exceed all applicable AWWA standards of C-509 latest revision and all specific requirements outlined in these specifications.

- a. Valves shall open left and be provided with 2" square operating wrench nuts unless otherwise specified.
- b. When valves are Mechanical Joint, they shall be furnished with all necessary glands, followers, and bolts and nuts to complete installation.
- c. The disc shall have integrally cast ASTM B-62 bronze stem nut to prevent twisting, binding or angling of the stem. Designs with loose stem nuts are not acceptable.
- d. Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.
- e. All internal ferrous surfaces shall be coated, holiday free, to a minimum thickness of 4 mils with a two part thermo setting epoxy coating. Said coating shall be non-toxic, impart no taste to the water, formulated from materials deemed acceptable in the Food and Drug Administration Document Title 21 of the Federal Regulations on food additives, Section 121.2514 entitled Resins and Polymeric Coatings. It shall protect all seating and adjacent surfaces from corrosion and prevent build-up of scale or tuberculation.
- f. The sealing element shall be secured to the disc with self locking stainless steel screws, and it shall be field replaceable, and shall be such that it cannot be installed improperly.
- g. Stem failure from over torquing in either the open or closing position shall occur externally at such a point as to enable the stem to be safely turned by use of a readily available tool after exposure of the valve through excavation.
- h. Valve design shall incorporate a positive metal to metal stop to prevent over-compression of the sealing element.
- i. A full faced composition gasket placed between machined body and bonnet flanges is required to eliminate cold flow or creep action present with "O" ring gasketed bodies.
- j. The exterior of the valves shall be Asphalt Varnish, JAN-P-450. If exterior epoxy is used, all bolts and nuts shall be made of Stainless Steel to prevent galvanic corrosion of said nuts and bolts due to insulation from the ferrous valve and line.

2. Butterfly Valve

- A. Unless otherwise noted, all valves 12" and larger shall be butterfly valves conforming to the latest revision of AWWA Standard C-504, Class 250-B, and shall comply with the following:
 - a. 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 C-111. 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.

- b. 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.
- c. The resilient seat shall be natural rubber bonded to an 18-8, Type 304 stainless steel retaining ring secured to the disc by 18-8, Type 304 stainless steel screws. The seat shall be capable of mechanical adjustment in the field and field replaceable without the need for special tools. Valve body seat shall be 18-8, Type 304 Stainless Steel.
- d. Valve shafts shall be 18-8, Type 304 stainless steel. Shafts shall be of the two piece stub design and attached to the disc by means of "O" ring sealed taper pins with lock nuts.
- e. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing designed to center the valve disc at all times.
- f. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
- g. Valve shaft seal shall consist of "O" Rings. Where the valve shaft projects through the valve body for actuator connection, the "O" Ring packing seal shall be field replaceable as a part of a removable bronze cartridge.
- h. When manual actuators are required they shall be of the traveling nut design capable of withstanding 450 foot pounds of input torque against the open and closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable. Valves shall be installed with the shaft horizontal unless otherwise directed by the Engineer and shall be provided with a 2-inch square operating nut for manually operating the valve with a "T" handle wrench.
- i. 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.

3. Valve Boxes

- A. 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 "Water" cast in the metal.
- B. 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 four (4) feet on all sides of the box, or to the undisturbed trench face if less than four (4) feet. Valves shall have the interiors cleaned of all foreign matter before installation.
- C. All valve boxes located in streets shall be installed as nearly to grade as possible.

4. After the pavement is in place, the valve boxes shall be raised to grade, the surrounding asphalt shall be neatly cut to form a 2 foot square opening with the valve box centered, and a concrete collar shall be cast around the box. Valve boxes in off-road areas shall extend six (6) inches above grade. Lid detail shall be similar to Comco C-6517.
5. Couplings
 - A. 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.
6. Pressure Regulation Valves
 - A. 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 prior to starting construction.

2.8.6 - Fire Hydrants

Fire hydrants shall be installed according to the standard detail for fire hydrants as contained in the Woodland Hills City Development and Construction Standards.

Fire hydrants shall be 6-inch water cast iron Muller Modern Construction or approved equal and conform to Specification C-502-64 of the American Water Works Association, including a 6-inch gate valve and valve box complete for a 4' -6" trench with one 4-1/2 inch streamer nozzle and two 2-1/2 inch hose nozzles. Hydrant shall open to the left and be frost proof. The threads shall be National Standard Fire Hose Thread. All outlets will have a national standard thread and the hydrant shall be red in color.

Fire hydrants shall be located according to the following Requirements:

1. For any continuous or through street, the minimum number of fire hydrants available to a building shall not be less than 1 hydrant per 500 feet and the maximum distance from any point on a street or road frontage to a hydrant is 250 feet as measured along the right-of-way. On dead end streets or roads, the spacing between hydrants shall be 400 feet and the maximum distance from any point on a street or a road frontage to a hydrant shall be 200 feet as measured along the right-of-way.
2. If the rear of the building or facility is located within 150' from the right-of-way, measured along the driveway, no additional hydrants are required to be installed.

3. If the rear of the building or facility is in excess of 150' from the right-of-way, measured along the driveway, the developer or owner shall provide on-site fire hydrants and mains supplying required fire flow according to the following guidelines:
 - A. An additional on-site fire hydrant shall be provided along the driveway within 150 feet from the rear of the structure, as well as an approved fire apparatus (fire truck) turnaround and driveway. The turnaround and driveway shall be an all-weather surfaced roadway not less than 16 feet wide, with a minimum vertical clearance of 13 feet 6 inches. Approved turnarounds consist of bulb turnarounds not less than 80 feet in diameter or a hammerhead turnaround with front and rear turning points not less than 32 feet in length.
 - B. New Subdivisions. Prior to final plat approval, a developer shall demonstrate on the final draft any buildable area of lots and placement of fire hydrants as required by this section.
 - C. Existing Subdivisions. Issuance of a building permit is contingent on the owner complying with the provisions of this section.
 - D. The owner or developer, through a licensed professional engineer licensed in the State of Utah, shall demonstrate that a minimum fire-flow rate of 1,500 gallons per minute is available at each hydrant required in this Section and that this flow can be sustained a minimum of 2-hours for a total of 180,00 gallons.

2.8.7 - Water Main Locations

Water mains shall be located on either the north or east sides of a roadway and ten feet from the centerline.

Water mains shall be minimum one (1) foot vertical above the sewer. Separation between water and sewer mains shall be 10 feet (horizontally) minimum unless authorized in writing by the City engineer or his/her designee.

2.8.8 - Water Meters and Service Lines

(To be provided and installed by City unless otherwise noted)

Prior to the installation of the water service line, the engineer retained by the developer shall stake out the water meter location and provide the grade at which the lid is to be set. All water service lines shall be 1" in diameter and shall start with a corporation stop at the main and shall be of type "K" copper or SDR-9 CTS 200 PSI Blue Polypropylene Pipe and meter setters of twenty-one (21) inch or taller and are braced and meet height specs in thirty-six (36) inch can with four (4) inch ring lid and shall be used and installed with the top of the setter at a depth of not less than eighteen inches and not more than twenty-two (22) inches from the lid of the meter box. Setters shall have dual check valves. Meter boxes shall be placed in the City right of way within two (2) feet of the property line. All water meter lids shall have hole for touch pad also known as pit pak

module. Hole shall be 1 ¾ “to 1 7/8 “in diameter. No meters shall be set in sidewalks or driveways. Meter boxes shall be in good repair and relatively free from obstruction to insure ease in maintenance and reading, (not full of dirt past the base of the meter, having trash present and being badly bent to create a hazard). Damaged boxes shall be replaced. Meter boxes shall be from level to one inch high from the final grade. See detail.

2.8.9 - Water Meter Standards

Water meters will not be placed in driveways or under sidewalks. If a water meter must be moved out of a driveway, the maximum lateral movement is 24 inches. If it must be moved more than 24 inches, a new service line must be installed and the old service lines must be shut off and abandoned.

2.8.10 - Tapping of Water Lines

Tapping valves may only be used when previously 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, wrap around 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.

Service taps shall be a minimum of 24" apart. No taps will be allowed within 24" of the end of the pipe.

2.8.11 - Water Supply

Each developer shall connect the subdivision with the City water system with all appurtenances and shall make such water available to each lot within the subdivided area. Adequacy of supply and sizes of water mains shall be established by the City engineer or his/her designee. Workmanship and details of construction shall be in accordance with the City “Development Standards” and/or standards adopted by the City. All work in connection with water services shall be done as directed and under the supervision of the City engineer or his/her designee.

2.8.12 - Testing and Flushing

A minimum pressure 50% in excess of the maximum line operation pressure shall be maintained on the portion being tested for a minimum period of two (2) hours, using either pneumatic or hydraulic means to maintain the pressure.

After pressure testing, all pipelines shall be flushed. Flushing shall be accomplished through hydrants or, if a hydrant does not exist at the end of the line, the contractor shall install a tap sufficient in size to provide for 2.5 foot-per-second flushing velocity in the line.

A leakage test shall be conducted concurrently with the pressure test.

1. 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.
2. Allowable leakage - No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{0.5}}{133,200}$$

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

- A. Allowable leakage at various pressures is shown in Table 1.
 - B. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078gal/hr/in. of nominal valve size shall be allowed.
 - C. When hydrants are in the test section, the test shall be made against the closed hydrant.
3. Acceptance of Installation - Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than specified, the Contractor shall, at its 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.
 4. All new water systems or extensions to existing systems shall be thoroughly flushed before being placed in service. Flushing shall be accomplished through hydrants, or end of line blow off assemblies at a minimum flushing velocity of 2.5-feet per second.
 5. The following is the flow quantity required to provide a 2.5 foot-per-second flushing velocity.

Pipe Size (Inches)	Flow (G.P.M)
4	100
6	220
8	390
10	610
12	880
16	1567

2.8.13 - Disinfection of Water Lines

Disinfection of water mains shall be done in accordance with the latest edition of AWWA C651.

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 one percent (1%) hypochlorite disinfection solution.

The pipeline shall be disinfected as outlined in AWWA C651. 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 equal. 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 twenty-four (24) hours, forty-eight (48) hours if the water temperature is less than forty-one degrees (41) F. The disinfection solution shall have a concentration of at least twenty-five (25) mg/l of available chlorine. The continuous feed shall be done exactly as outlined in AWWA C651 and shall have twenty-five mg/l available Chlorine after twenty-four (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.

After the chlorination, the line shall be thoroughly flushed with velocities greater than 2.5 ft/sec with clean water and if necessary re-chlorinated until satisfactory bacteriological testing is obtained. If any of the tests fail the contractor shall be responsible for the fees of additional tests. All new lines shall be isolated from existing lines when tested.

Following the approval of the testing and installation of a water main, the entire water line will be flushed through the end of the main via an approved outlet.

1. The developer shall take bacteria samples at the sites designated by the City engineer

or his/her designee for each job, based on the following formula:

- A. Minimum of 1 sample up to 200 feet.
 - B. Minimum of 2 samples up to 600 feet. (One in the middle and one on the end).
 - C. Minimum of 1 sample every 600 feet.
 - D. Sampling points to be established during the pre-construction meeting for each project.
2. If any sample point fails on the first test, the line will be flushed and re-tested at all sample points.
 3. If any sample point fails a second time the complete line will re-disinfected and re-tested at all sample points.
 4. If any samples come back marked “presence”, which means coliform bacteria is present, the line will be re-disinfected and re-tested at all sample sites.

Water services will not be installed until bacteria sample results have been approved by the City engineer or his/her designee.

2.9 - Sanitary Sewer

2.9.1 - General

1. Dry Pipe - Developers are required to install the specified sewer facilities regardless of whether or not sanitary sewage treatment facilities are available.
2. Specifications -These specifications cover the installation of sewer lines. Excavation and backfill of trenches is covered in Section 2.7. See standard drawings related to sanitary sewers. Pipe bedding for all sanitary sewer lines shall consist of $\frac{3}{4}$ " minus drain rock or other approved equivalents. In no case shall the bedding for sanitary sewer lines consist of sand.
3. Pipe - All sewer pipe less than 18 inches in diameter shall be PVC and all sewer pipe 18 inches and larger shall be reinforced concrete pipe (RCP) unless otherwise approved by City Engineer or his/her designee.
4. Size - The City must approve the sizes of all proposed sewer lines. The minimum size of pipe is 8 inch diameter for main lines and 4 inch diameter for services.
5. Location - Sanitary Sewer mains shall be located on either the south or west sides of a street 10 feet from the centerline. Separation from culinary water pipelines shall be

consistent with State Code. A maximum of 400 feet of pipe shall be allowed between manholes.

6. 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 Slopes (%)
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

7. Sewer Lift Stations - 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. Lift Stations will only be allowed when it is demonstrated that no option is available for gravity feed system. Lift stations, if allowed, will be the wet well/dry well type, will have standby power, telemetry, and will be designed for large areas, not individual subdivisions.
8. Unusual Piping and Plumbing - Special and unusual piping and plumbing for equipment or structures are treated as separated items and are not included in these standards. Any such items must be submitted to the City Engineer or his/her designee for review and approval.

2.9.2 - Sanitary Sewer and Sanitary Sewage Facilities

All new developments within the “Master Plan Development Area” as depicted by the Woodland Hills Sewer Master Plan Map is required to install sanitary sewer lines

according to Section 2.9 Sanitary Sewer of Woodland Hills Development and Construction Standards. Each lot must have the capability to discharge sanitary sewer to a sewer main fronting each lot, either by gravity through a lateral or by individual lift station. Until such time as a City sewer treatment facility is available, septic tank/fill drain systems will be allowed on each lot pursuant to Utah County health department regulations.

2.9.3 - Installation

Pipe Laying - All pipe shall be laid true to line and grade with the bell end up grade. All pipe shall be laid up grade with a suitable excavation for the bell. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place, so as to prevent any movement or disturbance of the finished joint.

Care and Handling of Material - All materials used for pipe installation shall be carefully lowered when unloading or when installing into a trench. This should be done one piece at a time in order to prevent damage to materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped from the truck or into the trench. Proper implements, tools, and facilities shall be provided and used for safe and convenient prosecution of the work. All material used shall be carefully inspected prior to installation. Any or all defective piece(s) shall be rejected.

Joints - All rubber gasket joints shall be completed in accordance with installation instructions supplied by the manufacturers of the pipe, taking particular care to avoid twisting of the pipe or other damage to the gasket. After jointing, approved backfill material shall be placed along the lower half of the pipe section and tamped thoroughly so as to maintain the section firmly in position. Any subsequent adjustment or damage to jointing shall require the pipe section to be removed and rejoined as for new pipe. All joints shall be water tight.

2.9.4 - Reinforced Concrete Pipe

1. **General** - Reinforced concrete pipe shall be ASTM specification C-76 with rubber gasket joints ASTM specification type C-443 reinforced concrete pipe class III. Only new pipe may be used.
2. **Joints** - Pipe Joints shall conform to ASTM Specification C443 and shall be of the bell and spigot type, and shall be so designated as to provide for self-centering and, when assembled, to compress the gasket to form a water tight seal.
3. **Gaskets** - Rubber Ring Gaskets for use on concrete pipe with rubber gasket joints shall be modeled or extruded and cured in such a manner that any cross section will

be dense, homogenous, and free from porosity and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of plus or minus 1/32 of an inch for any diameter measured at any cross section. The gaskets shall be fabricated from a high-grade tread-type compound. The basic polymer shall be natural rubber, or a copolymer of butadiene styrene synthetic. The gaskets shall meet the physical tests requirements in ASTM Designation C443.

2.9.5 - Polyvinyl Chloride Pipe

1. General - All sewer pipe 8 inch to 15 inch pipe shall conform to ASTM 3034 and polyethylene pipe shall conform to ASTM F 405 and ASTM F 667. Polyvinyl Chloride (PVC) pipe shall have a minimum wall thickness of SDR 35. The City Engineer or his/her designee may require a heavier wall thickness when needed.
2. Deep 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.

2.9.6 - Manholes and Appurtenances

1. Material - Manholes shall be pre-cast reinforced Portland Cement Concrete. Excavation and concrete shall conform to applicable specifications meeting ASTM C478. Concrete shall be low alkali Type II.
2. Poly-urethane steps to OSHA standards shall be included in all manholes.
3. Frames and Covers - 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 ascertained by the engineer prior to installation.
 - A. Manhole covers and frames shall be the Twist Riser Manhole (3025-TRM) with appropriate parts as manufactured by Precision Cover System, Inc., or equal. Manhole covers and frames on all manholes shall be standard circular, solid, non-rocking type with pick hole with the word "SEWER" cast on the cover. Lids shall be of the vented variety.
 - B. After castings have seasoned sufficiently so that there will be no further distortion due to temperature changes, the cover and ring seat shall be machined so the entire area of the seat will be in contact with the cover, in any position of the cover on the seat.
 - C. The tops of the cover and frame shall be flush and there shall be one-eighth inch (1/8") clearance all around the periphery of frame between the cover and the frame.

4. Manhole Bases - Manhole bases shall be constructed of concrete. Main line sewer pipe and projecting ends of the sewer and pipe stubs shall be adequately supported to prevent displacement from line or grade during installation of the base.
 - A. All manholes shall have the invert shape to provide an adequate channel between the inlet and outlet pipes, and shall have an interior grade of 0.10. The entire surface of the manhole invert, including channels and shelves shall be steel-troweled to a smooth dense surface.
 - B. All inverts of junctions manholes shall be shaped while the bases of the manholes are under construction. All inverts shall follow the direction of the pipe entering the manholes. Rubber boots shall be provided to connect the inlet and outlet pipes and provide watertight joints.
5. Connecting to Existing Sewers - Manholes used to connect the sewer to the existing sewer shall be plumb and centered on the existing sewer. 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 sewer during the excavation procedure. Any damage to the existing sewer shall be repaired.

2.9.7 - Services

General - All sewer services shall be connected to existing sewer mains by use of an Inserta-tee brand connection or an approved equivalent. Sewer services shall extend 10 feet beyond the right of way line and plugged until connected to a building. The minimum cover of sewer laterals is at 3'6" at the property line.

Clean-outs - Any bend in a service line between the main line and the property line greater than 22.5° requires a clean out.

Temporary Plugs - Manholes shall be installed at each end of a new development unless otherwise approved by the City Engineer. Suitable temporary plugs shall be installed at the receiving or discharging ends of these manholes.

2.9.8 - Cleaning

1. General - After sewer lines have been laid and trench back-filled, they shall be thoroughly cleaned and tested for leakage and alignment in the presence of the City Engineer or his/her designee before acceptance by the City. Cleaning shall be done using a high pressure jet cleaning machine, producing a minimum of 800 p.s.i. Waste water and debris shall not be permitted to enter sewer lines in service, but shall be

removed at the lowest manhole of the extension. Such cleaning shall be done by private crews at the expense of the owner.

2. Displacement Test - The displacement test shall be conducted by the developer and inspector in the presence of the Engineer. All sewer mains shall be washed and inspected using a television inspection unit. The city must approve video inspection company. The TV inspection of any mains which reveal broken, misaligned or displaced pipe, or other defects, as designated by the City Engineer or his/her designee shall be remedied by the contractor. A tape of video inspection and log report shall be submitted by the inspection company to the City Engineer. After cleaning and inspection have been completed, the line shall be tested for leakage.

3. Leakage Tests - The Low Pressure Air Test shall be conducted by the following method under the direction of the City Engineer or his/her designee with equipment equal to Cherne Industrial, Inc. 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.
 - A. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 PSIG greater than the average back pressure of any ground water that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize.
 - B. 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 of 2.0 cubic feet per minute minimum when tested at an average 3.0 PSIG greater than any back pressure exerted by ground water that may be over the pipe at the time of the test.
 - C. 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 PSIG (greater than the average back pressure of any ground water than may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

Pipe Diameter (inches)	Time (min)
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

- D. If the installation fails to meet this requirement, the contractor shall determine at his/her own expense the source of the leakage. He/she shall repair all defective materials and /or workmanship.

2.10 - Storm Water

2.10.1 - General

These specifications will cover the installation of storm drains when required. Excavation and backfill of trenches is covered in Section 2.7. All developments will be responsible to provide a storm drain system on-site that will contain a specific storm event, depending on the type of system installed. The maximum allowable storm water discharge from any development will be limited to 0.2 cfs/acre of development.

The following rainfall intensities (inches/hour) for 10-year, 25-year, and 100-year storms shall be used in determining storm runoff quantities:

Time (min)	10-Year (inches/hr)	25-Year (inches/hr)	100-Year (inches/hr)
5	3.55	4.62	6.67
10	2.71	3.52	5.08
15	2.24	2.91	4.20
30	1.51	1.96	2.83
60	0.93	1.21	1.75
120	0.54	0.70	0.99
180	0.40	0.50	0.69
360	0.24	0.29	0.38
720	0.15	0.18	0.23
1440	0.09	0.11	0.13

2.10.2 - Drainage

The developer shall install a storm water drainage system pursuant to standards recommended by the City engineer or his/her designee. Potential groundwater of subsurface drainage problems may require additional requirements; further requirements will be reviewed and approved by the City engineer or his/her designee. Pumping of groundwater across sidewalks or into gutters will not be allowed.

Homeowners shall provide on-site facilities as required by the City Engineer. Design of on-site storm facilities shall be the responsibility of the homeowners' Engineer. The design of the on-site storm facilities shall be shown on and submitted with the Site Plan.

No building permit will be allowed before approval of said facilities

2.10.3 - Pipe

1. Concrete Sewer Pipe
 - A. Concrete sewer pipe may be used for storm drains up to and including 18-inch size unless otherwise specifically designated in these Specifications or on the approved Drawings.
 - B. Pipe shall be extra strength pipe manufactured to comply with the requirements of ASTM Designation C-14.
 - C. Joints shall be of the bell and spigot rubber gasket design with joints and gaskets conforming to the requirements of ASTM Designation C-443.
 - D. Pipe joints shall be so designed as to provide for self-centering, and when assembled, to compress the gasket to form a water-tight seal.
 - E. The gasket shall be confined in a groove on the spigot, so that pipe movement of hydrostatic pressure cannot displace the gasket.

2. Reinforced Concrete Pipe
 - A. Reinforced concrete pipe shall be used for all storm drains of size larger than 18-inches and for all drains of smaller size where installation does not provide a cover of at least 2 feet over the top of the pipe.
 - B. Reinforced concrete pipe shall comply with the requirements of ASTM C-76 (Class III) with bell and spigot rubber gasket type joints for sanitary sewers and the alternate option of tongue and groove mortar joints for storm drain lines.

3. High Density Polyethylene Pipe (HDPE)
 - A. Smooth Pipe Systems.
 - a. Material: Polyethylene code designation PE 3408 as rated in ASTM D 2239 with a minimum ASTM D 3350 cell classification of 345434C, and an SDR or pressure class rating as indicated.
 - b. Fittings: Manufactured of same resin as the pipe.
 - c. Joints:
 - (I) Thermally welded butt fusion in accordance with ASTM D 3261.
 - (II) Flanged in accordance with ASTM D 2657.
 - (III) Ultra high molecular weight electrofusion tape with a polyethylene coupler meeting ASTM F1055 requirements.
 - (IV) Nuts and Bolts: Carbon steel machined heavy hex heads, Class 2 fit in accordance with ASTM A 307; Grade B, threads in accordance with

ASME B1.1. Tape wrap steel materials for protection against corrosion after piping installation.

B. Corrugated Pipe Systems

- a. Material: "High density polyethylene pipe shall be smooth lined and meet the requirements of AASHTO M294 Type S."
- b. Material: Polyethylene, in accordance with ASTM F 405 or ASTM F 667, Type III, Category 4 or 5, Grade P33, Class C, or Grade P34, Class C as defined by ASTM D 1248.
- c. Fittings: Manufactured of same resin as the pipe.
- d. Joints: Split corrugated couplings with plastic or stainless steel ties and leak resistant neoprene gasket.

4. Pipe Markings

A. Mark pipes continuously to identify:

- a. Manufacturer's name (or trademark) and code.
- b. Nominal size.
- c. Polyethylene code designation.
- d. SDR rating. (Not applicable to corrugated polyethylene.)
- e. Date of manufacture.
- f. Pressure class. (Not applicable to corrugated polyethylene.)
- g. ASTM or AWWA designation number.

2.10.4 - Laying

1. Under no circumstances shall any pipe be laid until inspection is complete and has adequately passed the requirements indicated above. All pipe shall be laid true to line and grade with the bell end up grade. All pipe shall be laid up grade with a suitable excavation for the bell. Special care shall be taken that pipe is well bedded on a solid foundation throughout the length of the barrel. The bedding of all pipe shall conform at least to the characteristics of Class C bedding except as herein designated by the engineer. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place, so as to prevent any movement and selected samples have or disturbance of the finished joint. For the purpose of maintaining grades, grade stakes may be required. Each section of pipe shall be checked for alignment and grade before each joint is made. If a laser beam is used, a grade stake shall be established at each manhole and a maximum of 200 feet apart.
2. Jointing - All rubber gasket joints shall be completed in accordance with installation instructions supplied by the manufacturers of the pipe, taking particular care to avoid twisting of the pipe or other damage to the gasket. After jointing, approved backfill material shall be placed along the lower half of the pipe section and tamped

thoroughly so as to maintain the section firmly in position. Any subsequent adjustment or damage to jointing shall require the pipe section to be removed and rejoined as for new pipe.

3. In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer. HDPE shall be installed as per manufacturer's instructions, ASTM D 2321 or ASTM D 2774 as applicable.

2.10.5 - Manholes

1. Manholes shall be pre-cast reinforced Portland Cement Concrete. Excavation and concrete shall conform to applicable specifications meeting ASTM C478. Concrete shall be low alkali Type II.
2. Manhole Frames and Covers
 - A. 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.
 - B. Type of Cover and Frames - Manhole covers and frames on all manholes shall be standard circular, solid, non-rocking type with pick hole with the word "storm drain" cast on the cover. Clear openings shall be of the diameter shown on the plans. The minimum weight of the cover shall be one hundred sixty (160) pounds. The minimum weight of the frame shall be two hundred eighty (280) pounds. (COMCO A-1180 or A-1181 as required).
 - C. After castings have seasoned sufficiently so that there will be no further distortion due to temperature changes, the cover and ring seat shall be machined so the entire area of the seat will be in contact with the cover, in any position of the cover on the seat.
 - D. The tops of the cover and frame shall be flush and there shall be one-eighth inch (1/8") clearance all around the periphery of frame between the cover and the frame.
3. Manhole Construction-Pre-cast Manholes
 - A. Pre-cast manholes shall be constructed as indicated on the standard plans. Bases for pre-cast units shall be constructed in place and shall conform to specifications for "manhole bases" as herein specified. The walls of the manhole above the base shall be built up to such an elevation of the street or natural ground surface, whichever is applicable. Manholes shall be plumb and so positioned that the

center line of the manhole is coincidental with the center line of the storm drain line. Fiberglass steps shall be installed and offset cones providing a direct vertical step onto the steps from the top of the manhole.

4. Manholes will be 48" I.D. under 18" main line and 60" I.D. for 18" and larger storm drain mains.

2.10.6 - Manhole Base

Manhole bases shall be constructed of concrete to the dimensions shown on the drawings. Main line storm drain pipe and projecting ends of the sewer and pipe stubs shall be adequately supported to prevent displacement from line or grade during installation of the base. All manholes shall have the invert shape as indicated on the "Standard Details" to provide an adequate channel between the inlet and outlet pipes. The entire surface of the manhole invert, including channels and shelves shall be steel-troweled to a smooth dense surface. All inverts of junction manholes shall be shaped while the bases of the manholes are under construction. All inverts shall follow the grades of the pipe entering the manholes. Rubber boots shall be provided to connect the inlet and outlet pipes and provide watertight joints.

2.10.7 - Minimum Slopes

Minimum slopes for different size pipes are as follows:

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

2.10.8 - Cleaning

After the storm drain lines have been laid and the trench back-filled, they shall be thoroughly cleaned and tested for leakage and alignment in the presence of the City

engineer or his/her designee before acceptance by the owner. Cleaning shall be done using a high pressure jet cleaning machine, producing a min. of 800 psi. Waste water and debris shall not be permitted to enter storm drain lines in service, but shall be removed at the lowest manhole of the extension. Such cleaning shall be done by private crews at the expense of the owner.

2.10.9 - Sumps

Sumps shall be located as staked in the field and indicated on the plans. They shall be to the grade indicated by the cut-sheets and as staked in the field. Excavation and backfill shall conform to Section 2.7 of these specifications. If the sump is located in an area where the earth is stratified with gravel layers, care shall be taken during backfill to be sure that these layers are not sealed off from the sump beginning three (3) feet below the bottom of the sump up to the top of the sub-grade. One to three inch diameter drain rock shall be used. The original material shall be removed and the total backfill done with imported drain rock. After backfilling is completed, the entire excavation shall be thoroughly flooded to insure that settlement is complete. Grates shall be set in place and adjusted for final elevation and alignment. The City may require a fabric barrier between the drain rock and road base (or other backfill) when there is the possibility of road base moving into the void space of drain rock.

Sumps may be constructed of either twelve (12) gauge galvanized, corrugated steel or reinforced concrete, pre-cast sections and shall meet the requirements of ASTM C478-73 in accordance with standard detail drawing. Either class shall have eccentric lids to ensure adjustments in alignment.

2.10.10 - Inlet Structures

1. All inlet structures shall be reinforced concrete boxes (pre-cast or cast-in-place) with a gravel bottom.
2. Inlet Grates and Frames.
 - A. 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.
 - B. The type of grate and frame shall be D&L 1-3516 or approval Equivalent.
3. Each inlet structure shall have a minimum 12" drain pipe extending to the storm drain main line.

2.10.11 - Retention/Detention Basins

1. Retention Basin
 - A. All retention basins shall be constructed with a maximum water depth of 36 inches. 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.
 - B. All retention basins shall be constructed for drainage areas designated in the general plan. Basins for smaller areas may be allowed only with prior written approval of the City engineer or his/her designee.
2. Detention Basins
 - A. All detention basins shall be constructed with a maximum water depth of 36 inches; with that depth remaining for no longer than a 48 hour period. Detention basins may be constructed in landscape or parking areas.

2.10.12 - Low Impact Development (LID)

1. Refer to Section 12 Chapter 7 of the Woodland Hills City Code for design guidelines.

2.10.13 - Design Storm

1. Frequency
 - A. Minor system facilities shall be designed to collect and convey storm water runoff from a storm with a return frequency of 10 years. Minor system facilities include local catch basins, storm drain pipes, and manholes.
 - B. Major system facilities shall be designed to collect and convey storm runoff from a storm with a return frequency of 100 years. Major system facilities include streets, storm drain pipes to regional facilities, open channels, and culverts and bridges.
 - C. Detention basins shall be designed to detain runoff from a storm with a return frequency of 25 years. Retention basins shall be designed to retain runoff from a storm with a return frequency of 100 years.
2. Depth and Intensity
 - A. Rainfall depth and intensity shall be obtained from the table listed above in Section 2.10.1
3. Distribution and Duration
 - A. The rational method is to be used to evaluate and design the storm drain conveyance facilities (i.e. pipes, culverts). The 10-year 24-hour storm duration shall be evaluated.
 - B. The rational method is to be used to evaluate and design the storm drain storage facilities (i.e. detention and retention basins). The 10, 25, and 100 year 24-hour storm durations shall be evaluated. The maximum peak volume from these three storm durations shall be used to evaluate and design the storage facility.

2.11 - Restoration of Surface Improvements

2.11.1 - General

The contractor shall be responsible for the protection and the restoration or replacement of any improvements existing 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, ditches, driveways, culverts, fences, walls and landscaping. All improvements shall be reconstructed to equal or better, in all respects. The contractor shall be responsible for maintaining a road surface suitable for travel by the public. He/She shall be responsible for all dust control and all claims and damages resulting from his/her failure to maintain the construction area. All road cuts shall be repaired within two (2) working days.

2.11.2 - Road Base

1. Where trenches are excavated through gravel surfaced areas such as roads and driveways, etc., the gravel surface shall be restored and maintained as follows:
2. The gravel shall be placed deep enough to provide a minimum of 6 inches of material.
3. The gravel shall be placed in the trench at the time it is backfilled. The surface shall be maintained by blading, sprinkling, rolling, adding gravel, etc., to maintain a safe uniform surface satisfactory to the engineer. Excess material shall be removed from the premises immediately.
4. Material for use on gravel surfaces shall be obtained from sound tough durable gravel or rock meeting AASHTO T-27 requirements. The following requirements for grading shall be met:

Sieve Size	Percent Passing
1-inch	100%
¾ inch	85%-100%
No. 4	45%-65%
No. 10	30%-30%
No. 200	5%-10%

2.11.3 - Bituminous Surface

1. Where trenches are excavated through bituminous surfaced roads, driveways or parking areas, the surface shall be restored and maintained as follows:

- A. Excavations that interrupt the existing asphalt surfacing shall be backfilled with untreated base course. All fill material shall be placed and compacted to City standards. All fill material shall be placed in layers not exceeding eight (8) inches in un-compacted thickness. Each layer shall be compacted to a density equal to ninety five (95) percent of maximum dry density as measured six (6) AASHTO T-180 method C. All backfill shall be certified by a Geotechnical Lab prior to placing asphalt surface course.
- B. Before any pavement resurfacing is placed, the contractor shall cut the existing paving to clean, straight lines as nearly parallel to the centerline of the trench as practicable and six (6) inches wider on each side of trench than initial excavation. Said straight lines have no deviations from such lines except as specifically permitted by the Engineer.
- C. Existing bituminous paving shall be cut back a minimum of six (6) inches beyond the limits of any excavations or cave-in along the trench so that the edges of the new match existing pavement height.
- D. Within five (5) working days and weather permitting, the bituminous surface shall be restored by standard paving practices to a minimum thickness of three (3) inches to match existing pavement height.
- E. Pavement restoration shall include priming of pavement edges and top of the cured flowable fill with an asphalt tack coat and placing and rolling plant mix bituminous material to the level of the adjacent pavement surfaces.
- F. All pavement restoration shall conform to Section 2.12 of these specifications.

2.11.4 - 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 and maintained until asphalt plants open. When asphalt plants open, the cold patch shall be removed and a new patch of hot mix asphalt shall be placed within twenty (20) days of plant opening.

2.11.5 - Concrete Surfaces

All concrete curbs, gutters, and driveways shall be removed and replaced to the next joint or scoring lines beyond the damaged or broken sections; or 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 conform to the requirements of Section 2.13 of these specifications.

2.12 - Street Surfacing

2.12.1 - General

These specifications cover the preparation of sub-grade, the placing of base gravel, and the placing of asphalt surface on any City street.

2.12.2 - Traffic Control

1. Traffic control shall be submitted to the City prior to any work in accordance with MUTCD. In order for a street excavation permit to be approved, Woodland Hills needs the following information:
 - A. Copy of Contractors License;
 - B. Certificate of Insurance;
 - C. Performance Bond of \$1000.00; and
 - D. Detailed drawing of proposed work and traffic control (4 copies).
2. The contractor is given a copy of the signed permit and the signed / approved plan after the City engineer or his/her designee has approved and signed the application. Time limits may be set; and the permit can be suspended for non-compliance.

2.12.3 - Excavation and Fill

1. General - This item shall consist of the removal of all earth, stone, loose rock, roots, brush and all other materials that may be encountered in shaping the sub-base to the lines indicated on the plans or designated by the engineer.
2. Fill - Where fill is required, it shall be placed in twelve (12) inch layers at or near optimum moisture content and compacted to ninety-five (95) percent of laboratory density as determined by AASHTO T-180, Method C. Materials may be cuts or excavations on the project or imported from off site. Imported materials shall be granular, well graded, with the maximum size not to exceed three (3) inches.
3. Surplus Material - The surplus materials that result from the grading will be at the disposal of the contractor and shall be removed from the site.

2.12.4 - Sub-Grade Preparation

The 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. The sub-grade shall be compacted to ninety-five (95) percent of laboratory density as determined by ASTM D1557.

Soft and yielding spots which do not compact to the specified density shall be removed and replaced with suitable material.

2.12.5 - Gravel Base

1. General - Gravel base course shall consist of natural gravel, crushed gravel, crushed rock or crushed slag conforming to one of the gradations hereinafter specified, placed on a prepared sub-grade as specified herein.
2. Materials - The mineral aggregate shall conform to the following requirements:
 - A. On that portion of the aggregate passing the No. 40 sieve, the liquid limit shall not exceed 25, nor shall the plasticity index exceed 6 when tested in accordance with AASHTO T89 and T90.
 - B. The dry mineral aggregate shall be uniformly graded within one of the gradations listed below when tested in accordance with AASHTO T-27. The size of aggregate shall be at the option of the contractor unless otherwise specifically designated.

Percent Passing		
Sieve Size	1"Max	3/4"Max
1 1/2"		
1"	100	
3/4"		100
1/2"		69-100
3/8"		46-75
No.4	41-68	46-75
No.16	21-41	22-44
No.50	10-27	10-28
No.200	4-13	4-13

***Total amount of material passing the No. 200 Sieve shall be determined by washing**

with water in accordance with AASHTO T-11.

- C. Aggregate shall have a percentage of wear not exceeding 50 when tested in accordance with AASHTO T-96. This requirement shall be used only in determining the suitability of the aggregate source and shall not be used for routine control testing.
- D. Crushed slag, if used, shall be uniform in density and quality and have a rodded weight of not less than 75 pounds per cubic foot when tested in accordance with AASHTO T-19. Open hearth slag shall not be allowed.
- E. Construction Methods. - The mineral aggregate shall be placed on a compacted sub-base, water added, and mixed to provide moisture content at or near the optimum. The material shall be compacted until the average density of tests performed in accordance with AASHTO T-180; Method is ninety-six (96) percent of the laboratory density and not less than ninety-two (92) percent.
- F. The sub-base and road base shall be graded to an engineered redhead and accepted by Woodland Hills City. The redheads shall be placed every fifty (50) feet at the crown of the road. Redheads shall be placed every fifty (50) feet at the edge of the road where there is no curb and gutter.
- G. The total thickness 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 percent 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. Base shall be finished to a smooth uniform line and grade.

2.12.6 - Bituminous Surface Course

- 1. General - Bituminous surface course shall consist of a mixture of mineral aggregate and bituminous binder conforming to one of the gradings hereinafter specified. It shall be mixed at a central mixing plant and spread and compacted with lay down machines or boxes as approved by the street department.
- 2. Materials
 - A. Bituminous Material. The bituminous material shall be penetration asphalt cement conforming to the requirement of Section 704 of the State of Utah Standard Specifications for Road and Bridge Construction, 1970 issue.
 - B. Mineral Aggregate. Mineral aggregate shall be in accordance with Section 403.03 of the State of Utah Specifications for Road and Bridge Construction, 1970 edition, paragraph (H through J).
 - C. Graduation. The combined dry mineral aggregate shall be uniformly graded and of such a size that will meet one of the gradation limits specified below when tested in accordance with AASHTO T-27.

Percent Passing		
Sieve Size	Min	Max
3/4"	100	
1/2"	--	100
3/8"	70-100	
No.4	48-76	61-100
No.8	36-59	43-75
No.16	27-45	32-55
No.50	16-29	19-33
No.200	5-11	7-12

D. Mix Design - The contractor shall prepare a mix design using the Marshall Method and the following criteria:

a. MARSHALL DESIGN CRITERIA:

(I) TEST PROPERTY

- i. Stability - all mixtures
- ii. Flow - all mixtures
- iii. Percent air voids
- iv. Percent voids in mineral aggregate 3/4" max
- v. Percent voids in mineral aggregate 1" max
- vi. 50 compaction blows each end of specimen

b. After a mix design has been approved, the mixture furnished shall conform within the following ranges of tolerance:

Sieve Size	Passing (%)
No. 4 Or Larger	+7
No. 4, 16, & 50	+5
No. 200	+3
Asphalt Content	0.4

- E. Temperature Control - The viscosity of the asphalt being used shall be between 150 and 300 centistokes as determined in accordance with ASTM designation D2170. The temperature range corresponding to this viscosity range will depend on the type and source of asphalt. The engineer will specify as a part of the mix approval the temperature limits for asphalt, aggregate, mixing and lay down.
- F. Spreading and Compaction - The bituminous mixture shall be spread with self-propelled mechanical spreading and finishing equipment or box approved by the City engineer or his/her designee. The mixture shall be spread and struck off in such a manner that the finished surface shall conform to the grades and cross sections required by the plans approved by the City engineer or his/her designee.
 - a. After the mixture has been spread, the surface shall be rolled in a longitudinal direction commencing at the outside edge or lower side and proceeding toward the higher side. Each pass of the roller shall overlap the preceding pass by at least one-half the width of the roller. Rolling shall continue until ninety-two (92) percent of laboratory density, as determined by Utah Department of Highways Test Procedure No. 8-942, has been achieved.
 - b. Thickness shall be reasonably close to the specified thickness. Depth analysis shall be made by cores located at random pattern with no less than four cores in each section. No cores shall show a deficient thickness of less than 1/4". Deficient thickness shall be corrected by adding additional surface course as directed by the engineer. All work shall be inspected by and certified to by a registered engineer hired by the developer.
- G. Weather Limitations - No bituminous surface course shall be placed when the temperature of the air or the road is 50 degrees F and falling; or during rainy weather; or when the base is wet. The air temperature shall be measured in the shade.

2.12.7 - Manholes and Valve Boxes

All manhole covers and valve boxes shall be raised to the proper grade after the placement of pavement. The cover shall be removed and raised to the proper elevation with concrete setting the frame 1/4" below the pavement grade. Concrete rings need to be around valve boxes and manholes.

2.12.8 - Cross Gutters

Bituminous surface course shall be three (3) inches thick within thirty (30) feet of a cross gutter.

2.13 - Concrete

2.13.1 - General

The work shall consist of curb and gutter, sidewalk, combination curb, gutter and sidewalk, cross gutters, curb, and other related concrete return constructed where indicated on the plans or as directed by the engineer and conforming in all respects to the specified lines, grades, and dimensions. A minimum slope along any curb and gutter shall be .4% and on cross-gutter shall be 0.4%.

2.13.2 - Concrete Materials

1. Coarse Aggregate - A coarse aggregate shall consist of hard durable particles of a mixture of crushed and natural gravel possessing at least fifty percent (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:
 - A. Deleterious substances shall not exceed:

Percent by Weight	
Soft Fragments	3.0
Coal	1.0
Material Passing No. 200 Sieve	0.5
Micaceous or Flaky Particles	1.5
Organic Material	0.1
Total for Any or all of above	3.0

2. Loss on abrasion by Los Angeles Abrasion Test not more than forty percent (40%) by weight.
3. Loss on exposure to five (5) cycles of sodium sulfate soundness test, not more than eight (8) percent by weight.
4. The maximum size of aggregate to be used shall not exceed one and one-half (1 ½) inches in terms of this size definition contained in ASTM Standards except that the maximum size shall not exceed one-fourth (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:

Retained On	Minimum %	Maximum %
1 ½" sieve	0.00	10

Retained On	Minimum %	Maximum %
3/4" sieve	30	70
3/8" sieve	75	100
No. 4 sieve	95	100

5. Fine Aggregate

A. Fine aggregate shall consist of clean, hard durable particles of natural sands, subject to the following limitations:

Percent by Weight	
Soft Fragments	3.0
Coal	1.0
Material Passing No. 200 Sieve	3.0
Micaceous or Flaky Particles	3.0
Total for any or all of above	5.0

B. Organic Calorimetric Test using sodium hydroxide shall result in a color not darker than Number 2 in the acceptance range.

C. Loss on exposure to five (5) cycles of the sodium sulfate soundness tests shall not exceed eight percent (8%) by weight.

D. Fine aggregate shall be uniformly graded within the following range:

Retained On	Minimum %	Maximum %
No. 4	0	5
No. 8	0	20
No. 16	20	50
No. 30	50	75
No. 50	75	90
No. 100	100	100

6. Cement - All cement used shall be Type II. 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.
7. 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 remixed.

2.13.3 - ADA Requirements

All pedestrian facilities will conform to the current Federal ADA Standards.

2.13.4 - Base Material

There shall be a minimum of 4" crushed gravel road base under all concrete.

2.13.5 - Testing and Inspection

1. Scope - All materials and processes involved in the construction shall be subject to testing and inspection as detailed in the various paragraphs of this section and in general compliance with ASTM E105-54T. Results of tests performed by recognized laboratories to the satisfaction of the engineer shall be accepted by the supplier as a basis for acceptance or rejection of any and all materials. Standard Methods of sampling and testing shall be used. 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.
2. Concrete - Where required by the engineer, samples of concrete may be tested to insure quality concrete.
 - A. Samples of wet concrete may be tested for air content. Failure to indicate the entrained air in this section shall be a basis for rejection of all concrete represented by the test.
 - B. Samples of wet concrete may be tested for slump. Failure to indicate the required slump shall be a basis for rejection of all concrete represented by the test.
 - C. Concrete compression specimens shall be taken for each pour of section as required by the engineer. Such specimens shall attain the specified strength of twenty-eight (28) days with the provision that no specimen may indicate a compressive strength of less than ninety percent (90%) of the strengths nominated

and with further provision that results from specimens which, in the opinion of the testing authority and the engineer, are obviously faulty or defective may be rejected in determining the requirements. Should any specimens fail to satisfy these requirements, the concrete represented thereby shall be removed and replaced, except that the contractor may submit evidence based on ASTM designation C42-49 which shall be considered by the engineer in relation to this requirement.

3. Flow Tests - All curb and gutter and cross-gutters will have a flow test prior to final inspection to determine any low or high spots. (The City will be present)

2.13.6 - Concrete Mixes

1. Mix Design Requirements
 - A. Cement content 6 bags per yard minimum, 28-day compressive strength, 4000 psi, Slump range 1 to 3 inches Air content 5 to 7 percent.
 - 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.
 - a. Coarse aggregate
 - (I) Source
 - (II) Deleterious substances
 - (III) Los Angeles Abrasion Test
 - (IV) Sodium Sulfate Soundness Test
 - (V) Sieve
 - b. Fine aggregate
 - (I) Source
 - (II) Deleterious substances
 - (III) Calorimetric Test for Organics
 - (IV) Sodium Sulfate Soundness Test
 - (V) Sieve and fineness modulus
 - c. Cement
 - (I) Type - supplier - analysis
 - C. 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 will all

other provisions of this specification.

- D. Control - Measurements of materials except water shall be by weight. Equipment used shall be capable of controlling weight within one percent (1%) of each ingredient. Water may be measured either by volume or weight provided that an accuracy of one percent (1%) is maintained. Cement may be assumed to weight ninety-four (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.
- E. Adjustments of Amount of Water - 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.

2.13.7 - Mixing, Conveying, and Placing

- 1. Mixing Time
 - A. 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 one (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 engineer. The maximum volume of mixed concrete transported in an agitator shall be in accordance with the specified rating.
- 2. Supervision of Placing
 - A. Concrete shall not be poured except under the direct supervision of the City engineer or his/her designee.

2.13.8 - Excavation and Backfill

The contractor shall excavate to the line and grade approved by the City engineer or his/her designee. All boulders, organic materials, soft clay or other unsuitable materials shall be removed and replaced with approved materials. The sub-grade shall be properly shaped to conform to the specified cross section and grade. All materials excavated in connection with the work not needed for backfill shall be removed from the site.

Where the grades are above natural ground the material shall be placed at or compacted to ninety-five (95) percent of the laboratory density as determined by AASHTO T-180.

2.13.9 - Forms

All forms shall be of steel, free from warps, bends or other deformations. They shall be of a size to match the sections shown on the plans. Forms shall be held firmly in place with stakes and shall be true to line and grade. Contraction joints shall be constructed every ten (10) feet by using steel templates one-eighth (1/8) inch in thickness. The templates shall be removed as soon as the concrete has set sufficiently to hold its shape.

2.13.10 - Slip Forming

Strike lines are every 10 feet. The #4 rebar, 2' O.C., is 12" in length placed 4" into curb and 8" into sidewalk. This is placed 2.5" below finished TBC.

2.13.11 - 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 moist wooden float to provide an even smooth surface, and then broomed lightly.

2.13.12 - Curing

As soon as possible after final finishing, the finished surface shall be coated with a curing compound. The compound shall be a chlorinated rubber type meeting ASTM C-309K, Type 1, clear. The compound shall be applied in accordance with the manufacturer's recommendations. The compound shall be Intermountain Hard-n-seal or equal. During the months of October through February, no curing compound shall be applied to exposed concrete; instead, exposed concrete shall be covered with plastic for three (3) days to allow for curing.

2.13.13 - 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 high temperatures are likely to descend below 32°F, concrete shall be covered or otherwise protected against freezing; add mixtures that are allowed.

2.13.14 - Clean Gutter

Once curb and gutter and surface course is in place they shall be kept as clean as possible. When equipment is required to cross over sidewalk, bridging will be provided to protect concrete. Dirt and gravel will not be placed in gutter or on street. Gutter will flow freely at all times.

2.13.15 - Right-of-Way

1. Construction within Right-of-Way - To the extent feasible, Utility's distribution and transmission lines and appurtenances will be constructed within the right-of-way boundaries of streets, roads and alleys. Whenever, in the opinion of Utility, it is not practical to construct and install its facilities within the limits of streets, alleys, and other public thoroughfares, Utility will construct and install such facilities on private rights-of-way.
2. Furnishing of Right-of-Way - Whenever it is necessary for Utility to occupy private rights-of-way, property owner shall furnish or assist in acquiring, without charge to Utility, such right-of-way as is necessary and will assist Utility in securing such other right-of-way as may be necessary to provide service to Consumer.

2.14 - Hillside Site Development

2.14.1 - Average Slope-Definition

1. For the purpose of this chapter, the definition of "average" slope shall be as follows: The average slope of the parcel of land or any portion thereof shall be computed by applying the formula,

$$S = \frac{0.00229 \ I L}{A}$$

to the natural slope of the land before any grading is commenced, as determined from a topographic map having a scale of not less than one inch equals 100 feet and a contour interval of not less than 5 feet, where:

0.00229 = A conversion factor of square feet to acres

S = Average percent slope

I = Contour interval, in feet

L = Summation of the length of contour lines, in feet within the subject parcel

A = Areas in acre of the parcel being considered.

2.14.2 - Certified Report Required

It shall be unlawful for the owner, developer, or any contractor or other person to excavate, grade, level, or build upon any lot or property within the City when the average slope of the lot exceeds twenty (20) percent, nor shall any person grade, level, or improve in any manner any parcel of land which is crossed by a natural or manmade water course or existing utility, before such person has submitted to the chief building

official a certified report from a qualified civil engineer licensed in the State of Utah containing the information set forth in the following section.

2.14.3 - Certified Report Specifications

1. The certified report required in the previous section shall contain at least the following information:
 - A. A plat of the property showing the following:
 - B. Contour lines at two (2) foot intervals. Existing contours shall be indicated by dashed lines and proposed contours by solid lines;
 - C. Elevations at the corners of foundations and at the corners of driveways; and
 - D. Show or reference any existing or potential groundwater flows which may cause unstable conditions such as debris flow or slides.
2. Assessment of the civil engineer as to the seriousness of any development problems such as erosion, drainage, flood and geologic hazards or unstable soil conditions and their potential effect on adjoining properties and on any proposed improvements to be built on the property.
3. The proposed method for handling the problems noted in “#2” above. No grading shall take place on a hillside area until the proposed method of handling said problems shall be submitted to and approved by the City Engineer. Owner, Developer, or Contractor shall comply with the following conditions:
 - A. Any subdivision containing a hillside area (any areas within the subdivision with slopes exceeding 25 percent) shall comply with the provisions of this section, as well as this chapter.
 - B. No grading shall take place on a hillside area until a grading plan has been submitted to and approved by the city engineer.
 - C. Any area within a Subdivision which has a slope of thirty-five (35%) or greater shall remain un-graded, unless approved by the planning commission and city council.
 - D. Any area within a Subdivision which has a percent slope between twenty (20%) and thirty-four (34%) may be graded: provided, however, the grading area shall be less than one half of the area of such slope.

- E. Any fill material shall be prepared and compacted as specified in the Construction Standards and Specifications for the City of Woodland Hills.
- F. Cut slopes shall be no steeper than one and one-half feet horizontal to one foot vertical (1 ½:1) and shall be designed with an acceptable erosion control system. An erosion control system is generally composed of a combination of long-term non-degradable erosion mat, structural geogrid and/or geo-textile. These materials can be used alone or in combination.
- G. Fill slopes shall be no steeper than two feet horizontal to one foot vertical (2:1) and shall be designed with an acceptable erosion control system. An erosion control system is generally composed of a combination of long-term non-degradable erosion mat, structural geo-grid and/or geo-textile. These materials can be used alone or in combination.
- H. Tops or toes of slopes shall be set back from property boundaries a minimum distance of five (5) feet. (Excluding Roads).
- I. Areas which have been graded shall be planted with stabilizing plant materials within one hundred twenty (120) days after the completion of final grading. If an area has been determined by the City as being an area subject to erosion danger, then the Sub-divider shall plant acceptable stabilizing plant material. If final grading is completed between October 15 and March 15 of the next year, then organic cover material shall be placed on the graded area to eliminate erosion until the soil can be permanently planted.
- J. Natural vegetation shall remain in areas where grading is not permitted. The City may require additional landscaping in areas which were graded in order to supplement the natural vegetation and to prevent erosion and slope failures.
- K. Surface water runoff drainage improvements shall be designed and installed to prevent both on-site flooding and erosion. Such drainage design shall channel water runoff away from cut and fill slopes and away from all buildings.
- L. Any build-able area or portion of a build able area shall not be closer than thirty feet (30') to any man-made or natural drainage channel.
- M. All drainage areas shall be kept free of debris and soil sedimentation during Subdivision development and building construction.

2.14.4 - Liability

The purpose of this chapter is to point out to the owner and/or developer of any property

that the liability and responsibility of such persons to protect the integrity of their own and adjoining properties, existing water courses and utilities lies upon the person doing the development and upon the owner of the property being developed and not upon the City or any other person. The City may require additional information on any development or building which may have potential hazards.