Part VII – Road and Bridge Standards

Policies and Design Criteria Manual

April 2016

Part VII – Road & Bridge

Policies & Design Criteria

MANUAL

ABBREVIATED
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SECTION 1.0

INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The City of West Jordan, Road and Bridge Design and Construction Standards, establishes uniform minimum policies and procedures for the design and construction of City roads and appurtenances. It is not the intent of this standard that any standard of conduct or duty toward the public shall be created or imposed by publication of this standard. This standard is not a substitute for engineering knowledge, experience or judgment. This standard is neither designed as, nor does it establish, a legal standard for these functions. The methods and procedures contained herein shall be reviewed by the Engineer using them to see that they are applicable to the project on which he/she is working. Where not considered applicable, the Engineer shall request a variance from these standards as provided in this standard.

The design and construction of streets, roadways, bridges and other appurtenances in City of West Jordan shall comply with these minimum standards herein called "Road and Bridge Policies & Design Criteria Manual", or the permit requirements of various governing bodies, except where specific modifications have been approved, in writing, by the City Engineer. All submitted plans shall be stamped and signed by a civil engineer, registered in the State of Utah, and all work shall be in accordance with good engineering practices.

This document sets forth the minimum procedure for designing and preparing plans and specifications for roadways built for the City, or ones which will be dedicated to the City. Wherever there are differences between these standards and other county, state or federal regulations, the most stringent or highest requirement shall govern. The specifications and standard drawings contained in this document are for roadway construction above the pipe zone only. The City has also prepared policies & design criteria manuals for other infrastructure which are operated and maintained by the City. The developer/developer's engineer shall obtain the other to determine how to design these other policies & design criteria manuals for these other facilities from the Engineering Department.

1.2 AUTHORITY

Titles 72, 74, 81, 86, 87, 89, and 90 of the City of West Jordan Municipal Code, establishes the legal authority for the planning, design and construction of the City's transportation and utility systems and appurtenances.

1.3 DESIGN ENGINEER'S RESPONSIBILITIES

These standards have been prepared and adopted to provide a minimum set of standards to be used in the design and construction of roads and bridges in the City. The design engineer preparing various studies, master plans, designs, specifications, drawings, and other documents for facilities to be constructed in the City, bears the full responsibility the work he/she performs in relation to this work. By affixing your stamp and signature to these documents, you accept the full responsibility for defects, difficulties or repairs, necessary as a result of a defective design. The preparation and publication of these standards shall not be construed as indicating the City has designed the projects,

or has directed the design so as to remove the responsibility of the design engineer and place it upon the City.

1.4 INTERPRETATION

The City Engineer shall decide all questions of interpretation of "good engineering practices" being guided by the various standards and manuals to include those published by the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers and the American Public Works Association (APWA).

1.5 QUALITY ASSURANCE

All work shall be performed in accordance with City drafting/submittal requirements as described herein. Design work shall be accomplished under the direct supervision of a Utah Registered Professional Engineer with at least 5 years of experience in conducting design, studies and traffic impact studies and shall carry the seal of the same supervising Professional Engineer. All submitted designs, specifications, reports and plans shall be signed by a civil engineer, registered in the State of Utah, and all work shall be in accordance with good engineering practice.

1.6 SUBMITTALS

A. Project Documents - Meet all checklist items required by Engineering Department before document submission.

B. Easements, Land Acquisition, and Permits

1. All easements and land acquisitions shall be submitted on the city's standard easement form and shall be included on the recorded subdivision plat.
2. One copy of all necessary easement forms shall be submitted to the City Engineer for review.
3. All necessary permits shall be submitted to the City Engineer for final approval. Required permits include but are not limited to state and county utility line permits, canal crossing permits, Railroad crossing permits, Army Corp. of Engineer permits, etc.
4. All necessary permits and easements must be submitted prior to final approval being granted by the City.

C. Soils Report - Shall include but not be limited to pavement design, groundwater level, soil type, gradation, location of tests, type of tests, conclusions, recommendations, etc. Test should be taken along proposed roadways at intersections, changes in soil type, and at 750-foot minimum intervals.

D. Traffic Impact Study - See Section 1.06

E. Project Documents - Meet all checklist items required by Engineering Department before document submission.

1.7 DEFINITIONS AND TERMS

Whenever in these specifications or in any document or instruments where these specifications govern, the following terms, abbreviations or definitions are used, the intent and meaning shall be interpreted as follows:

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
A.B.	Aggregate Base
A.S.B.	Aggregate Subbase
A.C.	Asphaltic Concrete Type A
ACI	American Concrete Institute
ADT	Average Daily Traffic in vehicles per 24 hours
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
EP	Edge of pavement
ES	Edge of shoulder
IMO	Infrastructure Maintenance and Operations Department
ITE	Institute of Transportation Engineers
P.C.C.	Portland Cement Concrete
	Structures Class A (6 sack)
	Pavement Minimum Class B (5 sack)
	Curb, gutters, driveways and walks Class B (5 sack)
	Higher classes shown on plans will govern
PUE	Public Utility Easement
TIS	Traffic Impact Study
TYP	Typical
UBC	Uniform Building Code
UPC	Uniform Plumbing Code

Symbols

C	Centerline
ROW	Right of way line
FL	Flow line
PL	Property line
"R"	Value
≥	Equal to or greater than
≤	Equal to or less than

DEFINITIONS

"Acceptance" Field acceptance is when the Engineering Department inspector approves the physical installation of the water system. The City Engineer acceptance or final acceptance follows field acceptance and is when the City Engineer approves both physical improvements as

	well as the administrative items associated with development, and the General Services Department accepts ownership and operations and maintenance responsibilities.
"Access or Access Connection"	Any driveway or other point of entry and or exit such as a street, road or highway that connects to the general street system. Where two public roads intersect, the secondary roadway shall be considered the access.
"Approved"	Unless specifically otherwise indicated, this shall mean approval by the City Engineer.
"Average Daily Traffic (ADT)"	Average 24-hour traffic volume at a given location over a time period, divided by the number of days in the period.
"Base Course"	Compacted material supporting subsequent construction.
"Bench Mark"	A surveyors reference point for establishing grade elevations and property line position.
"Binder Course"	An intermediate course, usually composed of asphalt, aggregate and mineral dust, placed between the base course and surface course.
"Block"	Land surrounded by streets and other rights-of-way other than an alley, or land which is designated as a block on any recorded subdivision plat.
"Building"	A permanently located structure having a roof supported by columns or walls for the shelter, housing, or enclosure of any person, animal, article, or chattel.
"Building Pad"	The designated and identified site working surface which can be a cut surface or a filled and compacted surface.
"Capital Project"	An organized undertaking which provides, or is intended to provide, the City with a capital asset. "Capital Asset" is defined according to generally accepted accounting methods.
"City"	City of West Jordan, Utah
"City Engineer"	City Engineer shall mean the City Engineer of City of West Jordan, or the person(s) engaged by the City and authorized to perform the duties assigned to the City Engineer, and shall include any deputies and representatives.
"Common Fill"	Usually excavated inorganic subsoil or topsoil materials.

"Contours"	The lines drawn on site plans indicating the elevations of grading and contouring of the site topography.
"Corner Clearance"	The distance from the driveway approach to the edge of the traveled way at an intersection. This is measured along the top back of the curb beginning at the end of the curb return radius for the driveway and ending at the extension of the top back of curb of the intersecting street.
"County"	Salt Lake County, Utah
"Cul-de-sac"	See Streets.
"Design Speed"	Posted speed plus 5 miles per hour.
"Developer"	An individual or organized group; partnership, corporation, etc.; proposing to subdivide or improve land which will require culinary water from the City's system.
"Developer's Engineer"	The engineer licensed by the State of Utah as a civil engineer, employed by the developer, under whose direction construction plans, profiles and details of the work are prepared and submitted to the City for review and approval.
"Driveway Spacing"	Desired distance between adjacent driveways on the side of the roadway as measured from near edge to near edge, considered necessary for the safe ingress and egress of vehicles and the safe operation of the roadway at its posted speed.
"Easement"	A recorded document in which the landowner gives the City permanent rights to construct and maintain public facilities across private or other property.
"Engineer"	A professional engineer or firm of professional civil engineers appointed by and acting for the Engineering Department in the case of a City sponsored capital project. In the case of a developer-sponsored project, the term refers to the engineer hired by the developer and may also be referred to as "developer's engineer".
"Engineering Department"	The City department responsible for planning, designing and construction of the City's roadways and bridges, culinary water, secondary water and storm drainage systems.
"Fill"	Placed soil or aggregate material, native to site or imported.
"Fire Department"	City of West Jordan Fire Department
"Freeway"	See Streets.

"Horizon Year"	The point in time at which traffic impacts are assessed in a Traffic Impact Analysis. Most likely full build out of the project.
"Inspector"	An employee or agent of the City engaged to observe and record field compliance with design criteria, plans and construction standards.
"Intersection Sight Distance"	The distance at which motorists attempting to enter or cross a roadway should be able to observe traffic in order to make his desired movement. The required distance varies with the speed of the traffic on the primary roadway.
"Level of Service"	A qualitative measure describing a range of traffic operating conditions such as travel speed and time, freedom to maneuver, traffic interruptions, and comfort and convenience as experienced and perceived by motorists and passengers. Six levels are defined from A to F, with A representing the best range of conditions and F the worst. Please see Section 2.0 – Design Criteria for additional information.
"Limit of Rough Grading"	The dimensional limits are usually identified on the site plan.
"Lot"	A parcel or tract of land within a subdivision and abutting a public street, or a private street, which is or may be occupied by one building and the accessory buildings or uses customarily incident thereto, including such open spaces as are arranged and designed to be used in connection with the building according to the zone within which the lot is located.
"Lot, Corner"	A lot or parcel abutting two intersecting or intercepting streets where the interior angle of intersection or interception does not exceed 135-degrees. Corner lots shall have two front yards and two side yards.
"Lot, Double Frontage or Double Frontage Lot"	A lot or parcel abutting two parallel or approximately parallel streets.
"Lot, Flag"	A lot or parcel located to the rear of another lot or parcel, the main body of which does not front on a street and is accessed by a narrow corridor.
"Lot Level Systems"	Lot level systems are those systems which are required to provide storm drainage, grading, culinary water and access to systems provided by the project as a whole, or systems already provided by the City. These systems connect to 'subdivision level' systems.
"Master Transportation Plan"	A plan adopted by West Jordan City that develops a unified transportation system that provides for the economic, efficient, comfortable, and safe movement of people and goods. The most current plan should be followed.

"Median"	That portion of a roadway separating the opposing traffic flows.
"Mixed Use Volumes"	The traffic generated by a project that will visit more than one unit of the development.
"Natural Drainage Course"	Those areas, varying in width, along streams, creeks, gullies, springs, or washes which are natural drainage channels.
"Non-Site Traffic"	Traffic not generated by the project, or site.
"Passer By" Traffic Volume"	Traffic captured by a development as it travels to a separate traffic generator.
"Park"	A playground or other area or open space providing opportunities for active or passive recreational or leisure activities.
"Parkstrip"	The area located between a street right-of-way line and the edge of asphalt or curb, but not including driveways, sidewalks, or trails.
"Peak Hour Volume"	The same as Design Hour Volume (DHV), typically 10% of ADT if actual volume data is not available.
"Plans"	Drawings of roadways, bridges, water pipelines, reservoirs
"Plate No."	Where not specified to the contrary, this refers to plates attached to these standards."
"Public Improvements"	Streets, curb, gutter, sidewalk water and sewer lines, storm sewers, flood control facilities and other similar facilities which are required to be dedicated to the City in connection with subdivision, conditional use, or site plan approval.
"Public Right-of-Way"	Any road, street, court, place, viaduct, tunnel, culvert or bridge laid out or erected as such by the public, or dedicated or abandoned to the public, or made such in any action by the subdivision of real property, and includes the entire area within the right-of-way.
"Public Works Department"	The City department responsible for operations and maintenance of the City's roadways, culinary water, and storm drainage systems.
"Right of Way"	Land set aside for public ingress and egress. Typically 1 foot behind the sidewalk to 1 foot behind an opposing sidewalk.
"Required"	Unless specifically otherwise indicated, this shall mean a requirement of the City Engineer.
"Staff Engineer"	A registered civil engineer employed by the City and designated by the City Engineer to act on the City's behalf.

"Sidewalk"	A passageway or pathways for pedestrians, excluding motor vehicles.
"Stockpile Area"	A portion of the site designated to store fill materials. The limits of rough grading noted on site drawings are appropriate to describe exact limits of rough grading.
"Stopping Sight Distance"	The distance required by a driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the roadway becomes visible. It includes the distance traveled during driver perception and reaction times and the vehicle breaking distance.
"Street, Alley"	A private thoroughfare less than 26-feet wide for the use of pedestrians and vehicles providing a secondary means of access to the rear of abutting properties. Alleys shall be a minimum of 26-feet wide with a 24 foot paved travel surface. Alleys may be required in residential areas and properties abutting arterials. Alleys may be required in all commercial areas and industrial areas. No parking is allowed within the right-of-way of alleys.
"Street, Arterial"	A street, existing or proposed, which serves or is intended to serve as a major traffic way and is designated in the Master Transportation Plan as a controlled-access highway, major street parkway, or other equivalent term to identify those streets comprising the basic structure of the street plan. Street designed to move large volumes of through traffic on a continuous route over a substantial distance. Land access is a secondary function. Access, intersection spacing and parking can be controlled to preserve the through traffic function of arterial streets.
"Street, Cul-de-sac"	A minor terminal street provided with a turn-around. The maximum length of a cul-de-sac shall not exceed 600-feet. The maximum length is measured from the center of the turning circle of the cul-de-sac to the center of the connection street intersection.
"Street, Dead-End"	An improved street or subsystem of streets with only one point of connection to the overall street system.
"Street, Driveway"	A private thoroughfare less than 26-feet wide for the use of pedestrians and vehicles providing a means of access to less than two abutting dwelling units, if a residential project, or parcels, if the project is a commercial property.
"Street, Freeway"	A street with a fully controlled access designed to link major destination points. A freeway is designed for high-speed traffic with a minimum of 4 travel lanes, and is owned by the State of Utah.

"Street, Half Street"	The portion of a street within a subdivision comprising at least one-half of the minimum required right-of-way on which improvements are constructed and in accord with one-half of an approved typical street section.
"Street, Lane"	A private thoroughfare less than 26-feet wide for the use of pedestrians and vehicles providing a means of access to more than two, but less than twelve residential dwelling units.
"Street, Local"	A minor street which provides access to abutting properties and protection from through traffic. Street designed to provide vehicular and pedestrian access to land parcels. With the movement of traffic a secondary function, local neighborhood streets should be designed to minimize through traffic and to add privacy and identity to a neighborhood.
"Street, Major Collector"	A street, existing or proposed, which is supplementary to a collector street and of limited continuity which serves or is intended to serve the local needs of a neighborhood.
"Street, Minor Collector"	A street, existing or proposed, which is supplementary to a collector street and of limited continuity which serves or is intended to serve the local needs of a neighborhood. Street designed to move traffic, as well as provide some land access. They are streets, which move primarily through residential areas and carry traffic from local streets to the arterial system.
"Street, Private"	A right-of-way which has been reserved by dedication unto the subdivider, lot owners, or Homeowners' Association to be used as a private access to serve property and complying with the adopted street cross-section standards and construction standards of the City. All private streets shall be approved separately by the City Council and maintained by the subdivider or other private entity. Private streets are those, which serve 12 or more dwelling units.
"Street, Public"	A right-of-way which has been dedicated to the City and accepted by the City Council, or which the City has acquired by prescriptive right, deed or by dedication, or a thoroughfare which has been made public by use and which affords access to abutting property, including highways, roads, lanes, avenues and boulevards.
"Structural Fill"	Place soil or aggregate material, native to site or imported, used above the subgrade surface to support elements above.
"Subbase"	Compacted material supporting the base course.

"Subdivision Level Systems"	Subdivision level systems are those systems which are required to provide storm drainage, grading, culinary water and access to the project in question. These systems connect to 'lot level' systems.
"Subgrade"	The lowest elevation upon which fill or other work will be placed.
"Surface Course"	Traffic bearing top course over placed fills, when no wearing course is used, usually associated with pavement work.
"Topsoil"	Excavated or imported earth material that encourages plant growth.
"Traffic Impact Study (TIS)"	The purpose and need for the TIS is to determine more precisely the impacts of development, to mitigate these impacts through the proper location, design, and construction of the improvements, and to ensure the continued functional and operational integrity of the roadway system.
"Trail"	A path, hard or soft surfaced, intended for public use for recreation and/or alternative transportation methods, and which may provide access to City, State, or Federal open lands or recreation areas.
"Tree, Street"	An approved tree placed either within or adjacent to the City's public right-of-way. Street trees are considered a public improvement.
"Utilities"	Includes culinary water lines, pressure and gravity irrigation lines, sanitary sewer, and flood control facilities, electric power, natural gas, cable television and telephone transmission lines, underground conduits and junction boxes.
"Wearing Course"	Traffic bearing top course over placed fills, usually associated with pavement work.

1.8 APPLICABLE CODES, MANUALS AND POLICIES

A. Ordinances and Codes - Ordinances, requirements and applicable standards of governmental agencies having jurisdiction within the City's service area shall be observed in the design and construction of roadways. Such requirements include but are not limited to current revisions of the following:
   1. Municipal Code of City of West Jordan
   2. Road encroachment regulations of City of West Jordan, State of Utah, Salt Lake County, as applicable.
   3. A Policy on Geometric Design of Highways and Streets – American Association of State Highway and Transportation Officials (AASHTO), current Edition.
   4. Standard Specifications for Highway Bridges – American Association of State Highway and Transportation Officials (AASHTO), current Edition.
   5. Manual of Standard Specifications, 2007 or most current edition, American Public Works Association. These standards apply to City or private development projects where the improvements will become the responsibility of the City, unless other more specific

specifications are called out in the Policies & Design Criteria Manual(s) of the City, or more specific specifications are included in these Manuals, or are included in City capital improvement projects' contract documents.

6. Manual of Standard Plans, American Public Works Association, most current edition. These drawings apply to City or private development projects where the improvements will become the responsibility of the City, unless other more specific drawings are called out in the Policies & Design Criteria Manual(s) of the City, or more specific drawings are included in these Manuals, or are included in City capital improvement projects' contract documents.

A complete listing of all reference material is included in the back of these standards.

B. City Manuals – In addition to the Codes indicated above, the City has prepared and adopted the following manuals, which provide additional City requirements and procedures.
   1. Development Processing Manual – Describes processes, procedures and requirements for various City processes, i.e. subdivision or site plan processing, for private development projects. It contains detailed, step-by-step processes and requirements for each step to assist developers and their engineers through a particular process.
   2. Private Development Construction Inspection Manual – Prepared to describe the processes and procedures required of all construction inspection of private development projects. In addition to processes and procedures, it also includes various forms and checklists to be used with private development projects.
   3. Capital Improvement Project (CIP) Construction Inspection and Management Manual – Prepared to describe the processes and procedures required of all City CIP projects. In addition to processes and procedures, it also includes various forms and checklists to be used with CIP projects.

C. City Policies – The following policies also apply to private development projects and CIP projects alike:
   1. Road and Bridge Materials - All Materials shall conform to specifications indicated in the City's *'Construction Specifications Manual'*.
   2. Private versus Public Streets Policy - All streets and roadways to be constructed in the City are to be considered public streets/roadways, unless otherwise separately, and formally approved as private roadways by the City Council. This includes all roadway or street types including a freeway, arterial road, major or minor collector, local road, cul-de-sac, court, place, viaduct, culvert or bridge, or other public dedicated street or roadway. Private street/roadway types, which will require separate City Council approval, are private local streets/roadways and cul-de-sacs, which serve more than 12 dwelling units. Other private street/roadway types include an alley, lane, and driveway, but these do no require City Council approval as private roadway facilities. Please see Section 1.8 – Definition and Terms to understand what these various roadway and street types are. Developers wishing to consider applying for 'private street' status, must meet the requirements set forth in *'Section 2.20 – Private Streets'*.
   3. Construction Water Use Policy – All water used for any purpose is to be metered through a City issued meter containing an approved backflow prevention device. Violation of this requirement will make the person and company subject to the City's Municipal Code and its penalties. Check with the City's Engineering Inspector for information on how to obtain the requirement meter.
   4. Policy on Irrigation Meters - Where the parkways or side landscaping strips along streets are to be irrigated, a separate meter must be installed on each side of the street. In such cases, running an irrigation line from the meter to the other side of the street is not allowed. Where

a median strip must be irrigated, the meter may either be in the side parkway or in the median strip, providing that at either location the meter is easily accessible and protected from being covered by landscape materials or other obstructions. The Engineering Department reserves the right to select all meter locations.

5. Fire Protection within the City - Within City of West Jordan, fire protection is provided by the City of West Jordan Fire Department.
6. Confined Space Entry Policy - All Developer/Contractor and City staff is subject to the City's Confined Space Entry Program requirements and as such shall meet its requirements. Confined spaces shall not be entered until all requirements of the City's Program have been made and approved by the City's Inspector on the project and all applicable permits have been received. Also of concern is that all "Lock-out, Tag-out" procedures be complied with to provide for a safe working environment for all personnel. Personnel not complying with the City's requirements for these items is subject to penalties.
7. Material/Product Suppliers Approval Process - Materials not indicated in this manual, as being approved for use in the City's water system must be approved by the City Engineer. The process for approval of these materials will be as follows:
   a. Material supplier submits a written request to the City Engineer for consideration of the material/product to be considered. The request must contain a letter making the request along with any material/product data sheets the City will need in determining its compatibility in the City's water system.
   b. The City will form a Review Committee comprising of Engineering Department engineers and Public Works Department staff to review, discuss, and evaluate the material's/product's acceptability to the City.
   c. The material/product supplier will be asked to come and make a presentation on their material/product to the City's Review Committee where additional questions will be asked of the supplier. Additional information will be required to be submitted as indicated by the Review Committee.
   d. Based upon all information, the Committee will make a recommendation to the City Engineer for his review and approval.
   e. The City Engineer will make a finding based upon the Committee's information and his own experience and render that decision to the supplier in writing.

1.9 CITY DEPARTMENTS' RESPONSIBILITIES/JURISDICTIONS

A. Engineering Department - The Engineering Department is responsible for the approval of plans and inspection of all public roads and bridges within the public right-of-way of the City's boundaries.

B. Public Works Department - The Public Works Department (PW) is responsible for the operation and maintenance of all public main water lines, valves, service lines, and other water facilities within the public right-of-way of the City's water service area. Where repairs or replacement of a service line on the City side of the meter are required subsequent to initial construction, it shall be the responsibility of the Public Works Department, except in the case of a service upgrade. In which case, the owner or customer will be billed for the work. Conversely, repairs or replacement on the customer side of the meter will be the responsibility of the property owner.

C. Community Development Department, Building Division - The Building Division is responsible for the residential and commercial building sites after final grade has been reached.

D. Fire Department – The City's Fire Department is charged with providing adequate and proper fire protection for the City and its residents and businesses. As such, they are responsible for reviewing all projects during design, City processing, construction and after construction, for ensuring proper fire protection is design and provided for. They also inspect businesses, water facilities, etc. to ensure they are operating properly.

1.10 DEVELOPER ENGINEER'S RESPONSIBILITY

These standards establish uniform policies and procedures for the design and construction of the City roadways. They are not intended to be a substitute for engineering knowledge, judgement or experience. These procedures shall be reviewed by the developer's engineer and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted by the Developer's Engineer in writing, prior to preliminary plat and or development project approval. If approved, the City Engineer will prepare an approval of the requested change.

It is the Developer and the Developer engineer's responsibility to be aware of the City's Transportation Master Plan for roadway improvements and to indicate any roadway relocations, extensions or vacations on the preliminary subdivision plat. This responsibility shall include investigating any changes from the Master Plan necessitated by development subsequent to the Master Plan, although the above shall not relieve the developer from the responsibility to provide an approved system consistent with Engineering Department requirements.

The Engineering Department may require that a Traffic Impact Study be completed for the project, depending upon City staff review. The Engineering Department and other City staff will review, comment on, and approve the traffic impact study. Verification of the adequacy of the surrounding roadway system rests jointly with the Engineering Department and the developer.

All plans, specifications, reports or documents shall be prepared by a registered civil engineer, or by a subordinate employee under direction of a registered civil engineer. Each of these documents shall be signed and stamped with a professional engineer seal, to indicate responsibility for them. A wet stamp is required on all documents except reproducible plans, where a stamp on the original is acceptable.

A "Preliminary Review" and or "Plans Approved for Construction" stamp or signature of the City on the plans does not in any way relieve the developer's engineer of the responsibility to meet all requirements of the City. The plans shall be revised or supplemented at any time it is determined that the City's requirements have not been met.

Generally, plans that are signed as being authorized for construction will not require revisions based upon subsequent revisions to these standards, however, when the Engineering Department's opinion, a change to the project is necessary, based upon a significant change in the standards, which significantly affects public safety, future maintenance costs, or similar concerns, such a charge may be required during construction by the City Engineer. Changes may also be required in the case where a developer does not proceed to construction within the time allowed in the agreement with the City.

1.11 REFERENCED SPECIFICATIONS

The following documents are referenced specifications for work related to City roadways and appurtenances. References to standards such as AASHTO, APWA or ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

A. Transportation Research Board. 2000. *Highway Capacity Manual*. Fourth Edition. Washington D.C.: Transportation Research Board.

B. Horrocks Engineers, and Fehr & Peers Associates, Inc. 1998. *West Jordan City Master Transportation Plan*. Salt Lake City, Utah. Horrocks Engineers, and Fehr & Peers Associates, Inc.

C. American Association of State Highway and Transportation Officials. 2001. *A Policy on the Geometric Design of Highways and Streets*. Washington D.C.: AASHTO

D. U.S. Department of Transportation. Federal Highway Administration. 2000 Millennium Edition. *Manual on Uniform Traffic Control Devices for Streets and Highways*. Washington D.C. Government Printing Office.

E. American Association of State Highway and Transportation Officials. 1996. *Standard Specifications for Highway Bridges*. Washington D.C.: AASHTO Standard Specifications for Highway Bridges.

F. Institute of Transportation Engineers. 1997. *TRIP Generation 6th Edition*. Washington D.C. Institute of Transportation Engineers.

G. American Association of State Highway and Transportation Officials. 1993. *Guide for the Design of Pavement Structures*. Washington D.C.: AASHTO

H. American Association of State Highway and Transportation Officials. 1984. *An Informational Guide for Roadway Lighting*. Washington D.C.: AASHTO

I. American Association of State Highway and Transportation Officials. 1999. *Guide for the Development of Bicycle Facilities*. Washington D.C.: AASHTO

J. Institute of Transportation Engineers. 1994. *Manual of Transportation Engineering Studies*. Washington D.C. Institute of Transportation Engineers.

1.12 CITY ENGINEER ACCEPTANCE

The City Engineer will not accept the roadway system until all applicable requirements of these standards and of the City of West Jordan Municipal Code have been met. Final acceptance is defined has having the 'final inspection' completed, having the 'punchlist' prepared during the 'final inspection' completed, and then having started the 18-month warranty period required by City ordinances.

1.13 ENGLISH VERSUS METRIC UNITS

The City requires the use of English units for all projects within the City. All designs, drawings, studies, etc. are to be completed in English units.

1.14 CONSTRUCTION SPECIFICATIONS

Nothing contained in the *'Construction Specifications Manual'* or in any other part of this standard as implying the City will pay for any of these improvements. In addition to the construction specifications being used for defining private development work, they are also used for City capital improvement projects, and therefore contain some language about methods of payment.

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Section 2.0
Design Criteria

2.1 GENERAL

A. General – this section defines the design criteria and standards, which the City expects a Developer, Contractor, or homeowner to follow in designing street improvements. Such improvements are to be designed to provide for drainage, pedestrian, and vehicular traffic to the areas in question. Any variance from this document shall be subject to the review and approval of the City Engineer.

B. Public versus Private Roadways – All roadways to be constructed in the City is to be considered public roadways, unless otherwise separately and formally approved as private roadways by the City Council. This includes all roadway or street types including a freeway, arterial road, major or minor collector, local road, cul-de-sac, court, place viaduct, culver or bridge, or other public dedicated street or roadway. Private roadway types, which will require separate City Council approval, are private local roadway and cul-de-sacs, which serve more than 12 dwelling units. Other private roadway types include alley, lane, and driveways, but these do not require City Council approval as private roadway facilities. Please see Section 1.8 – Definition and Terms to understand what these various roadway and street types are.

Frequently private developers wish to create private roadways for various reasons including a hoped for reduction in costs, ability to reduce the asphalt widths and roadway cross-sections to obtain more saleable parcels, gated communities, etc. In order to be approved as a private local roadway, the roadway needs to meet the requirements establish in Section 2.21 – Private Roadways. In proposing that a local street of cul-de-sac be a private facility, the developer and his engineer need to keep in mind that proposed private local streets and cul-de-sacs, even though being proposed to be private, will still need to meet City's minimum requirements for public local roadways and cul-de-sacs.

2.2 CITY TRANSPORTATION SYSTEM

A. General – The City boundary generally includes the region west of the Jordan River to the Qquirrh Mountains and between West Valley City (7000 South) / Taylorville (6200 South), on the north and South Jordan City (9400 South and 10200 South), on the south. A map showing the City's boundary is contained in the standard drawings at the back of this document.

The City's Engineering Department is responsible for all studies, design and construction for all roadway and bridge facilities and the Public Works Department is responsible for all operations and maintenance.

B. Utah Department of Transportation (UDOT) – The Utah Department of Transportation is responsible for several roadways within City boundaries including:

1. Bangerter Highway, from the north to the south City boundaries
2. Redwood Road, from the north to the south City boundaries

3. U-111, from North City boundary to New Bingham Highway
4. Mountain View Highway, from the north to the south City boundaries
5. 7000 South, from the Jordan River to Redwood Road
6. 7800 South, from Redwood Road to Bangerter Highway
7. 9000 South, from the Jordan River to Mountain View Highway
8. New Bingham Highway from Mountain View Highway to west City boundary

C. Salt Lake County Public Works Department (SLCPW) – The City has entered into an agreement with Salt Lake County Public Works Department for operation and maintenance of the traffic signals under the City's jurisdiction. Salt Lake County Public Works provides services necessary for acceptance of new signals and maintenance of existing signals, which are the responsibility of the City.

D. System Description – The following subsection presents a brief description of the City's roadway system and its classification of these roadways. Roadways are presently classified into the following categories:

1. Freeways
2. Arterials
3. Collectors
4. Local access streets

Figure 2.2.1 shows the various roadways widths and classifications for roadways in the City. As such, the following roadways have been classified as arterials and collectors as follows:

Table 2.2.1
Arterial Roadways

Street	Right-of-way Widths (feet)	Designation
7000 South (East City boundary – Bangerter Highway)	106 feet	City / UDOT
Jordan Landing Blvd.	106 feet	City
7800 South (East City boundary – SR-111)	106 – 126 feet	City / UDOT
9000 South (East City boundary – SR-111)	106-116 feet	City / UDOT
Redwood Road	106 feet	UDOT
5600 West (6200 South – 9000 South)	106 feet	City
SR-111 (North City boundary – South City boundary)	126 feet	City / UDOT

Table 2.2.2
Collector Roadways

Street	Right-of-way Widths (feet)	Designation
7000 South (West City boundary – Airport Road)	70 feet	City
7400 South (West City boundary – 5600 West)	70 feet	City
8200 South (West City boundary – 5600 West)	80 feet	City
8600 South (West City boundary – 5600 West)	70 feet	City
9400 South (West City boundary – 5600 West)	70 feet	City
9800 South (West City boundary – 5600 West)	70 feet	City
10200 South (West City boundary – 5600 West)	70 feet	City
1300 West (North City boundary – South City boundary)	80 feet	City
Old Bingham Highway (5800 West – 7800 South)	70 feet	City
2200 West (North City boundary – South City boundary)	70 feet	City
2700 West (North City boundary – South City boundary)	70 feet	City
3200 West (North City boundary – South City boundary)	80 feet	City
4000 West (7800 South – South City boundary)	70 feet	City
4800 West (North City boundary – South City boundary)	80 feet	City
Grizzly Way (7000 South – 9000 South)	80 feet	City
6000 West (7000 South – Old Bingham Highway)	70 feet	City
6400 West (North City boundary – Old Bingham Hwy)	70 feet	City
6700 West (7000 South – Old Bingham Highway)	70 feet	City
Oquirrh Blvd (7000 South – Old Bingham Highway)	70 feet	City

E. Bridges – The City is responsible for various bridges within the City. The Utah Department of Transportation inspects these bridges yearly and the City and UDOT work together on identifying their condition. The City owned bridges are as follows:

Table 2.2.3
Bridges

UDOT No.	Location	Date Built
035048E	2500 West 9000 South	1996
035163E	1840 West 9000 South	1996
035179D	1150 West 7800 South	1966
035022D	3100 West 7000 South	1986
035105V	8400 South 2700 West	1950
035183D	6700 South 2200 West	1989
035021D	2650 West 8660 South	1981

2.3 LEVELS OF SERVICE

A. Levels of Service (LOS) – Arterials

For arterials, level of service is based on average vehicle travel speed for the segment, section, or entire arterial under consideration. Level of service is reported as follows:

1. LOS "A" – Describes primarily free-flow operations at average travel speeds, usually about 90% of the free-flow speed for the arterial classification. Vehicles are seldom impeded in their ability to maneuver in the traffic stream. Delay at signalized intersections is minimal.

2. LOS "B" – Represents reasonably unimpeded operations at average travel speeds, usually about 70% of the free-flow speed for the arterial classification. The ability to maneuver in the traffic stream is only slightly restricted and delays are not bothersome.

3. LOS "C" – Represents stable operations; however, ability to maneuver and change lanes in mid-block locations may be more restricted than in LOS "B", and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50% of the average free-flow speed for the arterial classification.

4. LOS "D" – Borders on a range in which small increases in flow may cause substantial increases in approach delay and hence decreases in arterial speed. LOD "D" may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40% pf free-flow speed.

5. LOS "E" – Is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

6. LOS "F" – Characterizes arterial flow at extremely low speeds, from less than one-third to one-quarter of the free-flow speed. Intersection congestion is likely at critical signalized intersections, with long delays and extensive queuing.

B. Levels of Service (LOS) – Intersections

1. General – The level of service concept for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, LOS criteria are stated in terms of the average stopped delay per vehicle from a 15-minute analysis period. Level of service is reported as follows:

Table 2.3.1
Levels of Service Definition – Intersections

Signalized		Un-signalized		
LOS	**Delay**	**LOS**	**Delay (sec/veh)**	**Definition**
A	≤10.0	A	≤10.0	Favorable progression
B	>10.0 and	B	>10.0 and ≤15.0	Good progression
C	>20.0 and	C	>15.0 and ≤25.0	Fair progression
D	>35.0 and	D	>25.0 and ≤35.0	Noticeable congestion
E	>55.0 and	E	>35.0 and ≤50.0	Limit of acceptable
F	>80.0	F	>50	Approaching
Source: Highway Capacity Manual, Transportation Research Board, 2003				

2.4 TRAFFIC ENGINERRING ANALYSIS

A. Criteria for Providing a Traffic Impact Study – The Engineering Department will determine whether the project requires the preparation of a traffic impact study based upon the following general criteria: See Appendix D

1. Impact on Surrounding Areas
2. Structural Impacts on Roadways during construction
3. Neighborhood Issues
4. Impact on Adjacent Streets
5. Numbers of Trips Being Produced by the Project
6. Size of Project
7. Connection of project onto an arterial roadway
8. Subdivision which do not have good access, two entries to new subdivisions

B. Transportation Master Plan – The master plan will provide some of the basic structure needed to organize the City's transportation system, identify policies, provide the traffic engineering analysis needed to identify roadway sizes and identify a long range capital improvement program to meet the needs of the City.

C. Traffic Impact Studies – In addition to the traffic engineering analysis completed as part of the transportation master plan, traffic impact studies may be required of developments, coming into the City. The Developer is to assume that each project, which comes into the City, will be required to prepare a traffic impact study unless otherwise directed.

2.5 GENERAL ELEMENTS OF ROADWAY DESIGN

A. Sight Distance – Table 2.5.1 shows the standard minimum values for stopping sight distance as related to design speed which shall be used in design.

The minimum stopping sight distance is the distance required by the driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eye in a passenger vehicle which is considered to be 3.5 feet above the road surface to an object that is 2.0 feet above the road.

Table 2.5.1
Stopping Sight Distance

Design Speed (mph)	Brake stopping distance (ft.)	Brake reaction distance on level (ft.)	Stopping Sight Distance	
			Calculated (ft.)	Design (ft.)
15	55.1	21.6	76.7	80
20	73.5	38.4	111.9	115
25	91.9	60.0	151.9	155
30	110.3	86.4	196.7	200
35	128.6	117.6	246.2	250
40	147.0	153.6	300.6	305
45	165.4	194.4	359.8	360
50	183.8	240.0	423.8	425
55	202.1	290.3	492.4	495
60	220.5	345.5	566.0	570
65	238.9	405.5	644.4	645
70	257.3	470.3	727.6	730
Source: AASHTO Geometric Design of Highways and Streets, 2004 (Exhibit 3.1)				

B. Decision Sight Distance – Table 2.5.2 shows the standard minimum values for decision sight distance which vary depending on whether the location is on a rural or urban road and on the type of avoidance maneuver required to negotiate the location property.

Decision sight distance is the distance needed for a driver to detect an unexpected or otherwise difficult-to-perceive condition, select an appropriate speed and path, and initiate and complete the maneuver safely and efficiently. In computing and measuring decision sight distances, 3.5 feet eye height and 2.0 feet object height is applied as in stopping sight distance.

Table 2.5.2
Decision Sight Distance

Design Speed (mph)	Decision Sight Distance (ft.)				
	Avoidance Maneuver				
	A	B	C	D	E
30	220	490	450	535	620
35	275	590	525	625	720
40	330	690	600	715	825
45	395	800	675	800	930
50	465	910	750	890	1030
55	535	1030	865	980	1135
60	610	1150	990	1125	1280
65	695	1275	1050	1220	1365
70	780	1410	1105	1275	1445

Avoidance Maneuver A: Stop on rural road – t=3.0 s
Avoidance Maneuver B: Stop on urban road – t=9.1 s
Avoidance Maneuver C: Speed / path / direction change on rural road
Avoidance Maneuver D: Speed / path / direction change on suburban road
Avoidance Maneuver E: Speed / path / direction change on urban road

Source: AASHTO Geometric Design of Highways and Streets, 2004 (Exhibit 3.3)

C. Horizontal Alignment – In addition to the specific design elements for horizontal alignment, the following general controls apply:

1. Alignments shall be as direct as possible and consistent with geotechnical features and topography.
2. Alignment should be developed for the given design speed and avoiding minimum curve radii whenever possible.
3. Sharp curves at the end of long tangents or at the end of long, flat curves shall be avoided.
4. Short lengths of curves shall be avoided for very small deflection angles.
5. Flat curves shall be provided on long fills.
6. Compound circular curves with large differences in radii shall be avoided.
7. Direct reverse curves shall be avoided. Use a tangent length between them.
8. "Broken-back Curves" (two curves in the same direction on either side of a short tangent or large radius curve) shall be avoided.

D. Horizontal Curves – Table 2.5.3 shows the appropriate values. These distances need to be provided for horizontal curves.

Table 2.5.3
Standards for Curve Radius

Type of Roadway	Minimum Radius of Curve (ft.)
Local Roads - < 30 mph	240
Collector – < 40 mph	485
Arterial – < 50 mph	840
Source: AASHTO Geometric Design of Highways and Streets, 2004 Assumptions: e(max)=6%	

D. Vertical Alignment – Vertical curves should be used where the rate of change in grade exceeds the maximum allowable grade break on centerline of 0.5 percent.

The vertical curve is calculated from the following equation:

K=L/A, where:

"L" is the length of the vertical curve.
"A" is the algebraic difference of the approach and departure slopes.
"K" is the allowable rate of vertical curvature which is determined from the following table:

Table 2.5.4
Rate of Vertical Curvature (K)

Type of Roadway	Vertical Crest Curves	Vertical Sag Curves
Local Roads (30 mph)	≥ 19	≥ 37
Collector Streets (□ 40 mph)	≥ 44	≥64
Arterial Roadway (□ 50 mph)	≥ 84	≥ 96
Other Streets	(a)	(a)
(a) As approved by the Engineer		
Source: AASHTO Geometric Design of Highways and Streets, 2004		

Example: Assume the approach grade for a local roadway is a sag curve is 2% and the departure grade is 8%.

L = KA L=37*(8-2) = 222 Feet (minimum length)

2.6 STREET DESIGN CRITERIA

A. General – Street designs shall conform to the pattern of local streets designated in the City of West Jordan Master Transportation. Plan, any official street segment map approved by the City Code, and according to the following table:

Table 2.6.1
Local Street Design Guidelines

Item	Descriptions								
Terrain Classification	Level			Rolling			Hilly		
Development Density	Low			Low			Low		
Right-of-Way Width (ft.)	50			50			50		
Pavement Width (ft.)	25	35	35	25	35	35	28	35	35
Type of Curb (A=High Back Curb)	A	A	A	A	A	A	A	A	A
Sidewalk Distance Top Back of Curb (ft.)	5	5	5	5	5	5	5	5	5
Minimum Sight Distance (ft.)	200	200	200	150	150	150	110	110	110
Maximum Grade		4%	4%	8%	8%	8%			
Maximum Cul-de-sac Length (ft.)	450	450	450	450	450	450	450	450	450
Minimum Cul-de-sac Radius (right-of-way)(ft.)	50	50	50	50	50	50	50	50	50
Design Speed (MPH)	30	30	30	25	25	25	20	20	20
Minimum Centerline Radius of Curves (ft.)	240	240	240	150	150	150	90	90	90
Minimum Tangent Between Reverse Curves (ft.)	50	50	50	50	50	50	50	50	50
Street Lighting	SD	SD	SD	SD	SD	SD	SD	SD	SD
Driveways	SD	SD	SD	SD	SD	SD	SD	SD	SD
Private Streets	SD	SD	SD	SD	SD	SD	SD	SD	SD

Note: SD = See discussion in appropriate section

Development Density – The definitions of density classifications are:

1. Low – 2 or less dwelling units per acre
2. Medium – 2.1 to 6.0 dwelling units per acre
3. High – over 6 dwelling units per acre

Terrain Classification – The definitions of these terrain classifications are:

1. Level – grade range of 0 to 8 percent
2. Rolling – range of 8.1 to 15 percent
3. Hilly – grade of over 15 percent

B. Design Traffic Volume – Local streets should be designed to accommodate the anticipated traffic for the project from the date of construction completion to 20 years after street construction.

C. Design Speed – Table 2.6.1 shows the appropriate values.

D. Minimum Sight Distance – Table 2.6.1 show the appropriate values. These distances shall be provided for both horizontal and vertical curves.

E. Minimum Centerline Radius of Curves – The recommended radii shown in Table 2.6.1 are based on super elevation rate not to exceed 0.06 feet per foot.

F. Minimum Tangent Between Reverse Curves – A minimum tangent of 50 – feet is needed between reverse curves to facilitate steering and control.

G. Maximum Grade – Table 2.6.1 shows the appropriate values.

H. Vertical Curves – Vertical curves should be used where the rate of change in grade exceeds the maximum allowable grade break on centerline of 0.5 percent.

I. Right-of-way Width – The design and acquisition of property for a local street must consider the need and use for various facilities. Sufficient right-of-way is required to contain the elements of:

1. Pavement and/or curbing.
2. Sidewalks where required.
3. Street utilities customarily installed in border areas.
4. Landscaping and other aesthetic features.
5. A moderate amount of cross-section grading, including shoulders where utilized.
6. An additional area may be required for extensive retention of snow plowed from the roadway.

Table 2.6.1 shows the appropriate values.

J. Pavement Width – A minimum pavement width must allow safe passage of moving traffic in each direction, exclusive of other interferences such as conventional curb parking. This can be done by means of a shoulder on one or both sides of the street. In considering the width of pavement for local streets, the following must be taken into consideration:

1. A second function of shoulder is to provide for pedestrian and bicycle riders.
2. An alternate approach for low-density development is a 25 foot wide curbed street. Parking could be prohibited on one side of the street under certain conditions.
3. For higher density of land uses, street widths 35 feet with curbs are recommended for medium density developments. The lower width assumes off-street parking.
4. High density area (apartments), curb parking increases still more, and on both sides of the street. The 35 foot width provides for continuous movement as reasonable rates of speed.

5. Schools or parks are also traffic generators and need to be considered when determining street widths as well as curbed parking.

   Table 2.6.1 shows the appropriate values

K. Cross Slope – Pavement cross slope must be adequate enough to provide for proper drainage of the pavement while still maintaining a smooth riding quality and food non-skid performance. Cross slope on new roads shall be 2 percent from the crown of the road to the edge of the gutter.

L. Type of Curb – High Back Curb is the City of West Jordan Standard for local streets. The advantages of high back curb are:

1. Pedestrian, street trees, utilities, and signs are best protected by the barrier curb.
2. A positive limit of vehicle encroachment on the border area is established.
3. Depression of curb is required at driveways.
4. Creates excellent drainage control.
5. Provides improved control of potential parked runaway vehicles.

M. Curb Drainage – Minimum grade on all new curb and gutter should be 0.5 percent.

N. Curb Ramps – All new curb ramps in the City must be ADA compliant.

O. Sidewalks and Bicycle Paths' Widths – Recommended widths for sidewalks and bicycle paths are shown in Table 2.6.1. In today's subdivision, sidewalks have the following function:

1. Provides for maximum safety of children.
2. Protection of children walking to and from school and parks.
3. Adult walking to and from neighborhood amenities.

P. Sidewalk Width – Standard sidewalks are to be 5 foot wide in residential areas, and may be wider as determined by the City Engineer, depending upon the City's need.

Q. Sidewalk Distance from back to curb – In considering the design of local streets and teir appurtenances, the distance from the sidewalk to the curb face needs to be considered. The following items need to be considered:

1. Recommends a minimum of 5 foot from street edge of sidewalk.
2. If sidewalk must be placed next to curb, an additional sidewalk width of 1 to 2 feet is required.
3. Minimum sidewalk width is to be 5 foot.
4. Consider a meandering sidewalk if possible.
5. Other physical considerations are:
   a. roughen surface of sidewalk,
   b. be concerned about sidewalk slope to reduce persons from slipping,
   c. provide a minimum lateral drainage slope (1 to 2 percent), and avoid using steps.

R. Minimum Cul-de-Sec Radius – The minimum right-of-way radius from circular cul-de-sac design is 50 feet with curb radii of 40 feet. Within cul-de-sacs sidewalks may be placed slightly closed to the back of curb if desired. See Table 2.6.1 for additional detail. Curb radii of 40 feet or greater create a lot of pavement area and may be considered unsightly.

S. Dead End Cul-de-sac Grade – Unless approved by the City Engineer in writing, all cul-de-secs shall have a positive profile grade line from their intersection with a through road to their terminus.

1. General – In residential areas cul-de-sacs shall no exceed 40 feed unless approved by the City Engineer and shall contain no more than 20 housing units. A 50 foot radius cul-de-sac or other Fire Department approved turnaround is required at the road terminus.
2. Requirements – Dead end roadways in residential area and commercial areas shall comply with the following requirements.

Length	Width	Grade	Turnarounds Required
(a) 0 – 150’	30’	10%	None Required
(a) 151 – 450’	30’	10%	80’ Diameter Cul-de-sac
(b) 451 – 750’	30’	10%	80’ Diameter Cul-de-sac
(a) Curves and topographical conditions could alter the requirements for turnarounds and the width of access ways, Secure City Engineer’s approval. (b) Lengths over 450’ require City Engineer’s written approval. General Note: All distances shown are back-of-curb to back-of-curb dimensions			

3. Grade requirements – Unless approved by the City Engineer in writing, all cul-de-sacs shall have a positive profile grade line from their intersection with a through road to their terminus.
4. Signage – Appropriate signage shall be placed at the end of a roadway per the MUTCD.

T. Driveways – Because they are deceptively simple in appearance, driveways often do not receive the design consideration that they merit. Common deficiencies include:

1. Inadequate radii at street.
2. Excessive grades and grade differences (break over angles).
3. Inadequate width.

Typical residential driveways should be designed for passenger – car operation only. For a 90 degree turn, an inside radius of 18 feet and an outside swept path of 30 feet radius will comfortably accommodate most drivers in all passenger cars.

A minimum width of 10 feet is recommended for single-land driveways. At the narrowest street width of 22 feet such a driveway will require 12 foot radii to avoid lane encroachment. At a 34 foot street width, the radius required to avoid land encroachment drips to only 4 foot.

Temporary encroachment on the wrong side of minor street while entering or leaving a private driveway is generally considered allowable. This suggests a design value of about 5 feet for the

driveways radius. At higher traffic volume driveways of school or apartment parking lots, increased widths, plus radii requirements of 10 to 15 feet are recommended.

The common design fault of excessive break over angle (see Figure 3) and rear bumper dragging at the gutter line can be avoided by proper grading of right of way cross-section. As a general rule, the driveway grade should not exceed 8 % within the right-of-way area. Of greater importance is the change in grade, which should not exceed 12 percent within any 10 feet of distance. Car 'bottoming' on the crest can be avoided by the use of 8% maximum change per 10 feet.

U. Intersection Design – Intersections should be carefully located to avoid steep profile grades and to ensure adequate approach distance. An intersection should not be situated just beyond a short-crest vertical curve or on a sharp horizontal curve. When there is not a practical alternate to such a location, the approach sigh distance on each leg should be carefully checked, and where practical, back slopes should be flattened and horizontal or vertical curves lengthened to provide additional sight distance. The driver of a vehicle approaching an intersection should have an unobstructed view of the entire intersection and sufficient lengths of the intersecting roadway to permit the driver to anticipate and avoid potential collisions.

V. Street Lighting – The Developer shall show street light locations on all residential, commercial, and industrial development plats (see lighting layout detail). Street lights shall be placed on alternating sides of the street at the spacing one light every 300' of frontage. Additionally, one street light shall be required at each road intersection and at each cul-de-sac. Street lights should be placed at lot line boundaries to avoid unnecessary obstruction along the property frontage. Occasionally, the case may require a street light to be placed at a location other than at the property boundary; for example, this may occur on a lot with an unusually long frontage. The City Engineer may require additional or fewer street lights at his discretion. Additional street lights may be required in locations where safety hazards or special traffic needs exist; examples include locations such as half block intersections, bending roadways, parking lot entrances and exits, busy intersections, bridges and busy private or commercial driveways. In medium and high-density areas, midblock street lighting is also desirable in accordance with the recommendations of the Illuminating Engineering Society. These are published as an American National Standard Practice. The most recent edition of this Practice provides for a residential and commercial area minimum lighting. Local residential streets require 0.4 horizontal foot candles with a uniformity ratio of 6 to 1. Collector streets (Minor and Major) require 0.6 foot candles with a uniformity ration of 4 to 1. Arterial streets in residential require 0.6 foot candles in residential areas and 1.1 foot candles in commercial areas with a 3 to 1 uniformity ratio. Design guides for such illumination values may be found in the referenced text. A simple specification for a given number of lights of a given size is provided in the following table. A developer has the option to provide an alternate illumination analysis and light spacing with City approval. The effectiveness of illumination is a direct product of the distribution type selected for the luminaire, coupled with mounting height, bracket length, and luminaire orientation with respect to the geometrics of the roadway. In all cases, a competent illuminating engineer should review the street lighting design standards. The Developer shall incur all costs for and provide trenching in which subsurface electrical lines may be installed to power the street lighting system as shown on the development plat. Trenching shall be to the depth, width and standards

specified by the City. The Developer assumes all responsibility, expense, and liability for the street lighting system until the complete lighting system is accepted by the City. It is recommended that poles and fixtures be inspected for shipping damage, manufacturing flaws, etc., upon delivery. The City reserves the right to reject damaged or flawed materials with all costs associated to be incurred by Developer. The Developer shall restore all compromised surfaces to original or better condition. This includes, but is not limited to, landscaping, sidewalk, curb and gutter, roads, etc. All underground work shall be complete prior to construction of permanent roadway, sidewalk, and curb and gutter.

W. Traffic Calming Devices – Traffic calming devices, such as speed tables, traffic circles, roundabouts, chicanes, bulb- outs, etc., may be required on local streets when requested by the City Traffic Engineer.

X. Traffic Control – Street signs, warning signs, and traffic control devices are required on all local roads per latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Y. Bicycle Facilities – Local shall provide for according to the latest edition of the City Master Transportation and Master Trails and Open Space Plans.

Z. Private Streets – All roadways to be constructed in the City are to be considered public roadways, unless otherwise separately and formally approved as private roadways by the City Council. This includes all roadway or street types including a freeway, arterial road, major or minor collector, local road, cul-de-sac, court, place viaduct, culvert or bridge, or other public dedicated street or roadway. Private roadway types, which will require separate City Council approval, are private local roadways and cul-de-sacs, which serve more than 12 dwelling units. Other private roadway types include an alley, lanes, and driveway, but these do not require City Council approval as private roadway facilities.

Frequently, private developers wish to create private roadways for various reasons including a hoped for reduction in costs, ability to reduce the asphalt widths and roadway cross-sections to obtain more saleable parcels, gated communities, etc. In order to be as a private local roadway, the roadway needs to meet the requirements established in Section 2.21 – Private Roadways. In proposing that a local street or cul-de-sac be a private facility, the developer and his engineer need to keep in mind that proposed private local streets and cul-de-sacs, even though being proposed to be private, will still need to meet the City's minimum requirements for public local roadways and cul-de-sacs.

2.7 COLLECTOR ROADWAY DESIGN

A. General – Street designs shall conform to the pattern of arterials and collector roadways designated in the City of West Jordan Major Street Plan, any official street segment map approved by the City Code, and according to the following table:

Table 2.7.1
Collector Street Design Guidelines

Item	Descriptions		
Terrain Classification	Level	Rolling	Hilly
Right-of-way Width (feet)	70 – 80	70 – 80	70 – 80
Pavement Width (feet)	37 – 55	37 – 55	37 – 55
Type of Curb (A = High Back Curb)	A	A	A
Sidewalk and Bicycle Paths (feet)	5	5	5
Park Strip	5	5	5
Minimum Stopping Sight Distance (feet)	305	305	305
Maximum Grade	7%	10%	13%
Design Speed (MPH)	40	35	30
Minimum Centerline Radius of Curves (feet)	485	340	240
Min. Tangent between Reverse Curves (feet)	100	100	100
Street Lighting	SD	SD	SD
Driveways	SD	SD	SD

Note: SD = See discussion in appropriate section

Terrain Classification – The definitions of these terrain classifications are:
1. Level – grade range of 0 to 8 percent
2. Rolling – range of 8.1 to 15 percent
3. Hilly – grade of over 15 percent

B. Design Traffic Volume – Collector streets should be designed to accommodate a specific traffic volume at a specific level of service. It is difficult and costly to modify the geometric design of Collector Street after its initial construction. All Collector streets should be designed to accommodate the anticipated traffic for the street from the date of initial construction completion to 20 years after street construction.

C. Design Speed – Table 2.7.1 shows the appropriate values.

D. Minimum Sight Distance – Table 2.7.1 shows the appropriate values. These distances shall be provided for both horizontal and vertical curves.

E. Minimum Centerline Radii – The minimum centerline radii for a collector street (40 mph design speed) shall be 485 feet. Increases shown in the minimum curvature are predicated upon the increased design speed recommendation.

F. Minimum Tangent between Reverse Curves – Minimum should be 100 feet regardless of terrain or development density.

G. Maximum Grade – The only recommended change in grade is in hilly terrain. A 15 percent maximum grade on collector streets is not desirable.

H. Vertical Curves – Vertical curves should be used where the rate of change in grade exceeds the maximum allowable grade break on centerline of 0.5 percent. Table 2.7.1 shows the appropriate values.

I. Right-of-way Width – A minimum collector street right-of-way width of 70 – 80 feet is recommended as is shown in Table 2.7.1. This provides for a wider pavement and greater distance from sidewalks to curb.

J. Pavement Width – A minimum pavement width of 37 feet is recommended for all types of terrain and for low and medium densities. Under high-density conditions, 40 feet is recommended. When the centerline radius is less than about 600 feet, consideration should be given a 55 foot width unless curb parking is prohibited. The collector street provides space for one lane of moving traffic in each direction plus accommodation for curb parking and by prohibiting curb parking, the provision of an added turn lane at points where required. Examples of such points include approaches to intersections along major traffic routes and sections between adjacent offset intersections, so that through traffic would not be impeded by left-turning vehicles.

K. Cross Slope – Pavement cross slope must be adequate enough to provide for proper drainage of the pavement while still maintaining a smooth riding quality and good non-skid performance. Cross slope on new roads shall be 2 percent from the crown of the road to the edge of the gutter.

L. Medians – Median curb may be used on local roads to enhance the environment. Median openings should be placed at intervals approved by the City Traffic Engineer. End treatments must be visible to plows and be placed outside of any intersection zone of influence.

M. Types of Curb – High Back Curb are the City of West Jordan Standard for collector streets. The advantages of high back curb are:

1. Pedestrian, street trees, utilities, and signs are best protected by the barrier curb.
2. A positive limit of vehicle encroachment on the border area is established.
3. Depression of curb is required at driveways.
4. Creates excellent drainage control.
5. Provides improved control of potential parked runaway vehicles.

N. Curb Drainage – Minimum grade on all new curb and gutter should be 0.5 percent.

O. Curb Ramps – All new curb ramps in the City must be ADA complaint; curb ramps should be provided at all intersection pedestrian crossing locations.

P. Sidewalk Width – A mandatory requirement for providing a sidewalk along all collector streets is recommended. These form natural walking routes to pedestrian generators such as schools and neighborhood shopping. Table 2.7.1 shows the appropriate values.

Q. Sidewalk Distance from Curb Face – A minimum border area of 5 to 9 feet between curb and sidewalk edge is recommended as a practical method of retaining setback of residential property from the street. Another factor in cold climates includes area for plowed snow storage. Plowing is more frequent on collector routes, and the quantity of snow is increased by the added pavement width.

R. Driveways – Driveways should be regulated according to placement, width, vertical alignment, and number of entrances per property frontage. ADA guidelines must be considered when designing driveways. For more guidance on the regulation of driveways see section 2 of this manual.

S. Intersection Design – See information provided in Section 2.6.U for more information on local street intersection design.

T. Street Lighting – See Section 2.6 V.

U. Traffic Control – Street signs, warning signs, and traffic control devices are required on all local roads per latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

V. Bicycle Facilities – Local shall provide for according to the latest edition of the City Mater Transportation and Master Trails and Open Space Plans.

2.8 ARTERIAL ROADWAY DESIGN

A. General – Arterial roadway designs shall conform to the pattern of arterials roadways designated in the City of West Jordan Major Street Plan, any official street segment map approved by the City Code, and according to the following table:

Table 2.8.1
Arterial Roadway Design Guidelines

Item	Descriptions		
Terrain Classification	Level	Rolling	Hilly
Right-of-way Width (feet)	116	116	116
Pavement Width (feet)	81	81	81
Type of Curb (A = High Back Curb)	A	A	A
Sidewalk and Bicycle Paths (feet)	6' sidewalk 5' bike path	6' sidewalk 5' bike path	6' sidewalk 5' bike path
Sidewalk Distance Top Back of Curb (feet)	9	9	9
Minimum Sight Distance (feet)	425	425	425
Maximum Grade	6%	8%	10%
Design Speed (MPH)	50	50	50
Minimum Centerline Radius of Curves (feet)	840	840	840
Min Tangent between Reverse Curves (feet)	100	100	100
Street Lighting	SD	SD	SD
Driveways	SD	SD	SD

Note: SD = See discussion in appropriate section

Terrain Classification – The definitions of these terrain classifications are:
1. Level – grade range of 0 to 8 percent
2. Rolling – range of 8.1 to 15 percent
3. Hilly – grade of over 15 percent

B. Design Traffic Volume – Arterial streets should be designed to accommodate a specific traffic volume at a specific level of service. It is difficult and costly to modify the geometric design of an Arterial Street after its initial construction. All arterial streets should be designed to accommodate the anticipated traffic for the street from the date of initial construction completion to 20 years after street construction.

C. Design Speed – Table 2.14.1 shows the appropriate values.

D. Level of Service – See Section 2.3 for a discussion on arterial level of service standards.

E. Minimum Sight Distance – Table 2.8.1 shows the appropriate values. These distances shall be provided for both horizontal and vertical curves.

F. Minimum Centerline Radii – The minimum centerline radii for arterial roadways (50 mph design speed) shall be 950 feet. The maximum allowable degree of curvature shall be 12.5 degrees for arterial roadways. Increases shown in the minimum curvature are predicated upon the increased design speed recommendation.

G. Minimum Tangent between Reverse Curves – Minimum should be 100 feet regardless of terrain or development density.

H. Maximum Grade – Arterial roadways must maintain the maximum grade shown in Table 2.14.1 unless otherwise approved by the City Engineer.

I. Vertical Curves – Vertical curves should be used where the rate of change in grade exceeds the maximum allowable grade break on centerline of 0.5 percent. Table 2.14.1 shows the appropriate "k" values.

J. Right-of-way Width – A minimum arterial street right-of-way width of 106 feet is recommended as is shown in Table 2.14.1. This provides for a wider pavement and greater distance from sidewalks to curb. West of Bangerter Highway a minimum arterial street right-of-way width of 116 feet is recommended.

K. Pavement Width – A minimum pavement width of 81 feet is recommended for all types of terrain and for low and medium density developments.

L. Cross Slope – Pavement cross slope must be adequate enough to provide for proper drainage of the pavement while still maintaining a smooth riding quality and good non-skid performance. Cross slope on new roads shall be 2 percent from the crown of the road to the edge of the gutter.

M. Types of Curb – High Back Curb are the City of West Jordan Standard for arterial streets. The advantages of high back curb are:

1. Pedestrian, street trees, utilities, and signs are best protected by the barrier curb.
2. A positive limit of vehicle encroachment on the border area is established.
3. Depression of curb is required at driveways.
4. Creates excellent drainage control.
5. Provides improved control of potential parked runaway vehicles.

N. Curb Drainage – Minimum grade on all new curb and gutter should be 0.5 percent.

O. Curb Ramps – All new curb ramps in the City must be ADA compliant; curb ramps should be provided at all intersection pedestrian crossing locations.

P. Sidewalk Width – A mandatory requirement for providing a 6 feet wide sidewalk along all arterial roadways is recommended. These form natural walking routes to pedestrian generators such as schools and neighborhood shopping.

Q. Sidewalk Distance from Curb Face – A minimum border area of 9 feet between curb and sidewalk edge is recommended as a practical method of retaining setback of residential property from the roadway. Safety of pedestrian, snow storage and other factors are the reason for having this 9 feet requirement.

R. Driveways – Driveways should be regulated according to placement, width, vertical alignment, and number of entrances per property frontage. ADA guidelines must be considered when designing driveways. For more guidance on the regulation of driveways see Section 2 of this manual.

S. Intersection Design – See information provided in Section 2; for more information on local street intersection design.

T. Street Lighting – See Section 2.6 V.

U. Traffic Control – Street signs, warning signs, and traffic control devices are required on all local roads per latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

V. Bicycle Facilities – Local shall provide for according to the latest edition of the City Mater Transportation and Master Trails and Open Space Plans.

W. Bus Stops – Location of bus stops should be regulated according to the width and placement from driveways and intersections. For more guidance on the regulation of bus stops see Section 2.x of this manual.

2.9 AT-GRADE INTERSECTION DESIGN

A. General – Intersection designs shall complete by a registered Civil Engineer with expertise in traffic engineering that is to base his design on traffic analysis of the intersection. In addition to information obtained from the traffic analysis of the intersection, he is to take into account the information contained in the following table:

Table 2.9.1
Intersection Design Guidelines

Item	Description		
Terrain Classification	Level	Rolling	Hilly
Development Density	All	All	All
Approach Speed (mph)	25	25	20
Clear Sight Distance (length along each approach leg) (feet)*	90	90	70
Vertical Alignment within Intersection Area	Flat	2%	
Minimum Angle of Intersection	75˚ 90˚ Preferred	75˚ 90˚ Preferred	75˚ 90˚ Preferred
Minimum Curb Radius (feet) a. Local-local b. Local-collector c. Collector-major	25	25	25
Minimum Centerline Offset of Adjacent Intersection (feet) a. Local-local b. Local-collector c. Collector-collector d. Arterial-local e. Arterial-collector f. Arterial-arterial	 200 300 300 ¼ mile ¼ mile ¼ mile	 125 150 200 1100	 125 150 200 1100
Minimum Tangent Length Approaching Intersection (each leg) (feet)	50	30	20
Drainage Structures	SD	SD	SD

Note: SD = See discussion in appropriate section
* At an alley intersection with a street (or another alley) a 15 foot minimum clear sight distance leg is recommended along each intersection property line.

2. Approach Speed – An approach speed of 25 mph is desirable for all intersections. However, this requirement would be severely binding with respect to economics of design in hilly terrain. Therefore, a reduction to 20 mph for such intersection design maybe considered as shown in Table 2.17.5. The safe approach speed involves safe stopping distance or vertical and horizontal curves, beginning about 100 feet from the intersection, plus clear sign distance.

3. Clear Sight Distance – The intersection of two local streets should be designed to operate without any control device whenever possible. The best way to achieve this is to design and maintain proper sight distance. This usually can be attained at intersections by restrictions on height of lot embankment, location of building and any screening shrubbery, fences, or low-growing trees.

The sight distance clearances basically relate to the intersections of two local streets. Where a local street intersects a collector, it is customary to assign right-of-way to the collector. This is typically done by posting 'Yield' signs facing the local streets. If sight distance does not allow a safe approach speed of at least 20 mph, it is good practice to use 'Stop' sign control for the local street.

4. Vertical Alignment within Intersection Area – Intersection areas should be designed with a flat grade. In the more difficult terrains, this becomes economically impractical. An allowance of 2 percent maximum intersection grade in rolling and 4 percent in hilly terrain is recommended in Table 2.9.5.

5. Minimum Angle of Intersection – It is desirable for all intersections to meet at approximately a 90 degree angle. Skewed intersections must be approved in writing by the City Engineer, and in no case should the angle be less than 80 degrees.

6. Minimum Curb Radius – As curb radius is increased, paving costs and intersection area required for a pedestrian to traverse are increased and higher turning speeds are encouraged. Substandard radii result in unnecessary lane encroachment and increased traffic conflict and accident potential. Reasonable design values of 20 feet are recommended for intersection radii of two local streets, using the AASHO design passenger vehicle. This design will also accommodate garbage trucks and moving vans, with wide swings. An increased radius of 25 feet for the local-collector or collector-collector intersection is predicated upon a design to slightly improve speed of a vehicle in entering or leaving the collector. A collector intersection with a major street should have a 20 foot radius.

7. Corner Clearance – See Section 2.12, Figure 12.12.5

8. Minimum Centerline Offset of Adjacent Intersection – Several studies of intersection design have shown T-type intersection to be far safer than cross-type. Extensive use of T-intersections in residential subdivisions is strongly recommended. One disadvantage, however, is 'corner-cutting' when inadequate offset exists between adjacent intersections. To reduce this hazardous practice, offsets of at least 125 feet between centerlines are desirable. In the case of two collector-street intersections, this offset should be increased in order to allow for left-turn storage between intersections.

   Offset intersections have disadvantages when one or both such streets are a collector intersecting a major street, if volumes will be such to warrant traffic signals. Operations at such locations are more complicated than those for normal cross-type intersections. Therefore, other design solutions should be sought if signalization might otherwise be required. When offset intersections are used at a major street, they should be located to avoid conflicting left turns (this is especially important where 2-way left turn lanes are to be provided, or where left-turn slots are used in a fairly narrow median.) Such left-turn conflicts exist when an intersection offsets to the right rather than to the left. Multi-leg intersections (over four) are undesirable from the control and safety standpoint.

9. Minimum Tangent Length Approaching Intersection – It is desirable to provide a tangent section of roadway approaching intersections, when the street leg has a minimum of near-minimum radius curve. The guidelines values in Table 2.9.1 would not apply to a collector, for example, with a 1,000 foot radius that is intersected by a local street. It would apply to an intersecting local street with a 200 foot radius leg.

10. Drainage Structures – Inlets or catch basins should not be located within the corner radius or within 6 feet of either end. Clearance is needed to keep the area relatively dry and to allow space for streetlights, name signs, utility poles, etc. Grate design should provide for safety of bicycle traffic.

11. Traffic Control Devices – Traffic control devices shall be installed by the developer where the MUTCD warrants such a device. The following general rules will aid in the placement of traffic control devices.

12. Traffic Signal Locations – Traffic signals shall be installed by the city at locations determined by the Master Transportation Plan, a TIS, or the City Traffic Engineer. When it can be shown that a development change impacts a street or streets to a point that a traffic signal is deemed necessary for the safety and efficiency of vehicles and/or pedestrians, the developer may be responsible for all or some portion of the signal and its installation, determined on the amount of traffic contributed by the development.

13. Traffic Signal Emergency Vehicle Pre-emption – New traffic signals construction in the City are to be equipped with the pre-emption feature to allow emergency vehicles to pass through the intersection in a safe and timely fashion.

14. Roundabout Locations – Roundabout intersections should be considered at locations that do not meet traffic signal warrants but may do so in the future as traffic increases. Roundabouts may also be considered in place of traffic signals provided that capacity needs are met for at least 10 years after construction.

2.10 PRIVATE STREET DESIGN

A. General – A private roadway means any local street or cul-de-sac, or right-of-way which has been reserved by dedication unto the sub divider, lot owners, or Homeowners' Association to be used as a private access to serve property and complying with the adopted local street cross-section standards and construction standards of the City. All private local streets shall be approved separately by the City Council and maintained by the sub divider or other private entity. Private local streets are those, which serve 12 or more dwelling units. The Developer of a private local street established or created within the City shall comply with the following requirements.

B. Minimum Requirements to Qualify as a Private Street – The following defines minimum requirements to qualify as a private street as well as defining what a private street cannot do.

1. Requirements for Private Streets – Private streets within developments may be allowed, provided they meet the following additional criteria:

    a. If the private street is designed and constructed as a public street of similar classification would be designed and constructed.

    b. They provide the necessary easements for public owned utilities.

    c. They provide adequate space within the right-of-way for such things as parking, water meters, street lights, mail boxes, sidewalks, street signs, area for snow storage, garbage collection, and the traveled way.

    d. The traveled way must be a minimum of 29 foot wide.

    e. Structural sections shall be the same as for streets for public streets of equivalent classification.

    f. They must have curb, gutter, and sidewalk, just as a public roadway does.

    g. Pedestrian access plans shall be required.

    h. Internal traffic calming devices or traffic circles may be required.

    i. Street cross-sections shall be the same as defined for a public street of the same classification.

    j. The roadway shall be bonded for, and inspected, just as a public roadway would be.

    k. There is a Homeowners' Association (HOA) established, with bylaws approved by the City, which will provide for operations and maintenance of the private road rights-of-way.

2. Private streets within Planned Unit Developments (PIDs) and serving more than 12 single family residential lots require review and approval by the City Engineer, Fire Chief, Public Works Director, and City Council.

3. Additional Approval Criteria, General – Private streets are not allowed:

    a. When they conflict with the Master Transportation Plan; or

    b. When they are needed to provide for public circulation and connectivity through and within the area and project; or

    c. When they connect two (2) public roads (except for commercial or industrial use); or

d. When they have a traveled way less than that required for public streets of the same classification; or

e. When they do not include curb, gutter, and sidewalk facilities; or

f. Provided that where expansion of a public street is not presently feasible, the limitations of this subsection shall not apply if the affected internal and frontage streets are improved to public standards and dedicated to the City, with the acceptance of such dedication(s) being deferred until extension of a public street allows connection.

4. Notice on Plat – The following statement is required on the face of any plat, short plat, site plan, or binding site plan containing a private street: "The City of West Jordan has no responsibility to improve or maintain private streets contained within or, providing access to the property described in this document. Any private street shall remain a private street unless it is upgraded to public street standards at the expense of the developer or adjoining lot owners. No private street will be accepted as a City street until such time that it meets current City standards to the satisfaction of the City Engineer, Fire Chief, and is formally approved as a public street by the City Council."

5. Alleys – Alleys shall be a minimum of 24 feet wife with a 20 foot paved travel surface. Alleys may be required in residential areas and properties abutting arterials. Alleys may be required in all commercial areas and industrial areas. No parking is allowed within the right-of-way of alleys.

6. Fire/Safety Access

a. Residential streets serving thirty (30) or more residential units shall provide at least two (2) vehicular access routes. An "emergency only" route may suffice for one route.

b. Access roads shall provide a driving surface capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds.

c. Access roads with fire hydrants shall be at least 26 foot wide to an approved turn around. This condition applies to all street types including "Partial Streets" and "Private Streets."

d. Fire Apparatus access roads may not exceed 10 percent in grade. Grades steeper than 10 percent shall require approval by the Fire Chief.

e. Access road minimum turning radii shall be determined by the Fire Marshall.

f. Parking restrictions along access roads shall be determined by the Fire Marshall.

C. Application Requirements – Each developer must comply with the following:

1. Application – The Developer shall prepare the required application forms and pay the required forms in order for the City staff to process the request to consider the street as a 'private street'.

2. Map and sketch – As part of the application, the Developer or his Engineer has provide six copies of a map and sketch showing the proposed 'private street', drawn to scale by a Professional Engineer showing connection to public street(s), locations of buildings along roadway, width of the proposed 'private street', parcels along the proposed 'private street', etc.

3. Public Utilities – Public utilities are to be installed in the proposed 'private street' just a s they would be in a public street. This includes sizes, materials, plan reviews, inspections, etc. The City Engineer shall approve all improvements and all improvements are to be bonded for and inspected by City staff. These public utilities are to be transferred to the City by a bill of sale according to City form.

4. Easements for Public Utilities – The Developer is to provide easements to the City for public utilities and appurtenances, as determined by the City Engineer. Easements are to be provided on City approved forms.

5. Hydrants – Hydrants are to be designed and constructed in accordance with the City's 'Water Policies & Design Criteria Manual' and Fire Marshall's requirements. Hydrants are to be installed prior to issuance of building permit.

6. Street Extensions – Extended at same width of future road,

7. Zoning – Private roadway shall not be designed to cause any building to violate any ordinances.

8. Street Signs – The Developer shall provide street signs at each intersection of the street, as required for public streets. Damage to street signs shall be completed and paid for by the Developer or homeowner's association.

D. Municipal Service on Private Roadways – Private roadways do not allow for the same type of service as publicly dedicated roadways. The differences are as follows:

1. Garbage picked up where private meets Public Street

2. No snow removal.

E. Maintenance of Private Roadways - Owners of private road are responsible for the operations and maintenance of the private road and shall be so maintained so as to allow emergency vehicle access.

F. Sidewalks on Private Streets

1. All private streets shall provide for pedestrian and handicapped access to all units or building proposed.

2. Sidewalks are required on both sides of all private streets to provide access to all units, parking, and recreation areas in a planned development or condominium project. Sidewalk circulation throughout the site is required, although not necessarily adjacent to the curb.

3. Sidewalks may be eliminated under the following circumstances:

   a. Private streets that are not through streets and have an entire street length less than 150 feet and access a maximum of 12 units.

   b. Private streets that are not through streets which access eight (8) units or less and do not exceed 300 feet of entire street length.

   c. Single loaded streets may eliminate sidewalks on the side opposite the units when it is not needed to provide for a logical pedestrian circulation.

4. The City Engineer reserves the right of final determination of sidewalk locations and roadway design issues consistent with City Standards.

2.11 PRIVATE LANES, ALLEYS, AND DRIVEWAYS

A. General – A private lane means a private thoroughfare less than 26 feet wide for the use of pedestrians and vehicles providing a means of access to more than two (2), but less than twelve (12) residential dwelling units.

A private alley means a private thoroughfare less than 26 feet wide for the use of pedestrians and vehicles providing a secondary means of access to the rear of abutting properties. Alleys shall be a minimum of 26 feet wide with a 24 foot paved travel surface. Alleys may be required in residential areas and properties abutting arterials. Alleys may be required in all commercial areas and industrial areas. No parking is allowed within the right-of-ways of alleys.

A private driveway means a private thoroughfare less than 26 feet wide for the use of pedestrians and vehicles providing a means of access to less than two (2) abutting dwelling units, if a residential project, or parcels, if the project is a commercial property. The Developer of a private driveway established or created within the City shall comply with the following requirements.

B. Minimum Requirements to Qualify as a Private Lane, Alley, Or Driveway – The following defines minimum requirements to qualify as a private lane, alley, or driveway as well as defining what a private lane, alley, or driveway cannot do.

1. Requirements for private lane, alley, or driveways – Private lane, alley or driveways, within developments may be allowed, provided they meet the following criteria:

    a. They provide the necessary easements for public owned utilities, if any.

    b. Pedestrian access plans shall be required.

2. Notice of Plat – The following statement is required on the face of any plat, short plat, site plan, or binding site plan containing a private lane, alley, or driveway: "The City of West Jordan has responsibility to improve or maintain private lanes, allies, or driveways contained within or providing access to the property described in this document. Any private lane, alley or driveway shall always remain a private driveway.

3. Fire / Safety Access

    a. Access lanes, allies, and driveways shall provide a driving surface capable of supporting the imposed load on fire apparatus weighing at least 75,000 pounds.

    b. Access lanes, allies and driveways with fire hydrants shall be a least 26 feet wide to an approved turn around.

    c. Fire Apparatus access lanes, allies, and driveways may not exceed 10 percent in grade. Grades steeper than 10 percent shall require approval by the Fire Chief.

    d. Access lane, alley, and driveway minimum turning radii shall be determined by the Fire Marshall.

    e. Parking restrictions along access lanes, allies and driveways shall be determined by the Fire Marshall.

C. Municipal Service on Private Lanes, Allies, and Driveways – Private lanes, allies, and driveways do not allow for the same type of service as publicly dedicated streets. The differences area as follows:

1. Garbage picked up where private meets public street.

2. No snow removal.

D. Maintenance of Private Lanes, Allies, and Driveways – Owners of private lanes, allies, and driveways are responsible for the operations and maintenance of the private lanes, allies, and driveways and shall be so maintained so as to allow emergency vehicle access.

E. Private Lanes, Allies, and Driveways – Private driveways in residential areas and commercial areas shall comply with the following requirements.

Table 2.11.6
Requirements for Private Lanes, Allies, and Driveways

Length	Width	Grade	Turnarounds Required
(a) 0 – 150’	20’	10%	None Required
(a) 151 – 450’	20’	10%	120’ Hammerhead Diameter Cul-de-sac
(b) 451 – 750’	26’	10%	120’ Hammerhead Diameter Cul-de-sac

(a) Curves and topographical conditions could alter the requirements for turnarounds and the width of access ways. Secure Engineer’s approval.

(b) Lengths over 750’ requires Engineer’s written approval.

2.12 ACCESS MANAGEMENT

A. General – Access management programs seek to limit and consolidate access points along arterial and collector streets while promoting the use of the supporting local street system for access to developments. Access management controls will vary by the functional classification of a street. The principles of access management, however, are the same for all functional street classifications. The four major principles of access management are as follows:

1. Minimize the number of access points.

2. Separate conflict areas.

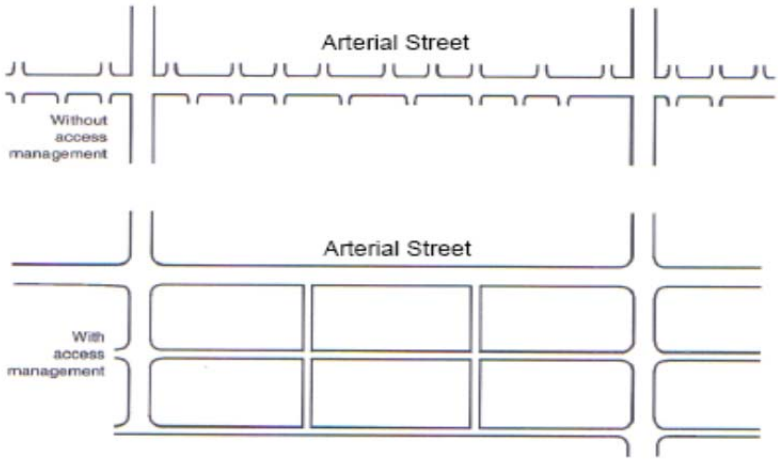
3. Minimize acceleration / deceleration requirements.

4. Remove turning vehicles from through-traffic lanes.

B. Minimize Access Points – Minimizing the number of access points to Collector and Arterial streets reduces traffic conflict locations along a roadway, improving safety and traffic flow conditions.

1. Limit Access to Lowest Functionally Classified Street – Access to arterial streets (and collector streets where possible) should be minimized by requiring access connections to adjacent lower functionally classified streets. Arterial streets are functionally classified to carry high traffic volumes, operate at higher traffic speeds, and serve primarily through traffic. If a property can receive access from an adjacent street with a lower functional classification it should not be granted access from the higher functionally classified street. In this manner, traffic access conflicts are shifted to the lower functionally classified street, which will typically have lower volumes and speeds and provide safer conditions. Figure 2.12.1 illustrates an example of requiring driveways access from lower level functionally classified streets.

Figure 2.12.1
Example of Limiting Access to Nonresidential Streets

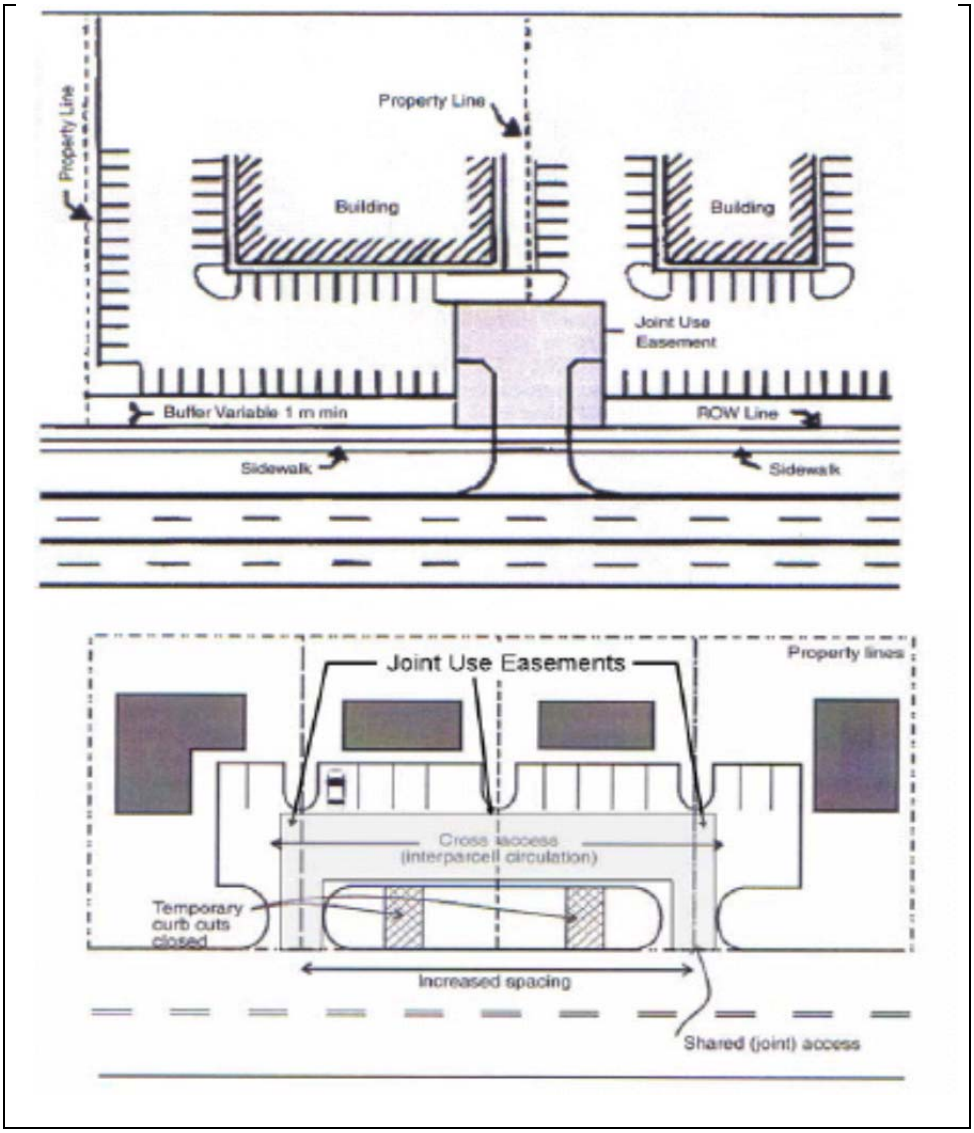


2. Limit Number of Property Access Points – Each sing-family residential property should be permitted only one driveway. These properties do not generate high traffic volumes and present minimal conflicts with local street traffic movements.

   For commercial properties, the number of access points that should be allowed depends on the length of property frontage along an arterial or collector street and the volume of traffic generated by the development. A general rule of thumb requires a property to generate more than 500 trips per hour (typically equivalent to 5,000 trips per day) to justify more than one driveway. Should a property generate this high volume of trips, a second driveway may be considered if its frontage exceeds 60 feet. Three driveways may be considered if the development's frontage exceeds 1,300 feet. A second or third access driveway should only be granted if a traffic impact study for the property indicates a need for two or three access driveways to maintain traffic flow on the street.

3. Shared Access – On some properties it may be possible to minimize the number of access points by sharing access between adjacent properties. This can be accomplished by encouraging cross easements between adjacent properties and parking circulation designs that accommodate ingress / egress traffic patterns to both properties. Figure 2.10.2 illustrates an example of shared access control between two adjacent properties.

Figure 2.12.2
Shared Access Examples – FHWA Access Manual



C. <u>Control Access Spacing</u> – The separation of conflict areas directly reduces the number of conflict points, the overlapping of traffic movements between conflict areas, and the footprint of conflict areas by limiting vehicle maneuvers at or between adjacent access points.

1. Driveways should be adequately spaced to limit traffic entrance / exit maneuver conflicts between driveways. Each driveway should be located based on its proximity to adjacent driveways, driveways on the opposite side of the street, and if the street is median-divided, its proximity to a median opening. Table 2.12.1 illustrates minimum recommended driveways spacing criteria based on the posted speed limit of the arterial or collector street.

Table 2.12.1
Driveway Spacing Criteria

Posted Speed	Driveway Spacing (Center to Center)
25	105 feet
30	125 feet
35	150 feet
40	185 feet
Source: FHWA Access Management Manual	

The application of the minimum spacing requirement assumes that a property has sufficient frontage to provide the required spacing. When a property does not have sufficient frontage along a street or the ability to share access with adjacent properties to meet this criterion, each property can be granted an individual access driveway. Under the above conditions, access should be located to maximize spacing between adjacent property driveways.

2. On median-divided streets, driveways should be located to align with existing or planned median openings or be sufficiently located away from the median opening to accent for a future driveway to be located at the median opening. This is required to minimize median traffic movement conflicts with adjacent driveway movements. Table 2.12.2 illustrates minimum recommended median opening spacing requirements.

Table 2.12.2
Median Spacing Criteria

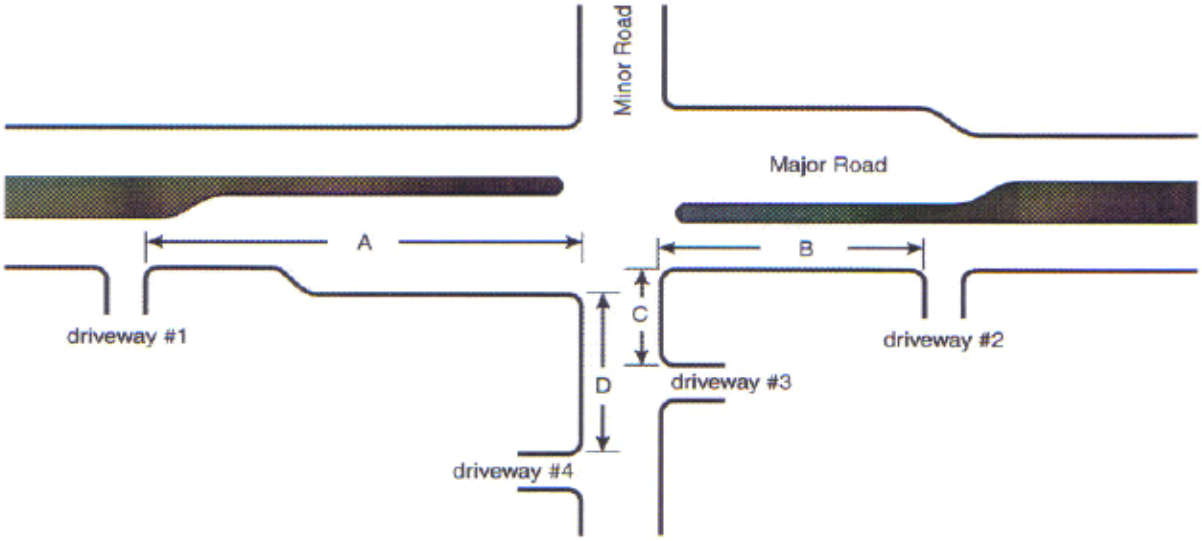
Posted Speed (mph)	Median Opening Spacing
25	300 feet
30	370 feet
35	460 feet
40	530 feet
Source: FHWA Access Management Manual	

3. For undivided streets, driveways on opposite sides of the street should be located across from each other, be spaced at least 150 feet apart for driveways to minor generators, or 30 feet apart for driveways to major generators. Minor generators are defined as developments that generate less than 5,000 trips per day. Major generators are defined as developments that generate greater than 5,000 trips per day. For arterial and collector streets with residential land uses, it is typically not feasible to provide 150 feet driveway spacing because of limited property frontage widths.

   Under this condition, spacing requirements of residential driveways on opposite sides of the street that cannot be located across from one another are reduced to 50 feet.

D. Limit Intersection Approach Clearance – The location of access driveways in proximity to street intersections should avoid the functional area of intersection. Traffic movements entering or exiting driveways within an intersection's functional area add conflict points to the intersection. Figure 2.12.5 provides recommended minimum driveway spacing criteria for the approaches to the intersections controlled by stop signs or traffic signals.

Figure 2.12.5
Corner Clearance Criteria at Controlled Intersections – FHWA Access Manual



Clearance Type	Volume in Lane Adjacent to Access	Intersection Capacity	Posted Speed	Min. Corner Clearance
A – Upstream on Major Street			20 mph	115 feet plus queue storage
			30 mph	270 feet plus queue storage
			40 mph	420 feet plus queue storage
			50 mph	610 feet plus queue storage
B – Downstream on Major Street			30 mph	200 feet
			40 mph	305 feet
			50 mph	425 feet
C – Approach Side on Minor Street	50 vph, ~500 ADT	< 100 vph (Stop control with high cross traffic)		100 feet
		> 100 vph (Stop control with low cross traffic)		50 feet
	100 vph, ~1,000 ADT	<100 vph (Stop control with high cross traffic)		100 feet
		<200 vph (Stop control with low cross traffic)		75 feet
		>200 vph (Signal Control)		50 feet plus queue storage
D – Departure Side on Minor Approach			20 mph	115 feet
			30 mph	225 feet
			40 mph	365 feet
			50 mph	535 feet

E. Driveway Design – In addition to controlling the spacing and frequency of driveway access points along arterial or collector streets, it is equally important to control the design of driveways. The four factors that are considered critical to sound driveway design are:

1. Throat width

2. Throat length

3. Curb radii

4. Vision corners

These considerations are necessary to minimize adverse effects from vehicle conflicts, backups, and vehicle acceleration / deceleration requirements at each driveway access location. The sound application of these principles will:

1. Reduce crashes

2. Maximize existing street capacity

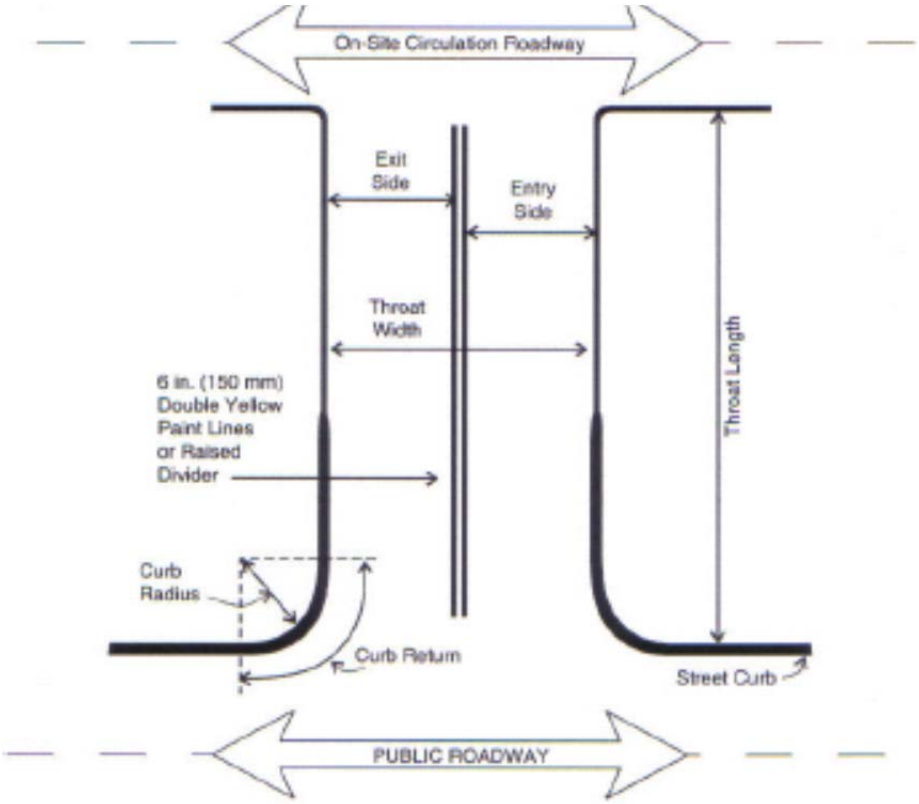
3. Preserve the public investment in transportation infrastructure

4. Reduce the need to widen or build new streets

5. Protect the value of private investments

Figure 2.12.6 illustrates some of the major driveway design elements for nonresidential land uses.

Figure 2.12.6
Nonresidential Driveway Elements – FHWA Access Manual

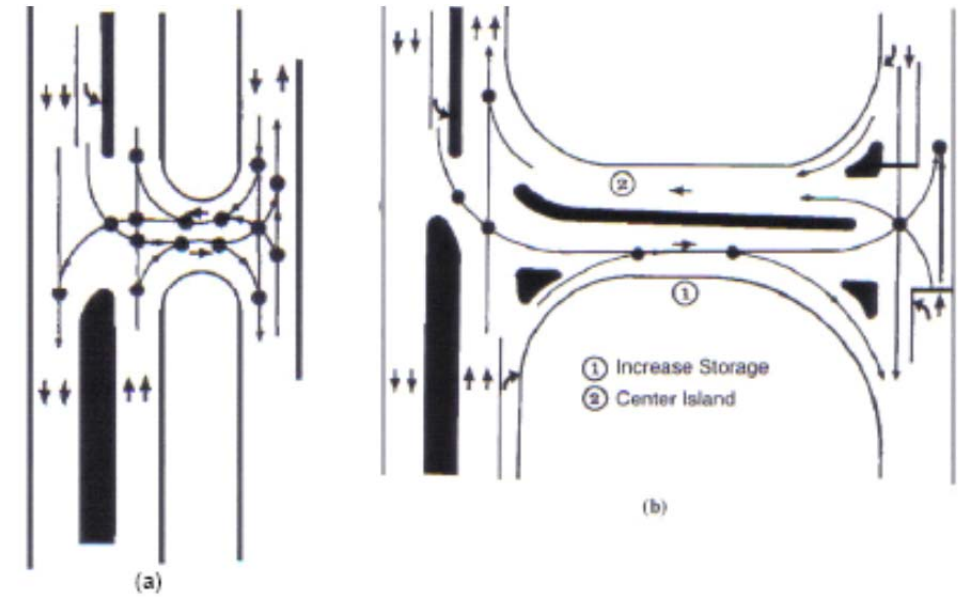


1. Driveway Throat Width – Driveway throat width and curb radii are related and control vehicle entering speeds that can affect through-traffic movements on the street. Driveway width also affects pedestrians and bicyclists. Narrow driveways serve to minimize the conflict zones between vehicles and crossing pedestrians or bicyclists. Studies have shown that the driveway throat width on single-entry lanes should be 14 feet. The driveway throat width of 14 feet permits an entering vehicle to maintain a reasonable speed when entering the development. Only when two lanes are required for movements into a major traffic generating development, additional width is required to accommodate regular trucking access to manufacturing, or light industrial development, should driveway be widened beyond the recommended maximum sing entrance land width of 16 feet.

2. Driveway exit lane widths should be a minimum of 10 feet unless a traffic study shows a need for additional lanes. Whether signed or not, Utah Statutes require drivers to stop in the driveway proper to entering the street. If two lanes are required for operational purposes to minimize driveway queuing or to separate right-turn vehicles from through or left-turn exit movements, the exit lanes should be 10 to 12 feet wide and separate from entering traffic by a raised median with a minimum width of 4 feet. The median width is necessary to protect traffic control signage that may be located within it.

3. Driveway Throat Length – As shown in Figure 2.12.6, driveway throat length is the distance between parking lot circulation activity and the street curb. Parking space activity and site circulation roadways should be separated from traffic entering or exiting the driveway to avoid the overlapping driveway entrance and parking lot circulation conflicts as shown in Figure 2.12.7.

Figure 2.12.7
Driveway Design Examples



(a) = poor design
(b) = good design

The standards shown in Table 2.12.3 should be applied to the design of driveway throat lengths.

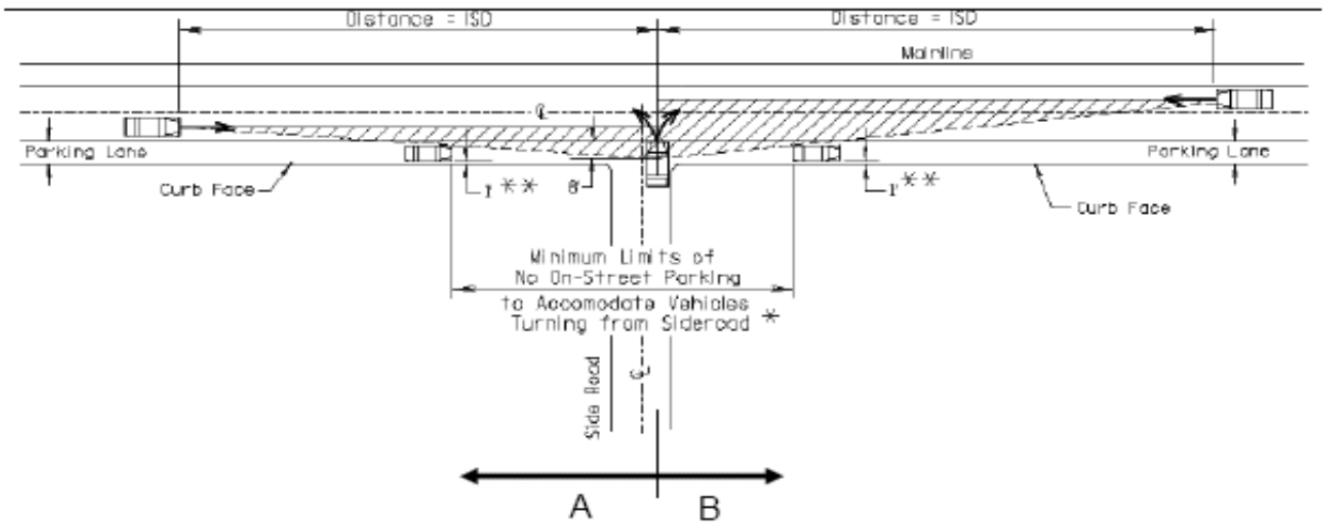
Table 2.12.3
Recommended Minimum Driveway Throat Length

Parking Spaces per Exit Lane	Land Use			
	Multifamily	Retail	Office	Industrial
0 – 200	25 feet	25 feet	25 feet	50 feet
201 – 400	25 feet	50 feet	100 feet	150 feet
401 – 600	50 feet	150 feet	200 feet	Add lanes
601 – 700	100 feet	200 feet	Add lanes	
> 701	200 feet	Add lanes		
Source: CHRP Report 348, Access Management Guidelines for Activity Centers				

4. Driveway Curb Radii – Curb radii design affects the turning radius used by vehicles entering a driveway and the speed of right-turning vehicles. Increased radii and vehicle speeds have a negative impact on pedestrian safety on adjacent sidewalks. Driveway radii should range between 10 to 15 feet. This standard may require that larger trucks encroach on the exiting travel lane of the driveway when entering.

5. Driveway Vision Corners – The final element of sound driveway design on arterial and collector streets is the provision of adequate sight distance for entering and exiting vehicles. Vision corners shown in Figure 2.12.8 are defined by American Association of State and Highway and Transportation Officials (AASHTO). The intersection Sight Distance (ISD), shown in Figure 2.12.8, are those recommended by the Utah Department of Transportation.

Figure 2.12.8
Driveway Vision Corners on Arterial and Collector Streets



Residential/Commercial Driveways

Design Speed	ISD to Left	A = Parking Restriction to Left	ISD to Right	B = Parking Restriction to Right
25 mph	295 feet	170 feet	370 feet	115 feet
30 mph	355 feet	205 feet	445 feet	140 feet
35 mph	415 feet	240 feet	515 feet	160 feet
40 mph	475 feet	275 feet	590 feet	180 feet

Industrial Driveways

Design Speed	ISD to Left	A = Parking Restriction to Left	ISD to Right	B = Parking Restriction to Right
25 mph	370 feet	215 feet	445 feet	140 feet
30 mph	445 feet	255 feet	530 feet	165 feet
35 mph	515 feet	295 feet	620 feet	190 feet
40 mph	590 feet	340 feet	710 feet	220 feet

2.13 DESIGN CONSIDERATIONS

A. General Requirements for all Subdivisions – The Developer and his engineer are also to comply with the requirements of the City's Development Processing Manual, which describes the general requirements for all subdivisions. Please refer to this manual for detailed information necessary in the design and processing of private development projects.

B. Right-of-way and Easements – All public roadways must be dedicated to the City using either the plat process or by right-of-way and easement documents, which dedicate these properties to the City. The City has standard fee parcel and easement dedication forms, which must be used for dedication of property to the City. These standards forms are contained in Appendix C.

C. Permits – In processing private development projects, please refer to the City's '*Private Development Processing Manual'* for additional information.

* * * * *

SECTION 3.0

FLEXIBLE PAVEMENT DESIGN METHOD

3.1 FLEXIBLE PAVEMENT DESIGN

A. General - This section provides a comprehensive set of design procedures required to produce an acceptable flexible pavement structural design on new and reconstructed roads in the City of West Jordan. These design procedures are based on the recommendations found in the 1993 version of the *"AASHTO Guide for Design of Pavement Structures"* and on recommendations found in the November 1998 version of the *"UDOT Pavement Design Manual"*. The AASHTO flexible pavement design method is an empirical approach. This means that the relationship between design inputs (e.g., loads, materials, layer configurations and environment) and pavement failure were arrived at through experience, experimentation, or a combination of both.

The City has decided to take this approach due to past problems it has experienced in regards to consultants performing these designs for private development projects. In order to eliminate these problems, the City has decided to require that consultants follow a well established and proven method, show their work, and stamp and sign these pavement designs, rather than provide tables or minimum pavement thicknesses which may be appropriate for the vehicle loads placed on them.

B. Background – When the AASHO Road Test was completed, the test results and existing design procedures were compiled to develop pavement design criteria and procedures. These procedures were published in 1961 as the *"AASHO Interim Guide for the Design of Rigid and Flexible Pavements"*. The AASHTO Guide for Design of Pavement Structures was published in 1972, and updated in 1981, and 1993. The City of West Jordan has altered some of the current design values, performance requirements, material properties and environmental effects to match the local conditions found in the City.

C. Scope – The design procedures outlined in this section apply to the construction of new asphalt pavement roadways in the City of West Jordan. All designs submitted to the City for review and approval must adhere to the following procedures to receive approval. Approval by the City does not relieve the designer of his or her responsibility to ensure that the information given to the City is accurate and that the submitted design will properly serve the type of traffic that use or will use the facility over the specified performance period.

D. Design Engineer's Responsibilities – The design of pavement sections is a combination of several different and varied factors of civil and geotechnical engineering, which are under the control of the design engineer, not the City. This includes the preparation of an adequate geotechnical report which is representative of soil conditions in the field, at the proper location, both horizontally and vertically, a determination of the types of vehicles which are going to use these roads, the numbers of these types of vehicles, an assumption of the life of the roadway, the equivalent single axle loads (ESALs) the roadway will be subject to, all of which are based in original assumption prepared and made by the design professionals preparing these pavement

sections designs. Assumptions and studies made of these initial design parameters are the sole responsibility of the design professional preparing these pavement designs and are not dictated by the City. The design professional is tasked with performing an adequate design of the pavement design and affixes his/her stamp and signature indicating he/she have performed the design, and it is adequate to provide the service life designed for.

E. Pavement Design Scoping Meeting - One of the biggest sources of an incomplete pavement design is a lack of understanding by the designer of what the owner expects from the pavement being designed. In many cases, the pavement designer is hired by an intermediate party, such as a developer or design consultant, and is not given the complete set of requirements that they must design to. The current West Jordan design policy requires a consultant pre-application meeting to discuss traffic volume issues, but it does not necessarily include the pavement design engineer. It is recommended that either the Pavement Designer attend the pre-application meeting or the City require a Pavement Design Scoping meeting with the Pavement Design Engineer. The following items should be addressed:

1. Discuss critical City concerns
   a. Review existence of Expansive/Swell potential soils
   b. Review Requirements for Geogrid/Separation fabric
   c. Review Qualifications of Designer
   d. Review Materials and Construction items to include in design (see below)
2. Identify Traffic Detail Needs
   a. City provided AADT, or define plan for acquiring
   b. Define growth factor based on planned development and road class
   c. Discuss construction traffic needs and phasing practices that will affect pavement structural design and construction
      1) If pavement will be built with staged construction practices during development construction, pavement needs to be designed for actual thickness to be placed at time of development construction and appropriate adjustments made to remaining service life of first stage layer, prior to designing/placing top layer.
3. Develop a plan for pavement specific geotechnical investigation (before investigation begins and separate from the geotechnical plan for home construction)
   a. Require Site Visit by pavement engineer
   b. See recommendations for geotechnical investigation below
4. Review acceptable computer programs
   a. Commercial programs
      1) ACPA WinPAS
      2) DARWin
   b. Spreadsheets need to be checked against established programs to verify accuracy
5. Identify and review any adjacent location pavement designs
6. Discuss pavement drainage
   a. Address need for drain systems for major arterials and high water tables
   b. Design to FHWA Drainage System Requirements Technical Paper No. 90-01 "Subsurface Pavement Drainage"

F. Minimum Pavement Design Experience -. The minimum requirements for those performing pavement designs are:
   1. All designs to be performed and stamped by a registered P.E.
   2. Pavement designer shall:
      a. Submit list of minimum 5 similar designs/investigations previously performed.
         1) Include brief summary of scope and location
         2) Designs for demonstration of experience must include
            1. Subgrade investigation and testing
            2. Materials identification for all layers
            3. Specification/special provision development
         3) Designs performed by other members of the designer's firm are not acceptable for demonstration of experience.
      b. Pavement Designer shall have 5 years of experience in materials testing or evaluation, or demonstrate collaboration with a Materials Engineer with similar experience.

G. Limitations – Major limitations of the AASHTO flexible pavement design procedure are summarized as follows:

   1. Limited materials and Subgrade - The Road Test used a specific set of pavement materials and one roadbed soil. The extrapolation of the performance of these specific materials to general applications is dangerous because the materials and soils available locally will probably not be identical to those used at the Road Test and will perform differently. The AASHTO design procedure addresses this deficiency through the use of several adjusting factors and inputs. However many of these inputs are also based on empirical relationships and must be used carefully.
   2. No mixed traffic - The AASHTO Road Test accumulated traffic on each test section by operating vehicles with identical axle loads and axle configurations. In-service pavements are exposed to many different axle configurations and loads.
   3. Short road test performance period - The number of years and heavy axle load applications upon which the design procedure is based represents only a fraction of the design age and load applications that many of today's pavements must endure.
   4. Load equivalency factors - The load equivalency factors used to determine cumulative 18-kip ESALs pertain specifically to the Road Test materials, pavement composition, climate and subgrade soils. The accuracy of extrapolating them to other regions, materials and distresses, etc., is not known, but is questionable.
   5. Variability - A serious limitation of the AASHTO design procedure is that it is based upon very short pavement sections where construction and material quality were highly controlled. Typical projects are normally several miles in length, and contain much greater construction and material variability, and hence show more variability in performance along the project in the form of localized failures. Projects designed using average inputs could be expected to exhibit significant localized failures before the average project serviceability index drops to p , unless a level of reliability somewhat greater than that desired is selected for t design. Lack of guidance on some design inputs - Structural coefficients and drainage modifying factors are very significant on influencing flexible pavement layer thicknesses, and there is very little guidance provided for their selection. The design reliability also has an extremely large effect on pavement thickness and very little guidance is provided in selecting this factor.

Successful use of the AASHTO Guide requires a lot of experience and knowledge of the assumptions and underlying basis for design. It is strongly recommended that the resulting designs be checked using other procedures and mechanistic analyses.

3.2 DESIGN VARIABLES

A. Performance Period – This refers to the period of time that the initial pavement structure will last before it needs rehabilitation. This also refers to the time elapsed as a new pavement structure deteriorates from its initial serviceability to its terminal serviceability. When consultants perform pavement designs for the City of West Jordan, the *"Performance Period"* will be 30 - years from project construction completion.

B. Traffic ($W_{18,}$ Equivalent Single Axel Loads, ESAL) – The design procedures for highways and low volume roads are all based on the cumulative expected 18-kip equivalent single axle loads (ESAL) during the analysis period (W_{18}). The following procedure shall be used to convert mixed traffic into 18-kip ESAL units. Designers shall complete table 3.2.3 and submit it for design review.

A. STEP ONE. The average daily traffic volume for the base year (first year) in the performance period should be entered in column A of Table 3.2.3 of this document, for each vehicle classification or group being considered in the traffic analysis, representative of the design location.

a. Volume - The volume count on existing streets is to be collected using tubes or permanent counters over a minimum of 7 day period of time. The volume count on new road sections is to be provided in an acceptable Traffic Impact Study, or by collecting volumes on an existing street that is similar to the new project, and is to consider construction traffic. The City of West Jordan Traffic Engineer must approve any AADT (Average Annual Daily Traffic) used in the design of new or reconstructed asphalt pavements.

b. Vehicle Classification - The classification count on existing streets is to be collected using tubes or permanent counters over a minimum of 7 day period of time. The classification count on new road sections is to be provided in an acceptable Traffic Impact Study, or by collecting classification counts on an existing street that is similar to the new project, and should consider construction traffic. The FHWA has adopted the following 13 vehicle classifications which are to be grouped into five categories to be used in the process of calculating design traffic

Category One: (general two axle vehicles)
1. Motorcycles
2. Passenger Cars
3. Other Two-Axle, Four-Tire Single-Unit Vehicles

Category Two (buses)
4. Buses

Category Three: (Single unit trucks)
5. Two-Axle, Six-Tire Single-Unit Trucks
6. Three-Axle Single-Unit Trucks
7. Four or More Axle Single-Unit Trucks

Category Four: (single trailer trucks)

8. Four or less axle single trailer combinations
9. Five-axle single trailer combinations
10. Six or more axle single trailer combinations

Category Five: (multi-trailer trucks)

11. Five or Less Axle Multi-Trailer combinations
12. Six-axle multi-trailer combinations
13. Seven or more axle multi-trailer combinations

STEP TWO. A growth rate factor must be computed for each vehicle classification or group and entered in column B. Each growth factor is a function of the design/analysis period and the annual growth rate of the vehicle classification of interest. Contact the City of West Jordan Traffic Engineer to obtain the growth factors needed to complete the design. A sample growth rate for the performance period of 30 -years is shown below:

Table 3.2.1. Growth Rate Factor

Analysis Period (years)	No Growth	2	4	5	6	7	8	10
30	30	40.57	56.08	66.44	79.06	94.46	113.28	164.49
Source : 1993 AASHTO Pavement Guide Table D.20.								

B. STEP THREE. Column C is obtained by multiplying column A by column B by 365 (days per year). This column contains the estimated number accumulated applications of specific vehicle types during the performance period. Classification and volume growth rates must be considered.

C. STEP FOUR. The truck load factor (ESAL per truck) for each vehicle classification/group is to be entered in column D.

Table 3.2.2. Truck Load Factor

Axle Class	Arterial	Collector	Local
1-2	0.0002	0.0002	0.0002
3	0.03	0.03	0.03
4	0.88	0.88	0.88
5-7	0.3529	0.3529	0.1912
8-10	2.6028	2.6028	2.6028
11-13	3.3584	3.3584	3.3584
Source : 1998 UDOT Pavement Design Manual – Table 3B-4			

D. STEP FIVE. Midpoint Adjust Factor =
   a. Adjust Factor = 0 for Class 1-4
   b. Adjust Factor = 0.1 for Class 5-7
   c. Adjust Factor = 0.3 for Class 8-13

E. STEP SIX. Midpoint Truck Factor = Midpoint Adjustment Factor added to the Truck Load Factor.

F. STEP SEVEN. Directional Factor = Direction factor defaults to 0.5 for two-way and 1.0 for one way traffic if unknown.

G. STEP EIGHT. Lane Factor: Where
   a. F = 1, for 3 lanes or less
   b. F = 2.275 (AADT)-0.1054 for 4 or 5 lanes
   c. F = 2.484 (AADT)-0.1312 for 6 lanes or more

Table 3.2.3. ESAL Calculations

Project description:
City Route: _____
Crossroad Beg: _____ **End: _____**
Project Scope: _____ **Rigid: _____**
Construction: _____ **Functional Class: _____**
Design Period: _____ **SN: _____**

Vehicle Types Axle Class	Current Traffic (A)	Growth Factors (B)	Design Traffic (C)	ESAL Factor (D)	Mid Point adjust Factor (E)	Mid Point Truck Factor (F)	Direct Factor (G)	Lane Factor (H)	Design ESAL (I)
(Manual Count)	(Manual Count) *Step 1*	(Table 3.1) *Step 2*	*Step 3*	(Table 3.2) *Step 4*	*Step 5*	(D+F) *Step 6*	*Step 7**	*Step 8**	(C*F*G*H) *Step 9*
Category I 1-3									
Category II 4									
Category III 5-7									
Category IV 8-10									
Category V 11-13									
Total ESAL's									

*Not required if traffic counts including only single lane data.
(Source: 1998 UDOT Pavement Design Manual, Table 3B-2)

C. Reliability – Z_R, S_O uses the reliability concept to account for design uncertainties. The reliability factor is comprised of two variables:

A. Z_R = standard normal deviate. The standard normal deviate corresponds to a desired probability of exceedance level. For example, a designer may specify that there should only

be a ten percent chance the design does not last a specified number of years. Then, the reliability is 90 percent and the corresponding Z_R value is –1.282. A standard normal deviate, Z_R, of –1.282 or a reliability of 90% for all roads shall be used to determine the roadway structural sections of new flexible pavement in the City of West Jordan. *(See AASHTO Guide, Table 4.1, page I-62).*

B. S_O = combined standard error of the traffic prediction and performance prediction. This variable defines how widely the two basic design inputs, traffic and performance, can vary. A combined standard error of the traffic prediction and performance prediction value, S_O, of 0.45 shall be used to determine roadway structural sections of new flexible pavement in the City of West Jordan. *(1998 UDOT Pavement Design Manual, Page 3-52)*

3.3 PERFORMANCE REQUIREMENTS

A. Present Serviceability Index - The serviceability of a pavement is defined as its ability to serve the type of traffic that uses the facility. The primary measure of serviceability used by the AASHTO procedures is the Present Serviceability Index (PSI), which ranges from 0 (impassible) to 5 (perfect). Initial and terminal serviceability indices must be established to compute the total change in serviceability that will be input to the design equations. Initial serviceability index (p_i) is a function of pavement design and construction quality. Terminal serviceability index (p_t) is the lowest index that will be tolerated before rehabilitation, resurfacing or reconstruction becomes necessary. The input for many of the computer design procedures requires both the value for initial serviceability index as well as the value for the terminal serviceability index. An initial serviceability index of P_o = 4.2 shall be used to determine the roadway structural sections of new flexible pavement in the City of West Jordan. A terminal serviceability index of P_t = 2.5 shall be used to determine the roadway structural sections of new flexible pavement in the City of West Jordan. *(Source: 1998 UDOT Pavement Design Manual, page 3-52)*

3.4 MATERIAL PROPERTIES

A. Evaluation of Site Conditions - Site evaluations for new pavement design and construction are performed following a defined testing plan that helps identify the necessary conditions to ensure the required information is obtained in the field.

1. Required Design Information - The following list includes information that is required for pavement design.
   a. Soil types exposed at the ground surface.
   b. Soil conditions within a depth of 3 to 5-feet below the pavement subgrade including:
      1) Soil classification units
      2) In place soil moisture content and density
      3) The occurrence of swelling soils
      4) Soil plastic and liquid limits
      5) Moisture-density compaction curves
      6) The occurrence of moisture induced collapsing soils
   c. The depth to groundwater below the pavement subgrade
   d. Subgrade support variability
   e. The approximate vertical distance of the pavement surface above or below the adjacent ground surface

f. Soft or weak soils that will not support or will limit the size of earthwork equipment
g. Vegetation, debris and other deleterious material that may affect pavement support.
h. A hazard rating for frost damage
i. Water hazards
j. Performance of nearby pavements
k. Design CBR for road sections

2. Boring/Sample Locations - Location of the borings and samples shall be determined based on the centerline location of the planned road, the planned width of the road and the expected soil conditions for the area. Spacing of the test holes will be controlled by the type and profile of the soil at each location Use a minimum of 2 borings with subgrade samples from each stretch of road or roadway segment. Take samples from within top 3 feet of projected subgrade elevation. If subgrade elevation is not known, then samples should be taken every 3 feet to a depth of 12 feet. Subgrade elevation is the elevation where the subgrade and subbase/granular borrow will meet. For longer stretches, use a minimum of 1 boring with sample for every 500 feet. Borings, samples, and other explorations shall be located so that the sites can be found during construction. The locations shall be referenced to the following:
   a. A construction station,
   b. Road centerline, and
   c. Elevations or road grades where possible.

D. Selection of Design CBR - Perform laboratory testing by an accredited lab on at least two samples of each soil type found from *each stretch of road or roadway footprint*. Perform full soils categorization, including swell and soil class.
   a. Use Soaked CBR at 95% ± 1% with a 10 lb. surcharge *(note: this may require 2 or 3 tests run per sample at varying densities or determination of proctor value prior to CBR testing)*.
   b. If the range of the two initial CBR values from a soil type is more than 20% of the average of both tests, run at least two more CBR tests on samples from the same soil.
   c. Encourage the use of a Dynamic Cone Penetrometer for all borings to expand base characterization information. The DCP values obtained need to be properly corrected for material type and in-situ conditions, but provides a simply obtained evaluation of in-situ materials strength.

E. Effective Roadbed Soil Resilient Modulus (M_R) - The AASHTO flexible pavement design procedure requires the input of an effective roadbed soil resilient modulus, which is equivalent to the combined effect of all seasonal modulus values. The City of West Jordan uses the lowest CBR value identified for each stretch of roadway or roadway footprint to determine the effective roadbed soil resilient modulus (*M*) or modulus *r* of subgrade reaction. The equation to convert the CBR value to resilient modulus that the City of West Jordan uses is $M_R = 2555(CBR)^{0.64}$). The maximum value that City of West Jordan allows for *r* effective roadbed soil resilient modulus for unstabilized natural soils is 15,000 psi.

F. Pavement Layer Material Characterization - Although the concept of layer coefficients is still central to the AASHTO flexible pavement design procedure, the 1993 AASHTO Design Guide relies more heavily on the determination of materials properties for the estimation of appropriate layer coefficient values. The preferred tests are the resilient modulus (AASHTO Method T274) for subbase and unbound granular materials and elastic modulus (ASTM D4123 or ASTM C469)

for asphalt concrete and other stabilized materials. City of West Jordan uses the following values of resilient modulus based on material properties found in Utah:

Table 3.4.2. Resilient Modulus for Materials in Utah

Untreated Base Course (UTBC)	27,000 psi
Granular Borrow (GB)(A-1-a nonplastic)	15,000 psi
(Source: 1998 UDOT Pavement Design Manual, Table 3D-1)	

G. Layer Coefficients - The AASHTO flexible pavement layer coefficient (*a*) is a measure of the relative ability *I* of a unit thickness of a given material to function as a structural component of the pavement. For example, two-inches of a material with a layer coefficient of 0.2 is assumed to provide the same structural contribution as one-inch of a material with a layer coefficient of 0.40.

The determination of appropriate layer coefficients can be accomplished by deriving them from test roads or satellite sections (as was done at the AASHTO Road Test) or by using predetermined relationships based on materials properties such as resilient or elastic modulus. The City of West Jordan uses the following values for layer coefficients:

Table 3.4.3. Flexible Pavement Layer Coefficients

Plant Mix Seal Coat	= 0.30
Hot Mix Asphalt	= 0.40
Untreated Base Course	= 0.10
Granular Borrow	= 0.08
(Source: 1998 UDOT Pavement Design Manua, Table 3D-2)	

H. Pavement Structural Characteristics. Drainage - The AASHTO flexible pavement design procedure provides a means to adjust layer coefficients to take into account the effects of certain levels of drainage on pavement performance. Guidance concerning the design or effectiveness of various drainage approaches is not provided; the design engineer must identify the level or quality of drainage that is achieved under a specific set of drainage conditions. The following is a guide to qualify drainage:

Table 3.4.4. Drainage Quality Classification

Quality of Drainage	Water Removed Within
Excellent	= 2 hours
Good	=1 day
Fair	= 1 week
Poor	= 1 month
Very Poor	= water will not drain
(Source: UDOT Pavement Design Manual, Table 3D-3)	

The effect of drainage of all untreated layers below the surface is considered by multiplying the layer coefficients, *a* , by a modifying factor ( ). This factor can be *mi* obtained from the

following table and is a function of the drainage characteristics of the roadbed soil (as categorized above) and the amount of time the soil is in a saturated condition:

Table 3.4.5. Drainage Coefficient Values

Quality of Drainage	Percent of Time Pavement Structure is Exposed to Moisture Levels Approaching Saturation			
	< 1%	1% - 5%	5% - 25%	> 25%
Excellent	1.4 – 1.35	1.35 – 1.30	1.30 – 1.20	1.20
Good	1.35 – 1.25	1.25 – 1.15	1.15 – 1.00	1.00
Fair	1.25 – 1.15	1.15 – 1.05	1.05 – 0.80	0.80
Poor	1.15 – 1.05	1.05 – 0.80	0.80 – 0.60	0.60
Very Poor	1.05 – 0.95	0.95 – 0.75	0.75 – 0.40	0.40
(Source: UDOT Pavement Design Manual, Table 3D-4)				

The drainage conditions at the AASHO Road Test are assumed to be "fair" and the *mi* values there are assumed to be 1.0, regardless of the material. It should be noted that these values are assumed because the structural models should not require adjustment for the conditions at the Road Test. However, these same materials would probably receive drainage modifying factors of less than 1.0 for a new construction project, and the designer needs to select appropriate values to reduce the possibility of a poor design.

The maximum value the City of West Jordan's accepts for the drainage-modifying factor is 1.0. This corresponds to the unshaded portion of the chart above. The designer must verify the correct value to use with the City of West Jordan's Traffic Engineer in the initial consultant pre-application meeting.

The drainage modifying factor applies only to the effects of drainage on untreated base and subbase layers.

3.5 FLEXIBLE PAVEMENT DESIGN

A. <u>Design Structural Number (SN) – AASHTO Flexible Pavement Empirical Equation</u> - The following equation shall be used to determine the design structural number for roadway structural sections of new flexible pavement in the City of West Jordan. This equation is widely used and has the following form:

$$\log_{10}(W_{18}) \equiv Z_R \times S_O + 9.36 \times \log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left(\frac{\Delta PSI}{4.2-1.5}\right)}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \times \log_{10}(M_R) - 8.07$$

where:

W_{18}= predicted number of 18,000 lb. ESALs
Z_R = Standard normal deviate

S_O = Combined standard error of the traffic prediction and performance prediction
PSI= difference between the initial design serviceability index, Po, and the design terminal serviceability index Pt
MR= subgrade resilient modulus (in psi)
SN = Structural number (an index that is indicative of the total pavement thickness required)
= $a_1D_1+a_2D_2m_2+a_3D_3m_3$
a =layer coefficient of layer
D = thickness of layer , inches
m = drainage modifying factor for layer
(Source 1993 AASHTO Guide for the Design of Pavement Structures, page I-5, section 1.2)

The appropriate values for each of the design variables, performance requirements and material properties can be found in the preceding parts of this section. Design engineer is encouraged to use a computer program to solve the AASHTO Flexible Pavement Empirical Equation for the Design Structural Number (SN).

B. Selection of Layered Thicknesses - Once the design structural number for an initial pavement structure has been determined, the designer must identify a set of pavement layer thicknesses that will provide the required load-carrying capacity that corresponds to the design structural number. The following equation provides the means for converting the structural number into actual thicknesses of surfacing, base and subbase materials:

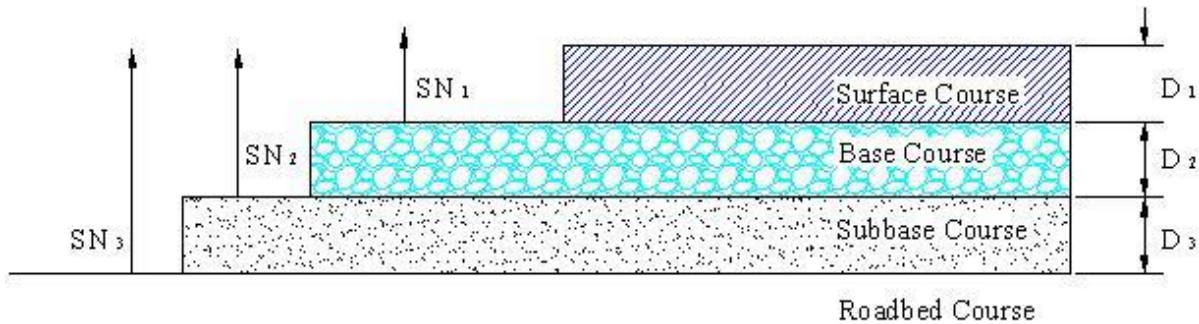
$SN = a_1D_1+a_2D_2m_2+a_3D_3m_3$ where:

a = layer coefficient of layer
D = thickness of layer, inches
m = drainage modifying factor for layer

This equation does not have a single unique solution. There are many combinations of layer thicknesses that can be used to achieve a given structural number. There are, however, several design, construction and cost constraints that can be applied to reduce the number of possible layer thickness combinations, and to avoid the possibility of constructing an impractical design.

i. Layered Design Analysis – The 1993 AASHTO Guide for the Design of Pavement Structures requires the designer to recognize that an appropriate layered design follows the principles identified in Figure 3.1. First, the structural number required over the roadbed soil need to be computed. In the same way, the structural number required over the subbase and base layers needs to be computed, using the appropriate strength values for each. By working with the differences between the computed structural numbers required over each layer, the maximum allowable thickness of any given layer can be computed. The thickness for each layer is to be computed in this manner.

Figure 3.1 - Procedure for Determining Thicknesses of Layers Using a Layered Analysis Approach



$$D^*_1 \geq \frac{SN_1}{a_1}$$

$$SN^*_1 = a_1 D_1 \geq SN_1$$

$$D^*_2 \geq \frac{SN_2 - SN_1}{a_1 m_2}$$

$$SN^*_1 + SN^*_2 \geq SN_2$$

$$D^*_3 \geq \frac{SN_3 - (SN^*_1 + SN^*_2)}{a_3 m_3}$$

1. a, D, m and SN are as defined in the text and are minimum required values.
2. An asterisk with D or SN indicates that it represents the value actually used, which must be equal to or greater than the required value.
3. Layer thicknesses must satisfy the City of West Jordan' s minimum layer thicknesses requirements.
4. The thickness of a layer should be greater than the thickness of the layer immediately above it).
   Design professional should also check to make sure the total depth of the pavement structure satisfies City of West Jordan' s minimum depth requirements for frost protection (70% of the predicted frost depth).

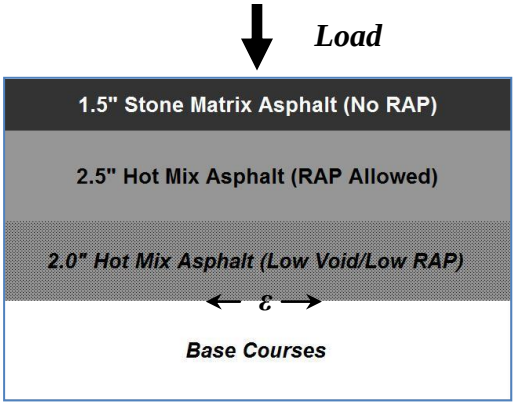
Source (AASHTO Guide for the Design of Pavement Structures Figure 3.2, II-36)

C. Arterial and Collector roadways may be designed using the Perpetual Pavement Concept. This concept combines measured pavement surface layer characteristics with expected key stress/strain points resulting in materials accurately designed to perform long-term in these critical areas. These concepts can be applied to all pavements. While thickness designs may vary based on actual traffic and geotechnical conditions, the

use of durable materials applies to all roads, especially those that will be built and then given low priority for future rehabilitation, such as residential or rural low-volume roadways.

Ideally, each pavement should be designed such that the pavement never fails from a structural or fatigue standpoint, and perpetual rehabilitation would be reduced to periodic mill and overlay of the top 2 or 3 inches of pavement due to environmental deterioration. The basic tenants of materials selection as it relates to durable, or perpetual, pavement design are as follows:

1. Top – Durable (high virgin binder), non-rutting, sacrificial
2. Middle – Stiff filler layer
3. Bottom – Elastic, Strain tolerant
4. Base Courses – Stable, non-moisture sensitive



The perpetual pavement approach is a basic concept of addressing stress-strain concerns, but typically requires multiple asphalt mixes to achieve. This can be a challenge to contractors to phase and construct, especially on a smaller project. For thinner pavements, those that are 5 inches thick or less, use of a two layer approach that has the middle and bottom layers combined into a single material is an effective substitution, however it reduces the amount of recycled pavement (RAP) allowed in the total pavement. Current asphalt industry practices and sustainable promotions are focused on the use of higher amounts of RAP in mixes and this causes a concern for them.

D. Stability and Constructability - It is generally impractical and uneconomical to place layers of material that are less than some minimum thickness. Due to the length of the performance period and the prevailing poor composition of soils in West Jordan the following table represents the minimum asphalt, base, and subbase layer thicknesses that will be considered for the approval of any asphalt concrete pavement road cross section.

Table 3.5.1. Asphalt Concrete Pavement Minimum Structural Section

Subgrade Class	Pavement Section	Traffic Classification			
			II Local	III Collector	IV Arterial
Very poor CBR 3	Asphalt Concrete Surface Untreated aggregate base Aggregate sub base		4" 8” *	6" 8” *	7" 8” *
Poor CBR 4-9	Asphalt Concrete Surface Untreated aggregate base Aggregate sub base		4" 8” *	6" 8” *	7" 8” *
Medium CBR 10 or greater	Asphalt Concrete Surface Untreated aggregate base Aggregate sub base		4" * *	6" * *	7" * *

*** Road structural design completed by a licensed engineer must be submitted for approval.**
(a)Design shall be based on the 30 year performance period as described in this section.
(b) Traffic Classification III & IV requires the addition of an appropriate geotextile fabric conforming to AASHTO M288-96 to separate the base course, or sub base course, from the sub grade.
(c) Traffic Classification II, III, & IV require a 1/2" mix design.
(d) Arterial and Collector roadway sections require a super pave mix design.
(e) Design shall also address minimum geotechnical remediation requirements listed below.

E. Minimum Geotechnical Remediation Requirements. Once the existing geotechnical profile of the roadway is identified, there are several minimum remediation practices that should be incorporated, based on the findings of the geotechnical investigation. Additional remediation efforts may be necessary, depending on existing conditions, and are the responsibility of the Pavement Designer to address.

a. **Frost Depth:** Use a minimum total engineered section of 21 inches (70% of typical 30” max for Salt Lake Valley).
b. **Utilize a separation fabric:** Use a Geotextile Separator/Stabilizer fabric for all areas where A-6 or A-7 subgrade materials exist. This will prevent long-term degradation and contamination of the base courses.
c. **Utilize Geogrid reinforcement:** For structural sections where subgrade CBR is 3 or less, use a Geogrid placed within bottom third of granular borrow layer.
d. **Address Swelling Soils:** Remediate subgrade materials with swell values greater than 3% when tested for CBR. Remediation includes removal and replacement or stabilization of material to a minimum depth of 12 inches below pavement section. Increase remediation depth to 18 inches for high swelling soils (swell greater than 15%).
e. **Address Pavement Drainage:** Design should include drainage system or modification of drainage coefficient (use .9 in areas with water tables within 2 feet of base, .8 in areas where water table is in base section).

f. **Scarify and compact subgrade**: Require subgrade preparation, including scarification and compaction, to a depth of 8 inches for all pavement sections that do not include Swelling Soil remediation.

F. Design Check - Check to make sure the layer thicknesses satisfy the City of West Jordan's minimum layer thicknesses requirements

Check to make sure the layer thicknesses are balanced (the thickness of a layer should be greater than the thickness of the layer immediately above it).

Check to make sure the total depth of the pavement structure satisfies City of West Jordan' s minimum depth requirements for frost protection (70-percent of the predicted frost depth). Refer to the Maximum Frost Penetration Depth Map.

3.7 SAMPLE PAVEMENT STRUCTURAL SECTION DESIGN REPORT

See New Report – Tim Biehl

*****

SECTION 4.0

MATERIALS

4.1 GENERAL REQUIREMENTS

This section discusses the materials involved in roadway and associated construction activities. Design and construction related to land disturbance and other underground infrastructure are subject to the policies and design criteria manuals for that specific type of facility. Separate policies and design criteria are available from the City's Engineering Department. The materials selected have been chosen for their strength, durability and ease of maintenance. All materials, unless specifically approved otherwise, shall be new and unused.

The City hereby adopts the use of the *'Manual of Standard Specifications'*, prepared by the American Public Works Association (APWA), 2012 or latest version, as the primary source for construction specifications for its public improvements with the following exceptions:

1. **Section 26 56 19 Roadway Lighting – Replace APWA Section 26 56 19 with West Jordan Specification Section 16500.**

2. **Section 31 05 13 Common Fill – Make the following modifications:**
   - 1.3 Submittals, C – Add degree of plasticity.
   - 1.3 Submittals, C – Add maximum dry density and optimum moisture determination.
   - 2.2 Granular Borrow, A – Revise eliminate "A-1-b, A-2-4, or A-3,".
   - 2.2 Granular Borrow - Add requirement that material shall be non-plastic, well graded, 3 inch maximum.
   - 2.3 Granular Backfill Borrow - Add requirement that material shall be non-plastic.
   - 2.7 Sand – Eliminate the existing table and include the following table in its place:

Sieve Size	Percent Passing
No. 4	100
No. 8	80-95
No. 200	0-10

   - 2.8 Gravel, B.2. – Eliminate the Pea Gravel table. Pea gravel is not allowed.

3. **Section 31 05 19 – Geotextiles – Replace APWA Section 31 05 19 with UDOT Specification 02075.**

4. **Section 32 11 23 Crushed Aggregate Base – Make the following modifications**:
   - 1.6 Acceptance .B.2. – Eliminate this item including the table regarding "Pay Factors".

5. **Section 32 12 05 – Asphalt Concrete**
   - 1.4B5 Submittals – Make the following modifications – Virgin asphalt binder percentage, RAP asphalt binder percentage, dust to binder ratio, tensile strength ratio (moisture sensitivity), stability, flow, and voids in the bituminous mix.

- 1.4E Submittals – Daily plant printout.
- 1.6C Acceptance – Remove pay factors and replace with – Remove and replace defective material at City's discretion, with no additional cost to the City.
- 2.1 Asphalt Binder – Remove and replace with – Use Performance Grade Asphalt Binder (PGAB) – PG64-28 for local streets and PG64-34 for Arterial and Collector Streets.
- 2.4 A3 b2 Mix Design Additives – Remove
- 2.4 A3 b3 Mix Design Additives – Remove
- 2.5 C4a Hot Mix Temperature in transport vehicle – Remove and Replace with- Hot Mix: 325 deg F maximum.

6. Section 32 12 06 – Superpave . Make the following moddifications.

- 1.4B9 Submittals –VMA calculation that uses Gsb(dry) is required to design mix.
- 1.4E Submittals – Daily plant printout required.
- 1.6C Acceptance – Remove pay factors and replace with – Remove and replace defective material at City's discretion, with no additional cost to the City.
- 2.1 Asphalt Binder – Remove and replace with – Use Performance Grade Asphalt Binder (PGAB) – PG64-28 for local streets and PG64-34 for Arterial and Collector Streets.
- 2.4A3b2 Mix Design Additives – Remove
- 2.4A3b3 Mix Design Additives – Remove

7. Section 32 12 16 Plant-Mix – Asphalt Paving – Make the following modifications:

- 1.3 Submittals. A.6. – Add the following as Item No. 6: "Notice to affected businesses, residents and property owners. A copy of the Notice is to be given to the City's Engineering Department along with a list of who the Notice was sent to."
- 1.5 Weather. A. – Revise to include prior to the first word: "Placement of materials after November 1st or prior to April 1st are subject to the approval of the City Engineer. Situations and weather conditions may also be such that even prior to November 1st, that the ability of the Contactor to adequately construct a facility may result in the City Engineer directing that the construction stop until further directed."
- 1.5 Weather A1 –Remove and replace with –Do not pave until the air temperature in the shade and the roadway surface temperature are above 50 degrees F.
- 1.5 Weather B Moisture – remove and replace with - Do not place on frozen base, during inclement weather or when inclement weather is threatening or imminent. No paving allowed when 50 percent or more chance of any kind of precipitation or when determined by Engineer.
- 1.7 Acceptance. A2. – Eliminate this entire reference.
- 1.7 Acceptance. A3. – Eliminate this entire reference.
- 1.7 Acceptance. C1a. – Remove and replace with – Hot Mix, 325 deg F.
- 1.7 Acceptance. E – Remove pay factors and replace with – Remove and replace material not meeting compaction requirements at City's discretion, with no additional cost to the City.
- 1.7 Acceptance F --Remove pay factors for thickness and replace with –deficiency of any sublot under 0.25" requires additional material to be placed, with no additional cost to the City.
- 3.1 Construction Equipment – Add paragraph D. – Shuttle Buggy: Use of a shuttle buggy will be required when paving arterial (Class IV) streets.

- 3.2 Preparation B –-No paving without an approved written quality control plan. For placement during cold weather (< 70 degrees F ambient temperature) provide a cold weather paving plan.—Quality Control Plan minimum requirements:
  1. Procedures to verify and demonstrate target density anywhere on the pavement according to standards
  2. Procedures to develop and maintain rolling patterns
  3. Define Quality Control testing procedures, sample location and frequency determination procedures, equipment to be used
  4. Verify density by using either cores or density gauge testing with gauges that are correlated to cores or with significant off-set to provide the best possibility of meeting density requirements (see following attachment).
  5. Provide asphalt mix design testing by the asphalt plant QC agency and a copy of the daily plant printout by a certified HMA plant.
  6. Note the compaction equipment the contractor intends to use.
  7. Obtain the Rice value that will be used either from the plant or the contractor. (Note who is providing the Rice value).
  8. Have gauge prepared for density testing at the time paving is begun. (Thin lift gauges are preferable to standard density gauges however they are not required. If there is no calibration to set an offset the offset should be at zero. Densities should be performed to ½” to 1” less than the lift thickness if the gauge has a thickness setting. 30 second tests are usually adequate for QC readings however longer tests provide more accurate information.)
  9. Check the temperature of the mix behind the paver periodically. (Variation in mix temperatures are common and changes in temperature will affect the amount of compaction effort required. If the temperature changes more than 10 to 20 degrees the roller operators and/ or the foreman should be notified so that adjustments can be made. It is a good idea to record a few of the temperature readings through the day.)
  10. Perform density tests on the first rolling to set the rolling pattern. (Often the roller operators have a good understanding of what they need to do. The QC person informs them of the densities they are achieving so that adjustments can be made. The QC technician should record values in different locations so that the entire rolling operation is verified. Common errors include having the roller ride on the curb on too many passes without rolling inside the curb leaving an area of low density from the curb to the center of the roller width; not having the roller ride 6”-12” over unbound edges resulting in low density at the edge; and the QC technician performing their tests in the center of the pass where the rollers overlap recording a misleading high number not representative of the surrounding area.)
  11. Perform routine density tests to verify that the contractor’s efforts continue to achieve the desired density. (If the densities are not consistent the technician should discuss the results and the contractor’s practices with the foreman. Note any changes in the conditions and the rolling operation. Changes that will affect the mat density include the distance the rollers are behind the paver, speed of the rollers, ambient and mat temperature changes and timing of the delivery trucks. The QC technician provides information for the foreman to act upon.)
  12. Record densities scattered across the width and length of the paving. (Densities taken as the final record should be taken after the final roller is finished and the mat has cooled reasonably- below 200 degrees. The technician should record a density every 100- 200’

along the length of the paving pass and the readings should be scattered across the width of the mat, not just along the sweet spot down the center of the pass. Densities are not typically performed within 1' of the edges of the paving or in the immediate vicinity of manholes and other obstructions.)

13. Perform coring as required by the QC plan. (Core locations must be chosen in a manner that ensures they are representative of the entire mat. Note who marks out the core locations. Perform density tests with the nuclear gauge at the core locations prior to coring so that results can be compared and gauge correlation and offset can be established. Core the entire depth of the mat. Mark the core number and location. Fill the core hole with either hot mix or cold patch material. The material must be compacted and finished to just above the surface of the adjacent asphalt.)

8. Section 32 17 23 Pavement markings – Replace APWA Section 32 17 23 with UDOT Specification Sections 02765, and 02768.

This adoption includes any supplements issued by the APWA changing the original document. Exceptions to this adoption are those construction specifications included in individual *'Policies & Design Criteria Manual(s)'* for various public infrastructure. These specifications will be considered *'primary sources'* and will override those included in the *'APWA Manual of Standard Specifications'*. This applies to both private development projects as well as City Capital Improvement Projects (CIP). In the case of CIP projects, the Contract Documents take precedence over any other documents.

Where applicable, American Society of Testing Materials (ASTM), American Association of State Highway Transportation Officials (AASHTO) or other standards have been referenced and it shall be the responsibility of the developer/engineer/contractor to be familiar with those standards to insure compliance. Titles corresponding to the specific numbers are given in the reference section of the standards.

In some instances, particular manufacturers and product names have been mentioned as being approved. Other products may also meet the requirements, but must be first approved in writing by the City Engineer. One factor, which may be considered by the City Engineer in any consideration of other products, is the need for some degree of standardization.

If at any time the Engineering Department believes that the use of a specific product must either be halted or changed, the City Engineer has the authority to make the change providing the decision is based upon an engineering, performance or maintenance evaluation.

4.2 TESTING AND FINAL ACCEPTABILITY OF MATERIAL

The Engineering Department will require such tests and certifications as deemed necessary to show the specified materials have been employed. Notwithstanding prior factory or yard inspections, the City Engineer shall have the right to reject any damaged or defective materials found on the job and order its removal from the site. Further information on testing is contained in the *'Private Development Construction Inspection Manual'*.

4.3 UTILITIES MATERIALS (Trench Zone)

Please refer to the following policies & design criteria manual for the appropriate utility to specify materials:

A. Culinary Water Policies & Design Criteria Manual
B. Land Disturbance Policies & Design Criteria Manual
C. Stormwater Policies & Design Criteria Manual
D. Secondary Water Policies & Design Criteria Manual
E. Landscape & Irrigation Policies & Design Criteria Manual

4.4 GENERAL ROADWAY CONSTRUCTION

As indicated above, the City has adopted the *'APWA Manual of Standard Specifications'*, prepared by the American Public Works Association (APWA), 2012 or latest version, as the primary source for construction specifications for its public improvements. Unless otherwise indicated in this, or other *'Policies & Design Criteria Manual(s)'*, or in the case of CIP projects, their Contract Documents, these *'APWA Manual of Standard Specifications'* shall apply.

4.5 STREET LIGHTING

A. General – This work includes the materials and installation of street lighting systems. The Engineer shall design City street light systems using the following technical specification sections for items involving street signage and markings:

   1. Section 16500 – Residential Roadway Lighting System

4.6 STREETSCAPE AND LANDSCAPING

A. General – All streetscape and landscaping shall be done in accordance with the City's 'Streetscape Master Plan' dated November 1990 or the most current version. The streetscape plan has been developed by the beautification committee to provide guidelines for the selection, arrangement, and management of street tress along public rights-of-way in the City. A full copy of the master plan is contained in Appendix E. The Engineer shall design City's streetscape and landscaping using the following technical specification sections:

   1. Section 02811 - Landscape Irrigation System

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SECTION 5.0

PLAN PREPARATION

5.1 GENERAL

Section 5.0 of the manual identifies work which is to be coordinated through the Engineering Department. The Developer is responsible for obtaining the necessary City design and construction standards, permits and for coordinating with the Engineering Department to ensure its requirements have been met. It is the Developer's responsibility to complete the work required. The Developer is responsible for expediting the work and obtaining the necessary approvals and permits to proceed with construction.

In the case of construction of secondary water canal weirs, the Developer is responsible for processing these approvals through the respective canal company prior to preliminary plat approval. The Developer is to provide all fees and securities necessary to construct these facilities.

For the most part, these requirements apply equally to commercial and industrial site plans as well as residential construction plans. Commercial sites include all commercial buildings and church sites.

5.2 MASTER PLANS

One of the first items the Developer needs to do is to review the City's master plans prior to starting design of various utilities or street systems. The City has completed the following master plans:

1. Culinary water system
2. Secondary water system
3. Transportation
4. Storm drainage system
5. Wastewater system
6. Parks and trails

The Developer needs to contact the Engineering Department and review these documents with them prior to proceeding with design.

5.3 DESIGN AND CONSTRUCTION STANDARDS

The Developer is responsible for obtaining the City's design and construction standards for land disturbance, roads and bridges, culinary water, and storm drain facilities. These standards are available through the Engineering Department for a fee, which covers the cost of reproduction of these documents. The fee is indicated in the City's Consolidated Fee Schedule and is available on the City's Website *www.wjordan.com*. Please see the Finance Department for the most current version.

5.4 PRELIMINARY DESIGN

All preliminary and final design is to be in compliance with the City's master plans and design and construction standards and is to include the following:

A. Master Plan Compliance – Prior to beginning design of any facilities, the Developer is to meet with the Engineering Department and receive information regarding facility sizing/locations for the proposed project. Call ahead and set up an appointment through the Engineering Department secretary.

B. Fire Flow Calculations – The Developer is to demonstrate to City Staff, through engineering calculations prepared by a registered civil engineer, that the fireflow required by the Fire Department can be met, prior to the construction of buildings being started. Prior to an outside consultant preparing these calculations, the Developer's consultant must obtain Engineering Department approval of the modeling technique and assumptions.

C. Flood Plain Evaluation – The Developer is to submit a flood plain evaluation performed and stamped by a registered civil engineer to document whether the property lies within a flood plain or not.

D. Drainage Calculation – The City has completed a storm drain and flood control master plan, which identifies major storm drain facilities to which each Developer must connect. The Developer is responsible for constructing pipelines and other facilities to the master plan facilities. Calculations must be prepared for the Developer provided facilities by a registered civil engineer and submitted to the Engineering Department for review and comment. The City will return an approved set of calculations to the Developer once these calculations are deemed to meet the City's requirements.

E. Traffic Impact Study – The Developer may be required to pay for a traffic impact study to be prepared by a registered traffic engineer, under the Engineering Department's direction that addresses the traffic and transportation impacts of the project. The extent of investigation and scope of work is defined in Appendix R – Guidelines for Traffic Impact Studies and will be determined by the Engineering Department. All original copies of the report are to be wet stamped and signed by the traffic engineer.

F. Geotechnical Report – The Developer is to submit to the Engineering Department for approval, a geotechnical report prepared by a registered geotechnical engineer. This report is to contain a soils report of the project's underlying soils, which is to identify groundwater levels and other soils data important to construction of the road and structures. The report is to contain recommendations to correct problems in the field and is to also contain a section that identifies pavement design for all facilities to be dedicated to the City. Appendix S – Guidelines for Geotechnical Reports identifies the extent and scope of work for the geotechnical report and the report is to be delivered to the Engineering Department directly from the geotechnical engineer preparing the report. All original copies of the report are to be wet stamped and signed by the engineer.

G. Subdrain/basement Drain Report – A separate report is to be prepared by a registered civil or geotechnical engineer which identifies design of subdrain/basement drains for the project. Those projects of specific concern are those, which lie near to, or adjacent to irrigation canals which run through the City. The City will, however, determine whether such a report needs to be prepared and what its extent will be. All original copies of the report are to be wet stamped and signed by the engineer.

H. Grading Report – The City has established a Land Disturbance Ordinance as part of its Municipal Code and will require a grading report including drawings prepared for each project. The report will need to identify where dirt will be move from, where its final placement will be, how it will be placed and methods of placement and compaction to meet the City's land disturbance ordinance. Prior to performing any grading on the project, the Developer is to obtain a Land Disturbance Permit from the Engineering Department. All projects over 5 acres in size are also required to have Utah Pollution Discharge Elimination System (UPDES) and Storm Water Pollution Prevention (SWPP) permits from the State of Utah, Department of Environmental Quality.

5.5 FINAL DESIGN AND DRAWING PREPARATION

Final design is to take into account the City's design and construction standards for all publicly dedicated facilities. These standards are available through the City's Engineering Department for a fee or online at *www.wjordan.com.*

A packet is to be submitted to the City's Engineering Department that includes all design assumptions and calculations and certifies the City's standards have been followed. Final drawings are to be submitted on the City's standard size sheets of 24x 36. Final drawings will be signed and stamped by the Developer's registered professional engineer for the project.

For commercial site plans, the Engineering Department will review all sheets which show the site improvements outside the building envelope, including site grading, drainage facilities, on-site public water lines, and hydrants, overland release path for storm water overflows, street lighting, and landscaping on street frontages.

Drawings submitted to the Engineering Department are to be organized according to the following order:

1. Cover Sheet
2. Abbreviations, Legends and Sheet Index Sheet
3. General Notes Sheet
4. Typical Sections Sheet
5. Survey Control Plan
6. Overall Utility Plan
7. Site Demolition Plan
8. Subdivision Plat or Site Plan
9. Street Signs and Striping Plan
10. Overall Grading and Master Storm Drainage Plan
11. Grading and Storm Drainage Details
12. Grading and Drainage Plan Key Sheet
13. Grading and Drainage Plan
14. Overall Storm Water Pollution Prevention Plan
15. Street Plan and Profile Sheets
16. Traffic Signal Plan

Additional information is provided in the Engineering Department, Construction Drawings Checklist contained in Appendix M – Subdivision Final Plat Process. This completed and filled-out checklist is required to be submitted with the copies of the check prints submitted for City review.

The following items are required as part of the construction plans:

A. Copies - Three copies of construction plans are to be submitted:
   1. One set for Engineering Department review
   2. One set for the City
   3. One set returned to the Developer for corrections and revisions

B. All drawings are to be clear and legible and conform to good engineering and drafting practice.

C. Drawings are to have signature blocks for Engineering, Community Development, Public Works, Fire Department and other City departments on all sheets. Departments will sign off on their block as they review it.

D. Size - 24x36 with ½-inch border on top, bottom, and right sides; left side is to be 1 ½-inches.

E. Plans are to include the following information:
   1. North arrow (plan)
   2. Elevations reference to USGS datum
   3. Stationing and elevations for profiles
   4. Title block located in lower right corner of sheet to include:
      a. Project title
      b. Specific type and location of work
      c. Name of engineer with license number and Utah Engineer's stamps
   5. Scale: 1"=20' or 1"=40' horizontally, 1"=2' or 4' vertically
   6. Both plan and profile views for curb and gutter plans for:
      a. Each side of the street
      b. Center line, may be eliminated
      c. Top of curb elevations with curve data must be shown for all curb returns
   7. Culinary water system - Size and location of mains, laterals, mains, valves, hydrants and pipe type.
   8. Secondary water system - Size and location of mains, laterals, vales, fittings, etc.
   9. Sanitary Sewer system - Size and location of mains, laterals, mains, valves, hydrants and pipe type.
   10. Storm Drain system - Size and location of mains, laterals, mains, valves, hydrants and pipe type.
   11. Subdrains, their manholes and cleanouts
   12. Irrigation facilities
      a. Size and location of all required irrigation piping
      b. Data regarding flow and outfall of affected irrigation water
      c. Separate sheets of details for structures, etc.

5.6 GUIDELINES AND CRITERIA FOR PLAN PREPARATION

A. Plan Submittal - Submittal to the city generally falls into three categories:

1. Initial submittal,
2. Resubmission addressing City comments and
3. The final submittal of the originals for City approval. The general requirements for each of these submittals is outlined in Table 1.1.

Table 5.6.1. – Submittal Requirements

Item	Required for initial Screening Acceptance	Required for Resubmmittal	Required for Approval
Number of Plan Sets (bluelines)	4	As Requested	Original Mylar Duplicate Mylar
Bond Estimate Form (completed by engineer)	1 Copy	As Requested	Approved Estimate
Tentative Map or other Conditions	1 Copy	-	On File
Final Map Conditions	-	1 Copy	On File
Geotechnical Soils Investigation Report (1)	2 Copies	-	On File
Traffic Impact Analysis (2)	2 Copies	Approved	On File
Drainage Study (2)	2 Copies	Approved	On File
Notarized Off-Site Grading Authorization Letter (3)	-	1 Copy	On File
Developer Agreement Information Form (5)	-	1 Copy	On File
Subdivision or Improvement Agreement	-	-	Completed
Improvement Bonds	-	-	Posted
Plan Review and other Fees	-	-	Paid

(1) – if construction of public street is required
(2) – if required as a condition of approval
(3) – if offsite grading or construction is required
(4) – if design deviates from Guidelines or Standard Requirements
(5) – Required if Subdivision Agreement is to be used

The specific requirements of each of these categories are discussed in greater detail in the following subsections.

B. Plan Submittal - Engineers submitting plans to the City for initial screening are to provide:
   1. Three (3) sets of complete plans (check prints) sealed by a registered Engineer in responsible charge.
   2. One (1) copy of the completed bond estimate form with quantities for all public improvements, also quantities should be shown on construction plans.

   In addition, the following items are required as part of the initial review submittal:

   1. Two (2) copies of the geotechnical soils investigation report if the project includes construction of public streets. The report must include a pavement section recommendation for all proposed public streets.

2. Verification of traffic impact analysis (TIA) submittal to the traffic engineer if a TIA is a condition of approval.
3. Verification of drainage study submittal to Engineering Department if a drainage study is a condition of approval.
4. When a project requires grading or construction off-site, One (1) copy of a notarized authorization from every private property owner on whose property work is required.
5. Completed Development Agreement information form if a Subdivision Agreement will be prepared.
6. Written notice of deviations. If the plan submittal contains deviations from either these guidelines or the requirements of the uniform standards and City policy, the design engineer is to as part of the initial submittal include a letter to the City outlining all deviations and substantial reasons for requesting the deviations.

In addition to the items outlined above the Assessor's Parcel Number (APN#) is to be placed on the cover or title sheet of the submittal. Fire flow information is to be placed on the water plan and secondary water information is to be placed on the master utility plan.

All initial submittals are reviewed for conformance to the Engineering Department initial plan screening checklist. Failure of the design engineer to include the required information with the initial submittal will result in rejection of the plan submittal and the return to the design engineer. If the submittal contains sufficient information to be processed for review, the submittal will be accepted and both the design engineer and developer will be notified. Following the initial plan screening, the three plan sets submitted will be circulated to various sections within the City for review and comment. This process generally takes two weeks. When comments are received from the other City reviewing groups, the Engineering Department will consolidate the comments and review the plans for conformance to City standards. The entire initial review process generally takes 4 to 6 weeks depending on the current workload and complexity of the project. The Engineering Department will transmit the review comments to the design engineer and either request the plans be resubmitted for review or that mylars be submitted following corrections.

C. Resubmittal - If the conditions of approval or the Engineering Department require a drainage study or traffic impact analysis, those studies are to be approved prior to resubmittal of the improvement plans to the Engineering Department.

Engineers resubmitting plans to the City for review are to provide:

1. One (1) to three (3) sets of complete plans (check prints) as requested from the initial review sealed by the Engineer in responsible charge.
2. One (1) copy of the initial plan review comments (redlined plans). The redline of the fire plan should be retained by the engineer for use in obtaining fire signature on the Mylar.
3. Verification of Traffic Impact Study (TIS) approval by the Engineering Department if a TIS is a condition of approval.
4. Verification of drainage study approval by Engineering Department if a drainage study is a condition of approval.
5. Design engineer's certification that the grading plan is in conformance with the approved drainage study.
6. Design engineer's certification that the plans are in conformance with the approved traffic impact study.

Plans resubmitted to the City for subsequent review are to address all previously made land development review comments. The design engineer is to certify the grading plan conformance to the approved drainage study with the initial resubmittal and subsequently thereafter. All redesign from the previous submittal is to be clearly identified. In the event of major changes or significant redesign from the previous submittal, the design engineer should contact the Engineering Department to schedule a meeting to discuss the redesign concurrent with the resubmittal. Failure to meet with the Engineering Department to resubmitting a major redesign may delay the plan process.

The resubmittal review process generally takes between 5 and 15 working days depending on the current workload, complexity of the project, and thoroughness of the design engineer in addressing previously made comments. After reviewing the plans, the Engineering Department will either return the plans to the design engineer to address comments or request that original and duplicate mylars be submitted to the City for approval.

D. Required Easements and Rights-of Way - When improvement plans indicate easements to be dedicated or rights-of-way granted a complete package must be submitted prior to approval of the plans. This package must include legal descriptions, 8 ½ by 11 sketch and current vesting document. Easements may include ingress/egress, drainage, sewer, and intersite easements.

E. Final Submittal and Plan Approval - Improvement plans for subdivisions cannot be approved until after the final plat is approved. Prior to submitting original mylars and duplicate mylars to the Engineering Department for approval, certain prerequisite items must be submitted to and approved by the City. As part of the initial plan submittal the design engineer is required to submit a complete bond estimate form. This form is reviewed and if it is deemed accurate with no major design issues outstanding, an approved bond estimate form will be provided to the design engineer. The process of completing the bond estimate and obtaining the required bond estimate form is the responsibility of the developer and should be commenced early on in the process.

F. Request for Deviation Procedure - All deviations from these guidelines, the uniform standards or City policy are to be submitted to and approved by the Engineering Department. There are two types of deviations the engineer may need to address during the design process. First, deviations from the guideline requirements. All deviations from the guidelines are to be listed and submitted with the plans and other documents identified in " Initial plan submittal". Upon receipt, the deviation listing will be reviewed by the plan screener and supervisor. If the deviations are deemed to have merit, the plans will be screened and either accepted or rejected. If the deviations are considered to be only for the convenience of the design engineer, the Engineering Department will review the deviation request. If the Engineering Department considers the deviations acceptable, the plans will be screened and either accepted or rejected. If the plans are rejected and the design engineer desires to appeal the decision, the appeal is to be made in writing to the City. Upon receipt of the design engineer appeal, the engineer will schedule a meeting with the design engineer and the City staff engineer. The purpose of the meeting is to allow the design engineer the opportunity to present its case to support the request. Within five working days following the appeal meeting, the Engineering Department is to inform the design engineer of its decision. The decision of the Engineering Department is to be final at this time.

The second type of deviation is a deviation from the requirements of the uniform standards and/or drawings or City policy. The design engineer is to identify and request a deviation from

standards in writing and submit the request along with the other documents required in subsection 5.7.B., " Initial plan submittal". If the deviation is deemed to be in the best interest of the City and the project, the plans will be allowed to proceed through the plan review process. If the deviation as requested is determined to be unacceptable to the City, the Engineering Department is to schedule a meeting with the design engineer to attempt to resolve the issue. If the deviation is rejected and the design engineer desires to appeal the decision, the appeal is to be made in writing to the City Engineer. Upon receipt of the design engineer appeal, the City Engineer will schedule a meeting with the design engineer and the City staff engineer. The purpose of the meeting is to allow the design engineer the opportunity to present its case in support of the request. Within five working days following the appeal meeting, City staff engineer is to inform the design engineer of his decision. The decision of the City Engineer is to be final. If the denial of a deviation from standards or City policy will significantly impact a project, the design engineer is to contact the Engineering Department to review and resolve the design issue prior to making the initial submittal.

G. Plan Setup Requirements - The City is required to be the custodian of all improvement plans in perpetuity once they are approved. As the City moves to archiving plans on electronic media it is important that some degree of uniformity is maintained. The objective of the following plan setup requirements is to provide uniformity and standardization of plan submittal while allowing the design engineer flexibility with respect to presentation. Standardization of information along with uniformity in setup and presentation allows the review process to occur in a more orderly and timely fashion.

H. Plan Sheet Size - All plans submitted to the City of City of West Jordan must be signed and sealed by a civil engineer who is registered in the State of Utah. Plans are to be plotted or drafted onto mylar reproducible sheets and having an overall size of 24-inches wide by 36-inches long with margins placed accordingly. One and one-half inches on the left side and ½-inch on all remaining sides with a line thickness of 0.075 inches.

I. Title Block - Each plan sheet is to contain a title block located adjacent to the right side margin. The design engineer has the flexibility to determine the layout of the title block provided the following information is included somewhere in the title block. The title block is to include:
   1. Title of sheet
   2. Project name
   3. Developer's or owner's name, address, and phone number
   4. Engineering consultants name, address, and phone number
   5. Professional engineer's name, P.E. number and seal and
   6. Revision block

J. Benchmark - All projects are to utilize and reference an existing recorded City benchmark datum within one-quarter mile of the project site. If an existing benchmark is not located within the one-quarter mile limit, a temporary benchmark on the project site suitable for the project construction/inspection purposes is to be established and referenced to the City datum. Every plan sheet to be utilized for construction of improvements is to indicate the referenced benchmark.

K. Drawing Scales - Drawing scales are to be a minimum of one-inch = forty feet (40') horizontal for plan views, unless otherwise noted in these guidelines. Drawing scales are to be a minimum

of one inch = 40-feet horizontal, one inch = 4-feet vertical for plan and profile when slopes are less than 5 percent and a minimum of one inch = 40-feet horizontal, one inch = 8-feet vertical for plan and profile when slopes are greater than 5 percent. Plan and profile sheets are to be arranged such that the plan view is in the top half and the profile view is in the bottom half of the sheet. Profiles are to have vertical lines at every 50-foot station and horizontal lines at every 4-foot elevation.

All details are to be drawn to scale. The horizontal and vertical scale need not be the same. The purpose of requiring details be presented at scale is to allow the plan reviewer the ability to see spatial relationships of the various elements in the detail.

L. Plan Orientation - Generally, in lying out and developing the design, the design engineer is to consider the following hierarchy in establishing plan sheet orientation;
   1. North should be to the top or right of the sheet
   2. Stationing is to be left to right unless the sheet orientation with respect to North will not permit. The image is to only be drawn on the front side of the mylar.

M. Text Size and Line Weights - The final criteria for acceptance will be that all information provided on the plans be clear, concise and legible when the 24-inch x 36-inch sheet drawing is reduced to an 11-inch x 17-inch format. The following text size and line weight references are recommended for clarity but are not required. All text, which includes but not limited to dimensional text, spot elevations text, notes and other text are recommended to be leroy (L80) or romans. Shx font type with a text height of 0.08 inches and a pen thickness of 0.25mm. Profile elevations and stations are recommended to have a text height of 0.1 inches and a pen thickness of 0.50mm. Detail titles are recommended to have bold type font with a height of 0.20 inches. Street names are recommended to also have a bold type font with text height of 0.25 inches. All existing underground utilities are recommended to be shown dashed.

N. Line Type, Symbols and Abbreviations - The City requires the use of line types, symbols and abbreviations consistent with the *Uniform Standard Drawings for Public Works' Construction Off-Site Improvements, City of West Jordan City* Legends and abbreviation listings used on the plans are to only include those terms that are not included in the standards.

O. Plan Set Organization - The City requires that all sheets in the plan set be sequentially numbered, beginning with the title or cover sheet, with information presented and arranged in the following order:
   1. Title/vicinity map/ quantities
   2. Plat
   3. Survey contour data sheet
   4. Storm water pollution previous plan
   5. General notes
   6. Master utility plan
   7. Grading plan and details
   8. Street plan & profile/sections/details
   9. Traffic signal plan
   10. Striping/signage/streetlight plans
   11. Sanitary sewer plan & profile/details
   12. Storm drain plan & profiles/details

13. Water utility plan & profile/details

Depending on the complexity and scope of the project, a complete plan set may contain plan sheets from any or all of the above referenced groups. The guidelines indicate the minimum information. Data that must be presented and should not deter the design engineer from providing additional information as may be required. In the event the design engineer believes that the requirements of these guidelines are not applicable to a specific site or condition, the engineer is to request a deviation from the City. To facilitate the plan review and construction process, the City prefers that certain information be placed in a specific location on given sheets. The preferred location is identified in ***bold italics*** following the item description.

Example: North Arrow (upper right quadrant of sheet)

The above example indicates that the preferred location for the north arrow is in the upper right quadrant of the plan sheet. The City realizes that on rare occasions it may not be possible for the design engineer to comply with the City information placement preference. In those instances, the design engineer needs to identify all deviations from these guidelines in writing and submit the deviation listing to the City in accordance witH, "Request for deviation procedure".

P. Cover Sheet Requirements - The design engineer may elect to provide a separate title sheet as part of the entire plan set or utilize the first sheet of the plan set to present additional information such as the vicinity map or quantities and thereby eliminate the need for separate sheets for those items. The guidelines allow the design engineer flexibility in the placement of information provided that such information is presented in a clear and concise manner. Regardless of whether or not the design engineer elects to utilize a separate title sheet, the first sheet of the plan set is to contain at a minimum the following information:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
6. Revisions block is shown.
7. Sheet size of improvement plans is 24" x 36".
8. Mylar sepia or vellum drawing sheets, not paper sepia drawing sheets, has been used for all drawings (At final submittal).
9. All lettering in capital letters, 3/16-inch (0.120-inch) size minimum.
10. Accepted City layout of title block.
11. Initials and last name of designer, drafter and checker on the drawings.
12. Name of City is shown.
13. Shows name and address of owner and/or developer.
14. Must show the name, address, fax number, and telephone number of the engineering firm preparing the plans.
15. Assessor's Parcel Number is shown.
16. Must clearly show the name, and "Phase" or "Unit", of the project. For subdivisions the name is to agree with the final map. For multiple units, each final map is to have a separate set of improvement drawings.
17. Drawings must be numbered consecutively and show the total number of sheets.

18. Provide an area map showing the project and how it fits into the immediate area. The map is to include a north arrow and details about the project (1" = 500').
19. Provide a vicinity map showing the location of the project. The map is to include a north arrow.
20. Seal and signature of the design professional is shown.
21. Approval block - Engineering Department.
22. Approval block for design engineer and statement/disclaimer is provided.

Q. Vicinity Map Requirements - Every plan set submitted is to contain a vicinity map. The design engineer may elect to place the vicinity map on a separate sheet immediately following the title sheet or place the vicinity map on the title sheet. If the design engineer elects to place the vicinity map on the title sheet, no separate vicinity map sheet is required provided the information required by this subsection is presented on the title sheet. The vicinity map is to relate the project to major landlines and prominent geographic features on an expanded scale. The following information is to be provided either on the title sheet or the vicinity map sheet:

1. A map of the City of City of West Jordan area with the project highlighted
2. A site map of the project and construction area (*upper right quadrant of sheet)*
3. North arrow for City and site maps

In addition, the vicinity map may include the following items when applicable:

4. Highways, streets, roads and railroads
5. Channels, washes and bridges
6. Other pertinent geographic features

The City's information placement preference is not applicable when the vicinity map and associated required information is placed on the title sheet.

R. Abbreviations, Legends and Sheet Index – This drawing sheet is to include the necessary abbreviations, legends and sheet index necessary for the project and are to include the following:

1. Title block
2. Project title
3. North arrow
4. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
5. Revisions block is shown.
6. Provide a sheet index for all sheets in the lower right corner. All sheets are to be numbered consecutively.
7. Abbreviations are provided.
8. Legend is shown.
9. Section identification system is provided.
10. Detail identification system is shown.

S. General Notes Requirements - Every plan set submitted is to contain a General Note sheet that provides applicable City standard notes. The following information is to be presented on either the second or third sheet of the plan set depending on how the design engineer elected to present the information required for the title sheet and vicinity map. The General Note sheet is to contain the following information where applicable:

1. Title block

2. City of City of West Jordan General Notes
3. City of City of West Jordan Clearing and Grubbing Notes
4. City of City of West Jordan Grading Notes
5. City of City of West Jordan Sewer Notes
6. City of City of West Jordan Traffic Notes
7. City of City of West Jordan Streetlight Notes
8. City of City of West Jordan Fire Department Notes
9. City of City of West Jordan Water Standards Notes
10. City of City of West Jordan Dewatering Notes
11. City of City of West Jordan Storm Drainage and Flood Control Notes
12. City of City of West Jordan U.P.D.E.S. Notes
13. City of City of West Jordan Erosion Control Notes
14. "Call Before You Dig" symbol & telephone # (plan sheets)

T. Typical Sections – This drawing is to show the typical sections to be used for the project and may include the following:
1. Title block
2. "Call Before You Dig" symbol and telephone number is provided (plan sheets).
3. Local street, 60-foot right-of-way, minor collector, 72-foot right-of-way, major collector, 84-foot right-of-way, arterial, 106-foot plus right-of-way, cross-sections are shown. Drawings are to shown maximum cut and fill lines.
4. Residential collector, 57-foot right-of-way is shown.
5. Typical sections must have right-of-way or property line dimensions, cross slopes, type of curb, width of sidewalks, and the structural section material and thickness shown.
6. Typical utility locations
7. Typical trail sections

U. Survey Control Plan - Survey Control Data Sheet includes:
1. Title block
2. North arrow
3. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
4. Co-ordinates at each outside boundary corner are shown.
5. Basis of bearings is shown on the drawing.
6. Shows the bearing equation, 10,000/10,000 co-ordinate at section corner or at point of beginning is shown.
7. Shows survey monuments found with identifying marker plates.
8. Indicates the class of survey and references to appropriate Record of Survey plats.
9. Shows monument lines, bearings, and distances between monuments.
10. At least two section corner ties to boundary are provided.
11. Legal description of boundary is provided.
12. Benchmark acceptable to the County, with elevation is provided. The plan must show identification number, location, and elevation per NAVD 88.
13. USGS datum of elevations is shown on plans.
14. Signature and stamp of the registered land surveyor who prepared the survey.

V. Overall Utility Plan - Many design engineers find it useful to provide a master utility plan as part of the plan set. The inclusion of this sheet is mandatory. Master utility plans are generally provided for one of two purposes, either for construction or to indicate the schematic

relationships of the various utilities. If the intent of the master utility plan is for construction, the plan is to have a scale of not less than one-inch = 40-feet to conform to the requirements of "General plan sheet requirements" and provide the information required by this subsection.

If construction plans are included in the submittal for the various utilities at a scale of not less than one-inch = 40-feet and the intent of the master utility plan is to indicate the schematic relationship of the utilities, then the plan scale can be reduced to a scale of not less than one-inch = 100-feet. Schematic master utility plans need to conform to the requirements of this subsection.

Master utility plans to be utilized for construction are to provide the following information:

1. Title block
2. Scale at 1"= 60' or 1"= 100'
3. "Call Before You Dig" symbol and telephone number are shown (plan sheets).
4. Complete the separate Street Plan and Profile Checklist (C100) and show this information on this plan.
5. Complete the separate Sanitary Sewer Plan and Profile Checklist (SS100) and show this information on this plan.
6. Complete the separate Storm Drain Plan and Profile Checklist (D100) and show this information on this plan.
7. Complete the separate Culinary Water Plan and Profile. Checklist (CW100) and show this information on this plan.
8. Complete the separate Secondary Water Plan and Profile Checklist (SW100) and show this information on this plan. This will include pressurized secondary water design (pipelines) and unpressurized secondary water design (ditches and canals).
9. Shows relationship of utilities to each other on plan view.
10. Indicates all utilities including culinary water, sanitary sewer, storm drain, natural gas, secondary water, power, telephone, cable and all other utilities.
11. Water meter locations are shown.
12. Overhead utilities must be buried. Show existing overhead utilities on this drawing and indicate how and where they will be buried.
13. All utility stub-outs are to be shown. They are to be constructed into each lot past the City's right-of-way at least 10-feet.
14. Utility easements are to be shown. The City's standard is a 20-foot easement for one utility, and a 25-foot easement for two utilities.
15. All streets are named and existing and future right-of-way width to centerline is shown.
16. Existing and proposed hydrants and streetlights are shown.
17. Must show existing improvements in, and adjacent to, the project. Must clearly distinguish "existing" and "to be constructed" improvements (Plan Sheets).
18. Water and sewer facilities located and dimensioned from the centerline of the road or property line, are shown. Drawings must show a mandatory 10-foot separation between culinary water and sewer facilities.
19. Driveways, if known, are shown – sidewalk ramps are located.
20. Fire Department flow calculation information is indicated.
21. Fire Department approval block is shown.
22. Public Works Department approval block is shown.

Street Lighting

1. Streetlights are shown on the preliminary plat, final plat and construction drawings.
2. Developer contacts UP&L with plat information, UP&L designs street lighting, pull boxes, conduits, wires, etc.
3. UP&L gets City a letter or report indicating where the streetlights and facilities are to be located and their design.
4. Detail of streetlight locations is indicated.
5. Streetlights are provided at ends of cul-de-sacs, all street intersections, at 250-feet spacing.
6. A streetlight is located at the entrance to any pedestrian pass-through

If construction information and data is clearly and concisely presented on other sheets of the plan set and the intent of the master utility plan is to indicate the spatial relationships of the various utilities, the amount of information on this plan may be reduced.

W. Site Demolition Plan – In the event that site demolition is required, this plan will be required to be prepared. This drawing will show all demolition included as part of the project and the drawing is to include:
   1. Title block
   2. Project title
   3. North arrow
   4. Scale of drawing
   5. "Call Before You Dig" symbol and telephone number are shown (plan sheets).
   6. Revisions block is shown.
   7. Structures and other facilities to be removed are shown.
   8. Complete the separate Street Plan and Profile Checklist (C100) and show this information on this plan.
   9. Obtain State permit for demolition of structures.

X. Subdivision Plat or Site Plan – Plat/Copy of Plat that will be recorded with Salt Lake County Recorder's Office. The plat is to follow the guidelines/requirements of Salt Lake County requirements and is to included the following:
   1. Complete the separate Land Development, Concept Plan, Preliminary Plat and Final Plat or Site Plan Checklists to complete this item.

Y. Street Signs and Striping Plan – This drawing is to indicate all traffic control required during construction to adequately and safely construct the project. This drawing will require the following:
   1. Title block
   2. Project title
   3. North arrow
   4. Scale of drawing
   5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
   6. Revisions block is indicated.
   7. 12" x 36" W14-1P "Dead End" and W14-2P "No Outlet" placards are provided with street name sign on residential streets where they intersect with collector streets, when applicable – the sign is to face the collector street. Placards also provided on interior intersections if the end of the street is more than 300-feet from or not visible from the intersection.

8. 30" x 30" W14-1 "Dead End" and W14-2 "No Outlet" signs are provided on the lot line past a thru intersection when conditions are as above.
9. A 6" x 24" yellow "Temporary" placard with black lettering and border is included under any W14 sign, where applicable.
10. 30" x 30" R1-1 "Stop" signs are provided on residential streets at intersections with collector streets and where otherwise warranted – "T" intersections will not typically require a stop sign, but most 4-legged intersections should have stop signs on the lesser legs.
11. 24" x 30" R2-1 Speed limit signs (25mph) are provided at entrance points into the subdivision, generally located at the first lot line, and at intervals of approximately 1,500-feet.
12. Crosswalk, Trail crossing signs
13. Striping plan
14. Bike lanes

Z. Overall Grading and Master Storm Water Drainage Plan – This drawing is to provide a summary, or overall view, of the project's grading and master storm water drainage plan. Subsequent drawings also are required to provide additional detail, if required. These drawings are to include the following:
1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number are shown (plan sheets).
6. Revisions block is indicated.
7. A note on the drawing from the design engineer verifying that the proposed improvements comply with the City's design and construction standards and master plan for storm drainage and flood control.
8. Location of FEMA 100-year flood plain and wetlands are shown.
9. Drainage calculations – These are to include the assumption of the 100-year storm event with 0.2 cubic foot per second/acre discharge in 24 hours and are to be stamped by a registered professional engineer. Engineer is to use TR55 or HEC1 and provide output from these calculations. (Separate report)
10. Orifice sizes, number of manholes, invert and rim elevations; required riprap, required double inlet/dissipator, etc. are indicated.
11. Detention areas and details are shown. This is to include spillways at a 3:1 maximum side slopes.
12. Permits – State stream alteration, county flood control, Corps of Engineer (COE), etc. permits have been obtained and evidence has been received by the City.
13. Cross-sections showing the elevational relationship, property line, and existing or "to be constructed" walls project's boundary with adjacent properties are provided.
14. Finished floor elevation of all buildings adjacent to this property and spot grades on adjacent properties to show elevational relationships.
15. Pad and finished floor elevations for all new structures are shown. (Site Plan only)
16. Street names are shown, show at the front of each lot.
17. Percentage of grade and direction of flow is indicated.
18. Proposed and existing drainage easements, with dimensions, elevations and typical sections as needed.
19. Size, slope, location, and description of existing and "to be constructed" storm drain facilities are shown.

20. All existing and "to be constructed" block walls are shown.
21. "Sight visibility easements", with dimensions, are shown.
22. Distance and bearing from project boundary to major intersection or major roadway is shown.
23. Sidewalk ramps with dimensions are indicated.
24. Engineer's note stating that the grading plan conforms to the approved drainage study is provided.
25. Elevations shown (top of curb, flowline and crownline) at limits of construction, P.C.'s, P.T.'s, and grade breaks.
26. Contours, at two-foot intervals, for undeveloped property are shown.
27. Dashed lines and labels showing existing improvements, with elevations noted, as needed, are provided to show the project's conformity with the existing conditions.
28. Shows existing or "to be dedicated" rights-of-way and easements.
29. Existing conditions - Must show "Existing Conditions" for the property being developed and within 100-feet of the project's boundary.
30. Existing contours are shown.
31. Slopes of 30-percent or greater are shown.
32. Proposed contours for parking lot and landscaping are shown.
33. Floodplain note/ evaluation was provided.
34. Road widths match Transportation Master Plan and/or Planning Commission requirements.
35. Road grades are minimum 0.5-percent and a maximum of 12-percent.
36. Sidewalks are provided as required.
37. Curb and gutter are provided as required.
38. Any waterways provided are 6-feet wide and only used with prior Engineering Department approval.
39. Erosion protection is provided for all cut and fill slopes.
40. Energy dissipaters are provided on the outfall of drain lines discharging into creeks and earthen channels capable of slowing velocities to 3-feet per second.
41. Storm drainage calculations were provided and reviewed.
42. Subdrain system – If project fronts canal property, the geotechnical report indicates groundwater within the footing zone, or the area is known for a high groundwater table.
43. Subdrain note was shown, if applicable.
44. Storm drains lines, catch basins, and clean out boxes are provided as needed.
45. Catch basins are provided at all sag points and every 500-feet. Doublewide catch basins, with two grates, are provided at sag points so the directional vanes can be installed in both directions.
46. Combination cleanout boxes provided at all changes in direction and every 500-feet.
47. An overland release for storm water is provided for all sag points such that no structures would be flooded if the underground drain system were blocked or the capacity exceeded.
48. Cul-de-sacs are graded to drain away from the bulb.
49. Drainage calculations were submitted and checked.
50. Storm drainpipe within paved area of City streets is reinforced concrete pipe (RCP), CL III and is a minimum 15-inch in diameter. Laterals may be sized to a 12-inch minimum size.
51. Smooth-wall corrugated HDPE pipe may be used in areas outside the City's right-of-way.
52. Subsurface drains are provided to an approved system or outfall where needed to lower groundwater levels to 3-feet below all basement levels. (To be maintained by Homeowner's Association)
53. Existing irrigation ditches have been piped or abandoned as approved by the ditch master.
54. Existing irrigation tailwater ditches or sheet flow is properly conveyed through the property.

55. All storm drainage conveyance systems have an oil water separator system, in heavily traveled areas (i.e. Commercial subdivisions, car washes, gas stations, etc.), in place before it discharges into the city system.

AA. Grading and Storm Drainage Details – This sheet is to include all of the details necessary to construct the grading and storm drainage facilities for the project. This sheet is to include:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
6. Revisions block is indicated.
7. Keyed Slope Detail
8. Backdrain Plan Section
9. Cut-Fill Transition Detail
10. Rear Lot Drainage Swale (Permanent)
11. Typical Section (Front to Back Lot Benching
12. Standard Rear Lot Inlet Box – Plan View
13. Standard Rear Lot Inlet Box – Profile View

BB. Grading and Drainage Plan Key Sheet – This sheet is to include the following:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
6. Revisions block is indicated.
7. Legend
8. Grading & Drainage Plan Key Drawing – Show adjacent roads, properties, etc.
9. Subdivision – Site Summary

Grading and Drainage Plan - This sheet is to include the following:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
6. Revisions block is indicated.
7. Grading & Drainage Plan Key Drawing – Show adjacent roads, properties, existing contours, graded contours, vegetation, etc.

(One of Several Sheets)(For a portion of the Subdivision, based on the Key Sheet)

DD. Overall Storm Water Pollution Prevention Plan – This plan is meet the requirements of the City's ordinances and standards and the first part of the drawings/plan are to show the overall plan for erosion control and revegetation. Additional drawings may also be necessary to provide additional detail.

1. Title block

2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number are provided (plan sheets).
6. Revisions block is provided.
7. A verification from the design engineer that the proposed improvements comply with the City's design and construction standards for land disturbance.
8. Any project over 1-acre requires a SWPP plan and permit be prepared (permit application available in the Engineering Department).
9. Project description - Type of project, area to be disturbed, number of units (residential/commercial) or square feet (single-parcel commercial/industrial sites).
10. Description of existing site conditions - Topography, vegetation, streams, lakes, canals, drainage features.
11. Description of bounding areas that may be affected by land-disturbing activities - Streams, canals, roads, residential and commercial areas.
12. Critical areas called out on plan such as steep slopes and environmentally sensitive areas.
13. Erosion and Sediment control plan showing BMP practices
14. Permanent stabilization - Methods used to permanently stabilize the site (e.g., sod, seed.).
15. Grading report - Identify where dirt will be moved from, final placement, placement methods and compaction. Prior to any grading on project, this report is to be submitted to the Engineering Department for review.
16. Grading Permit from the Engineering Department.
17. Erosion protection is provided for all cut and fill slopes.
18. Energy dissipaters are provided on the outfall of drain lines discharging into creeks and earthen channels capable of slowing velocities to 3-feet per second.

EE. Street Plan and Profile - This drawing is to provide all necessary information required to review the street plan and underlying utility work for adequacy for design as well as for eventual construction of the project. This will require that the following be provided:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number are shown (plan sheets).
6. Revisions block is shown.

Typical Sections

1. Typical street cross-sections
2. Local street, 50-foot right-of-way, minor collector, 66-foot right-of-way, major collector, 80, 90-foot right-of-way, arterial, 126-foot plus right-of-way, cross-sections are shown. Drawings are to shown maximum cut and fill lines.
3. Show sidewalk ramps with dimensions.
4. Extend existing ground profile 200-feet beyond project.
5. Typical sections must have right-of-way or property line dimensions, cross slopes, type of curb, width of sidewalks, and the structural section material and thickness shown.

General Requirements

1. Profile view over plan view is shown.

2. A verification from the design engineer that the proposed improvements comply with the City's design and construction standards and master plan for roads and bridges and transportation.
3. Permits – Permits have been received by the developer and evidence has been provided to the City. This may include Utah Department of Transportation (UDOT) if the project impacts State roads, railroads, City encroachment permits, etc.
4. Design efficient for snow removal and storage, and for traffic circulation.
5. A soils report has been prepared, submitted, and reviewed by the City recommending a pavement design.
6. The roadway cross-section meets at least the minimum City standards of local residential streets. The actual thicknesses are to be determined by the soils report.
7. Roadway designs meet the City standard for curb radii for local residential streets of 28-feet; for collector roadways of 35-feet and cul-de-sacs of 40-feet.
8. Roadway designs meet the City standard for vertical/horizontal design of 10-percent maximum grade for residential roadways, 8-percent for collector roadways, 6-percent for arterial roadways, and 100-feet of 3-percent. The minimum slope for these roadways is 0.5-percent. These roadways are also to meet the requirements of 90-degrees at intersections, intersections spaced 300-feet apart, the correct K value, 2-percent cross-slopes, etc.
9. Driveway designs meet the City standard of concrete apron, 30-feet maximum; for residential roadways – 50-feet from intersections, for collector roadways – 150-feet from intersections, and for arterial roadways – 200 to 250-feet from intersections. The spacing of these accesses shall be 85 to 150-feet for collectors, and 200 to 275 for arterial roadways.
10. Street names with right-of-way and back of curb widths are indicated and a designation as "Public" or "Private" to be maintained by .... are shown on each street plan or section, if on each sheet.
11. Centerline bearing(s) and stationing are shown.
12. Curve data is indicated.
13. Profile for centerline, near and far curbs - Also show crown profile, if there is an offset crown.
14. Centerline profile view – Curb profile may be eliminated.
15. Top of curb elevations with curve data shown for all curb returns.
16. No scale larger than 1"= 40' horizontally / 1"= 4' vertically grades less than 5-percent are shown. Grades more than 5-percent can be 1"= 40' / 1" = 8'.
17. If vertical curve is shown on profile, the vertical curve is shown on the plan view.
18. Curve table is shown in plan view.
19. Line of sight line shown in plan view.

Culinary Water

1. A verification from the design engineer that the proposed improvements comply with the City's design and construction standards and master plan for culinary water.
2. Culinary water meter are located within the City's right-of-way and within landscaped areas unless otherwise directed by the City.
3. Drawings indicate water system line sizes, valve locations and that the water lines are looped.
4. Notes indicate the method/procedure for connecting onto existing water line source. Needs to indicate it will be done according to the City's Culinary Water Design and Construction Standards.
5. Plan view over profile view is shown (12-inch and over, or in unimproved areas).
6. Street names with right-of-way and back of curb dimensions are shown.

7. Waterline(s) located with dimensions from centerline (CL) or property line (PL), provide bearing of waterline if not parallel to CL or PL.
8. Length of pipe distance between valves, type, size and slope are shown.
9. Indicate separation at all utility crossings.
10. All waterline easements are shown (document no., if existing).
11. Culinary water lines are provided, 8-inch minimum PVC C-900 water pipe, generally located on the north and east sides of the streets.
12. All culinary water lines are required to show all valves, fittings, and thrust blocks.
13. Service laterals are provided to each lot.
14. Combination air/vacuum relief valve assemblies (Apco 140C Series, Crispin UL Series, or approved equivalent) are provided at all high points of the water system.
15. Fire hydrants are provided at 500-feet minimum spacing on residential streets, 400-feet on cul-de-sacs, 200-feet minimum on collector streets with commercial frontage, and where otherwise needed as marked by the Engineering Department.
16. Fire hydrants are located on lot lines whenever possible.
17. Fire hydrants are called out as Mueller Super Centurion, Waterous Pacer 100, or Clow Medallion.
18. Fire hydrants in cul-de-sacs are placed at the lot line closest to the neck of the bulb, where feasible.
19. Fire hydrants, which are preferred, or wash-out valves are placed at low points and end-of-line points of culinary water mains, to act as blow-offs.
20. Secondary water lines are located in the south and west side of roadways in the parkstrips.
21. Public Works Department approval signature block and Water Notes are indicated.
22. Fire Department signature block is shown.
23. Fire flow calculations have been provided and reviewed.
24. Centerline profile view – Curb profile may be eliminated
25. Top of curb elevations with curve data shown for all curb returns.
26. Scale no larger than 1"= 40' horizontally / 1" = 4' vertically are used.
27. If a vertical curve is shown on the profile view, a vertical curve is shown on plan view.
28. Curve table shown in plan view.
29. Curve table shown in plan view.
30. Line of sight line shown in plan view.

Storm Drainage and Flood Control

1. Plan view over profile view is shown
2. A verification from the design engineer that the proposed improvements comply with the City's design and construction standards and master plan for storm drainage and flood control.
3. Street names with right-of-way and back of curb dimensions are shown.
4. Drainage calculations (Separate Document from Drawings) - These are to include the assumption of the 100-year storm event with 0.2 cubic foot per second/acre discharge in 24 hours and are to be stamped by a registered professional engineer.
5. Orifice sizes, number of manholes, invert and rim elevations; required riprap, required double inlet/dissipator, etc. are indicated.
6. Detention areas and details are shown. This is to include spillways at a 3:1 maximum side slopes.
7. Ditch master approvals have been provided.
8. Storm drain line(s) are labeled as public or private.

9. Show all laterals and drop inlets.
10. Storm sewer(s) located with dimensions from centerline (CL) or property line (PL), provide bearing of storm sewer line if not parallel to CL or PL.
11. Manholes are numbered.
12. Indicate the length of pipe, distance between manholes, type, size, and slope.
13. Indicate separation at all waterline crossings.
14. All drainage easements are shown (document no., if existing).
15. Storm drainage calculations were provided and reviewed.
16. All catch basins or storm drain appurtenances are to have proposed rim elevations with invert elevations shown on plan. A 3-foot minimum distance is shown between the rim and invert of the pipeline, unless approved by the Engineering Department.
17. Floodplain notes / evaluation are provided.
18. Subdrain system – Provide a subdrain system if the project fronts canal property, the geotechnical report indicates groundwater within the footing zone, or the area is known for a high groundwater table.
19. Subdrain Note are shown, if applicable.
20. All curb and gutter PC/PT, direction changes, sidewalks, handicap ramps, are to have finish grade (FG) calculations shown on the plan.
21. Storm drain lines, catch basins, and clean-out boxes are provided as needed.
22. Catch basins are provided at all sag points and every 500-feet or at all intersections, to intercept storm water runoff discharge. Doublewide catch basins, with two grates are provided at sag points so the directional vanes can be installed in both directions.
23. Manholes are to be located every 400-feet.
24. An overland release for storm water is provided for all sag points such that no structures will be flooded if the underground drain system were blocked or the capacity exceeded.
25. Storm drainpipe within paved area of City streets is reinforced concrete pipe (RCP), CL 111 and is a minimum of 15-inches in diameter.
26. Smooth-wall corrugated HDPE pipe may be used in areas outside the City's right-of-way only.
27. Subsurface drains are provided to an approved system, or outfall, where needed to lower groundwater levels to 3-feet below all basement levels.
28. Existing irrigation ditches are piped or abandoned as allowed in writing by ditch master.
29. Existing irrigation tailwater ditches or sheet flow is properly conveyed through the property.
30. In heavily traveled areas, i.e. commercial subdivisions, car washes, gas stations, etc., all storm drainage conveyance systems are to have an oil water separator system .in place before it discharges into the City's system.
31. Centerline profile view – Curb profile may be eliminated on new street construction.
32. Top of curb elevations with curve data shown for all curb returns.
33. No scale larger than 1"= 40' horizontally / 1" = 4' vertically is used.
34. If a vertical curve shown on the profile view, a vertical curve is shown on plan view.
35. Curve table is shown in the plan view.

<u>Sanitary Sewer</u>

1. Complete the requirements for the Sanitary Sewer Plan and Profile Sheets as indicated by the South Valley Water Reclamation Plant and show this information on this set of drawings.

<u>Secondary Water</u>

1. Complete the Secondary Water Plan and Profile Sheets checklist and show the information.

FF. Traffic Signal Plan – When a project requires the construction or modification of a traffic signal, a separate traffic signal plan will be required. The traffic signal plan is to have a scale of one-inch = 20-feet. In addition to the general requirements of drawings, the signal plans are to contain the following information:

1. Title block
2. Project title
3. North arrow
4. Scale of drawing
5. "Call Before You Dig" symbol and telephone number is shown (plan sheets).
6. Revisions block is shown.
7. All streets are named and dimensioned.
8. Conduit runs are shown.
9. Detail of signal pole location are shown.
10. Detail of signal improvements, i.e. foundation and pole type/size, location of pull boxes, cabinets, conduits, detection facilities, are shown.
11. Traffic signal notes
12. All existing improvements including streetlights, signal poles, curb and gutter, driveways, sidewalk ramps, drop inlets, surface and subsurface utilities are to be shown and located by centerline stationing.
13. All existing or "to be constructed" hand holes, pull boxes, underground conduits and detector loops are to be shown and located by centerline stationing
14. All existing or "to be constructed" stop bars, cross walks and pavement markings are to be shown and dimensioned
15. All improvements "to be constructed" including streetlights, signal poles, pull boxes, driveways, sidewalk ramps, curb, drop inlets, and subsurface utilities are to be shown and located by centerline stationing
16. Each signal type and location
17. Street name sign schedule
18. Conduit and cable schedule
19. Phase diagram

GG. Quantity and Schedule Requirements - Every plan set submitted is to contain a quantity estimate. The City requires the quantity estimate to contain quantities of all public improvements in a format consistent with the City's bond estimate form. In addition, the City requires quantities of improvements constructed within public easements, whether or not they are publicly maintained. If the project contains both public and private improvements, the design engineer may elect to indicate both quantity estimates on the plans to facilitate the review of the public improvement bond estimate. The quantity estimate may be placed on a separate sheet or on the title sheet. The design engineer may elect to use schedules to clarify construction items, however; the use of schedules is not mandatory.

5.7 STANDARD NOTES

A. General Notes

1. All construction and materials are to be in accordance with the " City of West Jordan Design and Construction Standards"; and other applicable approved standards issued by the

controlling agency; the International Building Code; and all local city codes and ordinances applicable, except as noted on this sheet as "Deviations from Standards".

2. The existence and location of any overhead or underground utility lines, pipes, or structures shown on these plans are obtained by a research of the available records. Existing utilities are located on plans only for the convenience of the Contractor. Existing utility service laterals may not be shown on the plans. The Contractor is to, at his own expense, locate all underground and overhead interference's, which may affect his operation during construction and is to take all necessary precautions to avoid damage to it. The Contractor is to use extreme caution when working near overhead utilities so as to safely protect all personnel and equipment, and is to be responsible for all cost and liability in connection therewith.
3. The Contractor is to take all precautionary measures necessary to protect existing utility lines, structures and street improvements which are to remain in place, from damage, and all such improvements or structures damaged by the Contractor's operations are to be repaired or replaced satisfactory to the Engineering Department and owning utility company at the expense of the Contractor.
4. All construction is to be as shown on these plans, any revisions are to have the prior written approval of the Engineering Department.
5. Type V cement is to be used in all off-site concrete work. Concrete to be 3,000 P.S.I. minimum @ 28 days. Mix designs to be approved by the City, prior to the use on the project.
6. Permits are required for any work in the public Right-of-way. The Contractor is to secure all permits and inspections required for this construction.
7. Expansion joints required, maximum every 300-feet in extruded-type curb.
8. Asphalt cement (AC) pavement to be ½-inch above lip of all gutters after compaction, except at sidewalk ramps and cross gutters.
9. Curb and gutter found to be unacceptable to the City is to be removed and replaced.
10. Sidewalk ramps are to be constructed in each quadrant of an intersection per standard drawing 235. Exact location of ramps may be adjusted in the field by a City inspector.
11. Contractor is to provide all necessary horizontal and vertical transitions between new construction and existing surfaces to provide for proper drainage and for ingress and egress to new construction. The extent of transitions to be as shown on plans.
12. All grading work is to conform to the soils report as prepared by the Soils Engineer approved by the Engineering Department, and as shown on these plans.
13. Exact location of all saw cut lines may be adjusted or determined in the field by a City of West Jordan Engineer if location on plans is not clearly shown, or existing pavement condition requires relocation.
14. The Contractor is to take all precautions necessary to protect existing permanent surveying monuments. Any monuments disturbed are to be replaced and adjusted per available records at the Salt Lake County Surveyors Office.
15. Utility company meter boxes, manhole lids, valve covers, etc., are to be located out of driveways, driveway aprons, flow lines, and cross gutters unless written approval is granted by the utility company and the Engineering Department.
16. Wall notes: (Below)
17. All walls, new or existing, are only shown on civil plans for the purpose of reviewing grading relationships; flood control and sight distance at intersections. New walls require a separate permit and inspection by the Building Department.
18. Asphalt mix design must be submitted and approved by the Engineering Department prior to the placement of Asphalt within City Right of Way.

19. Contractor is to adjust all new and existing inlets, valve boxes, manhole rims, and sewer clean outs, etc. to finish grade as applicable whether or not they are shown on the plans.

B. Traffic Notes

1. All construction signing, barricading, and traffic delineation is to conform to the "Manual on Uniform Traffic Control Devices", latest edition.
2. The street sign Contractor is to obtain street names and block numbering from the Engineering Department prior to construction.
3. Before any work is started in the right-of-way, the Contractor is to install all advance warning signs for the construction zone. The Contractor is to install temporary stop signs at all new street encroachments into existing City streets where warranted immediately after first grading work is accomplished, and is to maintain said signs until permanent signs are installed.
4. When a designated "Safe Route To School" is encroached upon by a construction work zone and the Traffic Engineer identifies a need for students to be assisted in the safe crossing through that work zone, the Contractor is to be required to provide a qualified "crossing guard". The guard is to be present for the full duration of time those children are likely to be present.
5. If the improvements necessitate the obliteration, temporary obstruction, temporary removal or relocation of any existing traffic pavement marking, such pavement marking is to be restored or replaced with like materials to the satisfaction of the Engineering Department.
6. The Contractor is to be responsible for providing and installing all permanent signs shown on the plans. Street name signs are to conform in their entirety to current City standards. All other signs are to be standard size unless otherwise specified on the plans. All signposts are to be installed in accordance with the current City standards.
7. When a proposed street light standard is located within 5-feet of any proposed sign shown on the plans to be mounted on a signpost, the sign is to be mounted on the street light standard and the signpost is to be eliminated.
8. All permanent traffic control devices called for hereon are to be in place and in final position prior to allowing any public traffic onto the portions of the road(s) being improved hereunder, regardless of the status of completion of paving or other off-site improvements called for by these plans.
9. Street signs and stop signs are to be installed per City standard specifications for placement of street name signs.
10. The Contractor is to provide barricades, signs, flashers, other equipment and flag persons necessary to insure the safety of workers and visitors.
11. Work in public streets as approved by City excavation permits, once begun, is to be expedited to completion so as to provide minimum inconvenience to adjust property owners and to the traveling public.
12. The Contractor is to be responsible for notifying for Utah Transit Authority (UTA) and the Jordan School District Transportation Services Department if the construction interrupts or relocates a bus stop or has an adverse effect on bus service on that street to arrange for temporary relocation of stop.

C. Streetlight Notes

1. No deviation of street light, pull box, conduits (etc.) locations are to be permitted without written approval of the Engineering Department. Any deviation from the plan location will require written notice from the Engineering Department.

2. All existing street lighting is to remain operational during construction.
3. All empty conduits are to have pull strings installed prior to final inspection.
4. Any structure such as block walls, chain link fences, retaining walls, etc., are to leave a minimum clearance of 18-inches to the face of street lightning pole on all sides when streetlight is installed behind sidewalk, and is to at no time completely enclose the street lighting pole.
5. As-built drawings are to be supplied to the Engineering Department who will provide copies to the Public Works Department prior to any pre-final inspection. The as-built drawing needs to be stamped as –built and signed by the preparer.
6. Service points are to be coordinated with Utah Power and Light, and wherever possible, be located near the center of the circuit. Service points are to be shown on the plans.
7. It is to be assumed that in the absence of an existing, workable circuit to attach to, all installations are to require a new service for operation of the circuit. In this case contact Utah Power and Light.
8. Wherever there is an overhead utility that may conflict with the installation of street lighting circuits and/or poles, these conflicts must be resolved between the developer and the utilities involved before streetlight bases are installed at no expense to the City of West Jordan and UPL.
9. The Contractor is to furnish complete service to transformers and control systems if required on plans, and is deemed necessary by UPL.

D. Grading Notes

1. In the event that any unforeseen conditions not covered by these notes are encountered during grading operations, the owner/engineer is to be immediately notified for direction.
2. It is the responsibility of the Contractor to perform all necessary cuts and fills within the limits of this project and the related off-site work, so as to generate the desired subgrade, finish grades and slopes shown.
3. Contractor is to take full responsibility for all excavation. Adequate shoring is to be designed and provided by the Contractor to prevent undermining of any adjacent features or facilities and/or caving of the excavation.
4. The Contractor is warned that an earthwork balance was not necessarily the intent of this project. Any additional material required or leftover material following earthwork operations becomes the responsibility of the Contractor.
5. The grading Contractor is responsible to coordinate with the owner to provide for the requirements of the project Storm Water Pollution Prevention Plan (SWPPP) and associated permit.
6. Contractor is to grade to the lines and elevations shown on the plans within the following horizontal and vertical tolerances and degrees of compaction, in the areas indicated:

		Horizontal	Vertical	Compaction
a.	Pavement area subgrade	0.1'+	+0.0' to –0.1'	See soils report
b.	Engineered fill	0.5'+	+0.1' to –0.1'	See soils report

Compaction Testing will be performed by the owner or his representative.

7. All cut and fill slopes are to be protected until effective erosion control has been established.
8. The use of potable water without a special permit for building or construction purposes including consolidation of backfill or dust control is prohibited. The Contractor is to obtain all necessary permits for construction water.

9. The Contractor is to maintain the streets, sidewalks and all other public right-of-way in a clean, safe and usable condition. All spills of soil, rock or construction debris is to be promptly removed from the publicly owned property during construction and upon completion of the project. All adjacent property, private or public is to be maintained in a clean, safe and usable condition.
10. In the event that any temporary construction items is required that is not shown on these drawings, the owner agrees to provide and install such item at his own expense and at the direction of the Engineering Department. Temporary construction includes ditches, berms, road signs and barricades, etc.

E. Fire Department Notes

1. Authorized hydrants for this project are:
   a. Kennedy Guardian
   b. Mueller a-423 Centurion
   c. Clow Model 2546 Medallion
2. On any new home or building installation, accessible fire hydrants are to be installed before combustible construction commences and said fire hydrants are to be in good working order with an adequate water supply.
3. Contractor is to call the Public Works Department and Engineering inspector for underground inspection, pressure and flush verification of all fire hydrants and fire lines before back filling.
4. Painting of the curbs and hydrant and any work necessary for protection of hydrants from physical damage is to be completed before approval.
5. A permit is required from the Fire Department for on-site water lines and fire hydrants. The permit and Contractor's material and test certificate for underground piping form is to obtain the Fire Department prior to any work beginning.
6. A flow test must be witnessed by the Fire Department prior to occupancy for verification of required on-site water supply.
7. All on-site fire main materials must be U.L. listed and A.W.W.A. approved.
8. Fire Hydrant Spacing:
   Residential – 500-feet unsprinklered; 1,000-feet sprinklered.
   Commercial, including multi-family – 300-feet unsprinklered; 600-feet sprinklered.
9. Where new water mains are extended along streets, hydrants are to be spaced at maximum 1,000-foot spacing to provide for transportation hazards.
10. No fire hydrant is to be located within 6-feet of any curb return, driveway, power pole, street light or any other obstruction.
11. Two sources of supply are required whenever there are four or more fire hydrants installed on a single system.
12. Not more than two hydrants can be out of service due to a single main break.
13. Fire apparatus access roads are to have an unobstructed width of not less than 20-feet provided no parking is allowed, not less than 28-feet if parallel parking is allowed on one side, and not less than 36-feet if parallel parking is allowed on both sides. Vertical clearance is to not be less than 13-feet, 6-inches and is to be paved.
14. The turning radius for any fire apparatus access road and/or fire lane, public or private, is to be not less than 45-feet outside radius and 22-feet inside radius and is to be paved.
15. A fire apparatus road is to be required when any portion of an exterior wall of the first story is located more than 150-feet from Fire Department vehicle access roads and/or fire lanes,

public or private, in excess of 150-feet in length is to be provided with an approved turn around area.

16. Access roads are to be marked by placing approved signs at the start of the designated fire lane, one sign at the end of the fire lane and width signs at intervals of 100-feet along all designated fire lanes. Signs to be placed on both sides of an access roadway if needed to prevent parking on either side. Signs to be installed no higher than 10-feet or less than 6-feet from roadway level. The curb along or on the pavement or cement if curb is not present, is to be painted with red weather resistant paint in addition to the signs.
17. Electrically controlled access gates are to be provided with an approved emergency vehicle detector/receiver system. Said system is to be installed in accordance with the City of West Jordan City F.D. approval. Gates are only allowed with prior approval.

F. Culinary Water Notes

1. No work is to begin until the water plans have been released for construction by the Engineering Department. Following water plan approval, 48-hour notice is to be given to the Public Works Department prior to the start of construction. Notice must be given by 2:00 P.M. the business day prior to an inspection.
2. All work is to conform to City of West Jordan City standard plates, drawing, and specifications and the Culinary Water Design and Construction Standards, latest edition.
3. All work, except as modified by these plans or by note 2, is to be done in accordance with the most current draft or edition of the Road and Bridge Design and Construction Standards for off-site improvements.
4. A single pipe material is to be used throughout the project, unless otherwise approved by the Engineering Department.
5. All service laterals 2-inches in diameter and smaller are to be copper tubing with City of West Jordan City approved service saddles.
6. All water meter boxes are to be located outside of driveway areas.
7. All valves are to be located outside of driveways, gutters, curbs and alley gutters.
8. The following requirements must be met in the event a water line and sanitary sewer or storm sewer line cross:

   A minimum 18-inch vertical separation (outside to outside) must be maintained when the water line is installed over the sanitary or storm sewer line. If the vertical separation cannot be maintained or the water line must be placed under the sanitary or storm sewer line, the sanitary or storm sewer line must be constructed with one of the following or, as shown on these plans:

   a. Potable water supply quality material
   b. Encasement, with 4-inch concrete (minimum)
   c. Sleeving with potable water supply quality pipe.

   Each provision must extend along the sanitary or storm sewer, on either side of the water main, a minimum 10-foot distance perpendicular to the exterior of main.
9. Warning tape is to be required over all mains, all 6-inch diameter and larger service laterals, and any service lateral not installed perpendicular to the main.
10. All water facilities are to be filled, disinfected, pressure tested, flushed, filled and an acceptance water sample obtained prior to connection to the City of West Jordan distribution system.

11. The Contractor must obtain all meters 2-inches and smaller from City of West Jordan Public Works – 48-hours prior to pick-up.
12. Construction may interrupt service, with City of West Jordan Public Works approval and proper notification, between the hours of 10:00 P.M. and 6:00 A.M. Sunday through Thursday. Circumstances that may require temporary service feed must have prior City of West Jordan Public Works approval.
13. All water facility construction materials used must be as listed on the City of West Jordan Public Works pre-approved materials and manufacturers listing for new facilities, latest revision or specifically approved on these plans.
14. Approval of these plans for the water used stubout installation will not be construed as a commitment for water service to this property.
15. Conditional approval of valved outlet (6-inch and larger)
    In the event the water plans show one or more valved outlets extending out of paved areas, installations of these outlets is acceptable, however, if the outlets are incorrectly located or not used for any reason when the property is developed, the developer is to abandon the outlets at the connection to the active main in accordance with the district's standards and at the developer's expense.

16. Water Crossing Note

    The following are the requirements that must be met when there is a water-sewer crossing:

    When protection of the water line is considered, the minimum vertical distance 18-inches must be maintained when the water line is installed over the sewer/storm line. If this distance cannot be maintained because of physical obstructions or the water line must be placed under the sewer/storm line, the sewer/line must be constructed with any on if the following:

    a. Extra heavy cast iron or ductile iron pipe
    b. Water supply quality
    c. Encasement with 4-inches minimum of concrete or sleeving with water quality pipe.

    Each of these provisions must be extended for 10-feet on either sides of the water line at 90 degrees to the crossing.

5.8 PLAN CHECK

Two plan check reviews are provided as part of the engineering review fees. The Developer will be charged an additional $100.00 for each subsequent plan check, which must be paid to the City's Finance Department prior to the Engineering Department reviewing the drawings.

5.9 ENGINEERING DEPARTMENT APPROVAL

Once the Engineering Department staff has reviewed all corrections to the plans and have verified that the requested changes have been made, the plans will be submitted to the Engineering Department for review and approval. The Engineering Department will then notify the Developer in writing of that approval.

5.10 EASEMENT AND FEE PARCEL DEDICATIONS

The Developer is to verify to the Engineering Department's satisfaction that all easement and fee parcels needed for the project have been dedicated to the City. The Developer is to submit such recorded documents to the Engineering Department for their files.

5.11 SUBDIVISION INSPECTION

All improvements to be dedicated to the City for public use are to be inspected by the City's Engineering Department. A preconstruction meeting will be held for each project before any work is done. At this meeting the Developer and the Developer's contractor will be notified of the points when City staff must be present and have the facilities inspected prior to proceeding with the next step. No facilities are to be covered up or concrete poured without first receiving the proper inspection by the Engineering Department. Failure to comply with this requirement will result in the pipeline being uncovered, or concrete being removed and replaced, at the contractor's expense, to ensure proper procedures have been followed.

5.12 ENGINEERING DEPARTMENT APPROVAL LETTER

Once the Engineering Department is fully satisfied that all Engineering Department requirements have been met, the Engineering Department will notify the City's Building Department, through CityView, indicating that building permits may be issued for the project.

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SECTION 6.0

PLAN REVIEW & APPROVAL

6.1 GENERAL

A. General - The process of City staff review and correction of Developer provided building elevations, plats, site plan drawings, construction drawings, reports, studies, calculations, and other documents used in the processing of a private development project through the City, is called the *'Redline Review Process'*. *'Redlines'* refer to those hand written corrections, usually written in red pencil or pen, on building elevations, plats, site plan drawings, and construction drawings, and other hand-written or typed documents, which provide direction to the Developer and his/her engineer/architect on what items need to be changed on these documents. They also include written documentation of alternatives the Developer might consider in order to meet the City's requirements, or optional suggestions the Developer might wish to consider in finalizing his/her project.

The process is initiated by the Developer submitting ***all*** of the required documents the City has indicated are necessary for the review of the specific project type. ***All*** of the documents required by the City must be provided at the time of submittal after application, or the City staff will return the submitted materials back to the Developer, mark those documents that are missing on an appropriate checklist, and require that the Developer obtain the other documents prior to submitting the application packet back to the City. City staff will inventory the documents to ensure all of the documents are present, and the City's Project Review Team will complete the detailed review of the documents later. The City's project planner, engineer, and other City staff involved in the project are referred to as the City's 'Project Review Team' and they will be responsible for reviewing the project and processing it through the City.

B. Definitions – The following definitions apply when referring to the review process for private development:

1. Released for Construction Drawings (RFCD) – The Engineering Department has established a set of drawings required for these RFCD. It consists of all of the construction drawings necessary to construct the entire project, including public and private infrastructure such as roadways, water, sewer, storm drain lines, and landscaping & irrigation drawings. This set of drawings is combined into what is referred to as the *'Released for Construction Drawings'*. The purpose of this manual is to describe what is necessary to review and approve just the landscaping and irrigation portion of these *'Released for Construction Drawings'*.
2. Redline – City staff comments written on drawings, reports, plats, and other documents submitted by the Developer for review, for the project. These are meant to give direction as to what needs to be corrected to make them acceptable to the City for further processing.
3. Redline return – The redline process consists of an *'Initial or 1st Review'* of a given document, which contains City staff's redlines (comments), which is then followed by a *'Second Review'*, *'Third Review'*, etc., depending on how well the Developer's engineer addresses City staff's redlines. A *'redline return'* is that portion of the process where the Developer returns the correct document from a City review, for additional City staff review.

4. *'Project Redline Memorandum'* – This is a memorandum prepared by City staff which has three main categories of comments: 1) comments made to address Code or Standards requirements, 2) alternatives for Code, standards, manual or other Planning Commission or City Council approved requirements, and 3) optional suggestions the Developer and his engineer may consider, and which are not required.

C. Purposes of Redlines – The purposes of the 'Redlining' process are as follows:
   1. Explain and clarify the City staff's comments regarding various documents they have reviewed which were provided to the City staff for review as part of the private development project.
   2. Create documentation, which sets the standard for what will be required of the project, in order for it to be processed through the City.

D. Types of Comments – Redline comments come in three distinct types, they are:
   1. Comments Required to meet Code, standard, manual or other Planning Commission and/or City Council conditions or approved requirements – These are comments the Project Review Team will make on *'redline'* documents which are required by the City of West Jordan Municipal Code, standards, manuals, or other Planning Commission or City Council approved documents. These are required to be complied with by the Developer and his/her engineer and other professionals and are not optional for them to consider. If the Developer wishes to contest these requirements, they must be done through the appeal process set forth in *'Section 6.6 – Developer's Appeal Process'* and or Municipal Code. City staff does not have the authority to waive or change these requirements.
   2. Alternatives for Code, standard, manual or other Planning Commission or City Council approved requirements – There are situations where a given project may have alternatives City staff may indicate are available to meeting City Code, standards, or manual requirements. These will be indicated in a separate *'Project Redline Memorandum'* which will detail the alternatives available to the Developer, along with any other information City staff may wish to communicate to the Developer for his/her consideration. It the responsibility of the Developer to weigh and select a given alternative and indicate so in writing to the Project Review Team. The project will not proceed with further review until the Developer provides this written decision.
   3. Optional suggestions – There may also be optional suggestions the Project Review Team wishes the Developer to consider in the remaining preparations for the project. These will also be included in the *'Project Redline Memorandum'* and will be included under the heading of *'Optional Suggestions'*. The Developer must provide a written response to whether these suggestions will be included in the project and can be included with the *'Alternatives for Code Compliance'* items.

E. Types of Redline Documents – *'Redline Documents'* typically include building elevations, plats, site plan drawings, construction drawings, studies, reports, calculations, property documents of all types, and any other type of document which may be submitted to the Project Review Team in order to adequately address City requirements for a given project. The Project Review Team will mark on these *'Redline Documents'* any corrections, which may be necessary to meet City requirements. Redline comments are to be prepared after reviewing the City's Municipal Code, standards, and manuals.

F. All Redlines Must be Addressed in Order to Process Project – The Developer must note that all redlines must be addressed to the satisfaction of the City staff before the City Planner and City Engineer will schedule the project for Planning Commission or City Council review.

6.2 PROJECT REVIEW TEAM'S RESPONSIBILITIES IN THE REDLINE REVIEW PROCESS

The Project Review Team is responsible for reviewing the documents submitted by the Developer in accordance with the established Municipal Code, standards, policies and design criteria manuals, specifications, the Development Processing Manual, and any other City Council approved documents meant for this purpose. The Project Review Team will mark on the drawings, any corrections that are necessary in order for the project to meet the requirements indicated above. The Project Review Team will indicate the Code, standard, or manual requirement, which applies to the comment. If the Developer does not agree with the Project Review Team's interpretation of regulations, or wishes to challenge the requirement, the Developer needs to understand that City staff does not have the authority to waive, or not enforce these requirements. These are City Council approved requirements, and only the City Council can change or alter the requirement. The Developer will need to follow the appeal process outline in *'Section 6.6 – Developer's Appeal Process'* or Municipal Code appeal process.

In addition to the 'redline' marking of building elevations, plats, site plan drawings, construction drawings, or other types of drawings, City staff will also provide a separate hand-written or typed document called a *'Project Redline Memorandum'*, which provides alternatives to the Developer for meeting the City's codes, standards or manuals. Review will be based on code, general plan, standards and specifications. As part of this effort, the Project Review Team will provide a written description of what the alternatives are, any concerns that City staff may have regarding the alternatives, pros and cons they may be aware of, and other items which may be useful in the Developer's decision on which alternative to select. The Developer will then choose the alternative course of action. The Developer must indicate, in writing, to the Project Review Team which alternative he/she elects to select. ***The project cannot be further processed until the Project Review Team receives this document.***

City staff may also elect to provide *'Optional Suggestions'* they wish the Developer to consider in finalizing the project. These will be included in the *'Project Redline Memorandum'* under the heading of *'Optional Suggestions'*. The Developer is not required to include these suggestions in the project, but must provide in writing, an indication as to whether he/she intends to include them in the project.

City staff's responsibility is to be as clear as possible in defining the issue(s) for the Developer, so the Developer and his/her engineers/architects understand the issue(s), and what the resolution to the issue(s) may be. Typically there will be one to three 'redline reviews' produced for a given project unless the Developer and his/her engineer/architect are not adhering to the 'redline' comments, and additional 'redlines' are required. If the Developer's project requires more than 3 sets of 'redlines', the Developer will be charged extra for the review of these additional sets of 'redlines'.

6.3 DEVELOPER'S RESPONSIBILITIES IN THE REDLINE REVIEW PROCESS

The Developer and his/her engineer/architect have responsibilities for making the 'redline' process a productive and efficient effort.

The first responsibility the Developer and his/her engineer/architect have in the process is to understand the City's general plan, codes, standards, manuals and other documents, and that the project is planned and designed in accordance with these documents. If the Developer and his/her

engineer/architect are not familiar with the City's requirements, the project will not be able to be processed as quickly as it would, if there aren't extensive 'redlines' to the project documents. The Project Review Team has extensive experience in these types of reviews and will 'redline' all deficiencies and require they be changed to meet City requirements prior to further processing the project. Not following these guidelines will result in delays to the Developer and his/her project.

The Developer has the responsibility of making the corrections noted on the 'redlines' if they are City code, standards, manuals, or other City Council approved documents comments. These corrections are not optional and are required to be made. If the Developer disagrees with these requirements, the Developer is required to indicate this disagreement in writing to the Project Review Team, once the Developer has received and reviewed the 'redlines'. *'Section 6.6 – Developer's Appeal Process'* must be followed in resolving these types of issues. Possible modification of project requirements/agreements are closed once the Planning Commission and/or City Council approve the project. If modifications are requested, the plan or application must go back to the Planning Commission and/or City Council for modification.

The Developer has the responsibility to respond to alternatives for code compliance contained in the *'Project Redline Memorandum'* in writing. The Developer is required to consider the alternatives and then select one for implementation into the project. City staff may indicate a list of items available for the Developer to consider in this process, but the decision to select one alternative over another is solely for the Developer to make.

The Developer has the responsibility to consider optional suggestions, but is not required to comply with these suggestions. The Developer does have the responsibility of responding to Project Review Team about whether he/she intends to implement these suggestions into the project.

The Developer and his/her engineer/architect have the responsibility of being as clear as possible in responding to the concerns expressed by the Project Review Team on the *'Redline Documents'*, so the Project Review Team understands the Developer's concerns, and what the Developer's proposed resolution to the concern(s) may be.

6.4 TYPES OF REDLINE DOCUMENTS

A. Building Elevations – One of the documents which may be redlined are the building elevations. These drawings depict the appearance of the structure from various vantage points and provide the Developer and City staff an opportunity to review the outward appearance of the structure to ensure it meets the City's codes and other requirements.

B. Plats – These are official property documents which depict how property is presently configured, or how the Developer wishes to configure property as part of the proposed project. It consists of a drawing of the property with various notations, acknowledgements, legal descriptions of the property and easements, signature blocks, etc. This document is recorded at the Salt Lake County Recorder's Office.

C. Site Plan Drawings – These drawings may depict property information but they are not legal, recordable documents, which alter property configurations. These documents are *'plan view drawings'* which indicate what the project will look like once the project is complete. It will indicate locations of property lines and easements, building, parking, landscaping, infrastructure and other site improvements required for the project.

D. Construction Drawings – These are specific drawings used by engineers, contractors, and others in the actual construction of the project. They consist of a number of different types of drawings including erosion control, wastewater system, stormwater system, water system, secondary water system, roadway improvements, notes, details, etc., which depict in detail how the project is to be constructed. The City requires that *'Approved for Construction Drawings'* be provided and followed in the construction of approved projects.

E. Studies and Reports – Projects may require the preparation of various types of studies and reports in order to quantify issues related to the project. These may include geotechnical reports, geologic reports, traffic impact studies, drainage studies, development plans, modifications of various master plans, etc., which may be required for the individual project. The Project Review Team will identify which reports are necessary at the beginning of the project and may require additional studies/reports as work on the project progresses.

F. Property Documents – Various types of property documents may be required for the project including warranty deeds, permanent easements, temporary easements, etc.

G. Other Types of Documents – Each project is unique and may require other types of documents to be submitted for the project to be processed. As the project is processed through the City, the documents will become evident and will be indicated to the Developer by the Project Review Team.

6.5 REDLINES

The Project Review Team will provide responses to the Developer's project submittals in three different forms. These are:

A. *'Project Redline Memorandum'* – In every case, the Project Review Team will assemble a *'Project Redline Memorandum'* which indicates the status of the project and provides code requirements, *'Alternatives for Code Compliance'* issues, *'Optional Suggestions'*, and any other comments the Project Review Team feels will help the Developer revise the *'Redline Documents'* and allow them to be further processed. The Memorandum may or may not include the items listed above, depending upon the needs of the specific project. This Memorandum will act as a summary of the 'redline' effort by the City staff.

B. *'Redlined Drawings'* – Most projects will contain some type of drawing or drawings. The Project Review Team may mark on these drawings any changes they wish to see made, as long as the comments were identified *as 'code requirements'*, *'alternatives'*, or *'Optional Suggestions'*, or they may include this discussion in the *'Project Redline Memorandum'*.

C. Other Redline Documents – There are a variety of these types of documents and the Project Review Team may mark on these documents, or may include a summary of concerns in the *'Project Redline Memorandum'*.

The Developer needs to check all documents for comments, which are returned to the Developer from the Project Review Team.

6.6 DEVELOPER'S APPEAL PROCESS

The *'Appeals Process'* to the Project Review Team's conditions and corrections as part of the 'Redline review process' is contained in the City's Municipal Code. This includes Title 89-1-201 and 89-2-303. Please refer to these sections for additional information regarding this process.

It needs to be noted that the appeals process will take time and will delay the Developer's project until a resolution of the issues can be finalized.

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SECTION 7.0

CONSTRUCTION & CONSTRUCTION INSPECTION

7.1 GENERAL REQUIREMENTS

This section describes the use of materials and workmanship to be employed in construction of roads and bridges. Construction of other infrastructure needs to be completed in accordance with those policies & design criteria manuals. The developer/engineer shall prepare such general and special specifications as are necessary to define the nature and location of the work, contractual arrangements, payment for work and any other matters concerning the owner or his contractor; these items are not discussed within the standards presented here.

A. Use of This Section - The construction section is intended to highlight the features of construction, which are deemed to be most significant. In any construction activity, the recommendations of the manufacturer of a product, especially where more stringent, should apply. Also, the omission of a particular practice, which is not considered to be a good construction technique common to the construction industry, should not be construed to mean that it is not required.

   Finally, Section 4.0 of this Manual contains material descriptions and the developer/contractor is required to use that section along with this section, and the respective plates as a reference. Section 7.0 describes testing procedures and requirements.

B. Quality of Materials - Materials and equipment to be incorporated into the work shall be new. In case a reference is not clear as to which of several available grades is desired, the highest quality material shall be used. When construction bids are received directly by the City such bids shall show the proposed pipe material and the manufacturer's name, if more than one type is allowed.

   Contractor shall have at the job site or be able to supply upon request, certified copies of factory or laboratory test reports showing the strength characteristics of any materials used in the work. For all reinforced concrete work, the contractor shall furnish in advance of pouring concrete and, if requested, the mix design and calculated concrete strength as prepared by the concrete supplier.

C. Substitutions - Where articles or materials are specified by brand or trade name, alternate materials or articles equal to those specified may be approved provided the request for approval is in writing accompanied by supporting data, in ample time to permit investigations without delaying the work. Unless substitutions have received prior approval, no deviation from the Standards will be allowed.

D. Quality of Workmanship - All work will be done by persons experienced in the specific work, under competent supervision and in a first class manner to the City's complete satisfaction. When work is being done directly for the City, the contractor in the proposal shall name each subcontractor and no substitutions will be permitted without prior approval.

E. Defective Work - Any defective materials or workmanship, which shall become evident within one year after field acceptance of completed work shall be replaced or repaired without cost to the City. Refusal of the contractor to correct defective work, which is clearly his responsibility, will

be considered just cause for exclusion from performing future work for the City. Such exclusion does not impair the City's right to bring legal action to correct the deficiencies as well as to withhold release/exoneration of cash/letter of credit bond and payment bond.

F. City Inspection, Field Acceptance and Guarantee Period - The Engineering Department is responsible for inspection of all excavation, pipe laying including appurtenant structures, trench backfill within the pipe zone and testing. The administration of this work is described in more detail in the City's *'Private Development Construction Inspection Manual'* which is available from the Engineering Department. All such work shall be available for inspection at all times. It will be the contractor's responsibility to provide a working day notice to the Engineering Department prior to the start of any work. Such notification will allow for scheduling a preconstruction meeting between interested parties. Failure to provide proper notification may delay the starting date since the Engineering Department may not be able to inspect the work and cannot accept any work for which inspection has not been arranged. It must be emphasized that the primary responsibility for compliance with all City requirements and standards rests with the developer and/or contractor. Any acceptance of a portion of the work by a construction inspector does not relieve the developer/contractor of this basic responsibility.

   Field acceptance is made by the inspector and will not coincide with the date of City Engineer acceptance of the work. However, the one year guarantee period for all work shall begin as of City Engineer acceptance. As mentioned in Section 7.I.E., any deflective work discovered during this period shall be repaired or replaced but a new one year period will not begin for the corrected work.

   All holiday or weekend inspection will be subject to additional charges as detailed in the City's standard rates for such work.

G. Public Relations - The contractor shall conduct its affairs in a manner which will lessen the disturbance to residents in the vicinity of the work. In this regard, standard working hours as specified in the Municipal Code (currently 7:00 a.m. to 7:00 p.m., Monday through Friday) shall be observed unless prior approval is received, which also includes City observed holidays. The job site shall be maintained in a condition which shall bring no discredit to the City or its personnel, and all affected private improvements shall be restored to at least their original condition. Saturday work may be provided for only by approval of the Engineering Department an the contractor will be responsible for payment of all overtime and other charges associated with having City staff available for inspection and other coordination. Special care must be taken in regards to school zones. These zones must be maintained open at all times and any alterations to existing shall be coordinated with the School District and the City's Engineering Department.

7.2 PERMITS

The following permits may be required of the contractor:

A. Encroachment - Where construction or other types of activities will encroach into the public right-of-way or easements, the contractor shall obtain all necessary Encroachment Permit. Within City of West Jordan right-of-way, the permit is secured from the Engineering Department. Within the County areas, a similar permit is required from the County. State roads require a

permit from UDOT. Particular attention is called to Section 7.15 and the appropriate standard drawings.

B. Explosives - Where the contractor anticipates the use of explosives in conjunction with construction, a blasting permit shall be first obtained from the City of West Jordan Fire and Police Departments, and all nearby property owners shall be notified. These permits are discretionary and may not be given for a particular circumstance.

C. Land Disturbance Permit – Prior to the movement of any dirt on the site, the Contractor shall obtain a land disturbance permit from the City for the project. The land disturbance permit application may be obtained from the Executive Secretary of the Engineering Department. In obtaining the necessary information required for this permit, the Contract should also obtain a copy of the City's most current version of the *Land Disturbance Policies & Design Criteria Manual*. This Manual contains all of the particulars for obtaining this permit which also contains information about erosion control, revegetation and sedimentation control.

D. Other Permits - Other permits may also be required by other agencies, which must be applied for and obtained by the developer or his contractor. Certain permits are also required as part of the development conditioning process which must be provided prior to beginning construction of the project. Please refer to the City's *'Development Processing Manual'* for additional information.

7.3 TRAFFIC REGULATION

A. General - The Contractor shall submit a traffic control plan to the City for review and approval. The traffic control plan shall include the times the work shall be ongoing, streets affected, the proposed plan for dealing with traffic as well as a schedule for work to be performed. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'* and the City Traffic Engineer's additional requirements:

7.4 CLEARING AND GRUBBING

A. General - Clearing and grubbing which consists of removal of objectionable material from the right-of-way shall be done with caution such that existing wastewater improvements, adjacent property and trees and shrubbery that are not to be removed shall be protected from injury or damage.

Within water easements or rights-of-way, trees, shrubs, fences and all other improvements that have to be removed to permit construction and which are intended for replacement, shall be replaced in kind or size (excluding native trees under 2-inch diameter or native brush) or with approved substitutes unless permission to exclude such replacement is obtained from the owner/agency or granted by the Engineering Department. Replacement trees shall have a minimum diameter at breast height (DBH) recommended by the American Association of Nurserymen, but shall be larger if so required. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

B. Removal and Disposal of Material - The contractor shall be responsible for leaving the site in a neat and finished appearance, free from debris and/or inflammable material.

7.5 UTILITIES, EXISTING FACILITIES AND CONCRETE REMOVAL

A. Abandonment - Refer to Section 9.0 regarding abandonment of roadways and/or structures.

B. Utilities and Existing Facilities - The existing utilities and/or facilities shown on the drawings or the location of which is made known to the contractor prior to excavation, by contacting Blue Stakes 2 working days prior, shall be protected from damage during the excavation and backfilling of trenches and, if damaged, shall be repaired by and at the contractor's expense. Any existing utility or facility not shown on the drawings or the location of which is not shown to the contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the contractor; and adjustment in payment, if any, is subject to negotiation between the contractor and the developer without any City liability, unless it is a City sponsored project.

Whether expressly indicated on the drawings or not, all contractors shall call Blue Stakes prior to any construction of pipelines. Failure to do so shall not relieve the contractor of any liability associated with disturbance/ breakage of existing utilities. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

In case it shall be necessary to remove any such utilities, facilities or any portions thereof, the contractor shall notify the Engineering Department and the owner of the structure. The contractor shall not interfere with said utility and/or facility structures until disposition of the obstruction to the work has been determined and/or notice to relocate or remove has been given by the Engineering Department or authorized agent of the owner of the utility and/or facility so affected.

The fact that any underground utility and/or facility is not shown on plans shall not relieve the contractor's responsibility to comply with these standards. It shall be the contractor's responsibility to ascertain prior to commencing work the existence of any underground utilities or facilities which may be subject to damage by reason of operations performed by the contractor.

The Public Works Department will provide service line location services of existing services upon request and with satisfactory notification in advance.

C. Concrete, Masonry or Mortared Construction Removal - At locations shown on plans, portions of existing concrete pavement, curbs, gutters, sidewalks, foundations and other concrete or mortared structures shall be removed to the lines and elevations specified. Concrete structures or objects not shown or noted on the plans shall be removed where necessary and disposed of by the contractor.

Concrete removal operations in connection with the reconstruction of existing structures shall be performed without damage to any portion of the structure that is to remain in place. If damage occurs, the contractor shall repair any such damage at his own expense, to the satisfaction of the Engineering Department. Repair/replacement of any sidewalks, curbs and/or gutters shall be to the satisfaction of the Engineering Department, as appropriate. Where existing reinforcement is to be incorporated in new work, such reinforcement shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

7.6 EXCAVATION AND TRENCHING

A. General - Trench excavation shall consist of all excavation involved in the grading and construction of water lines as shown on plans. The contractor shall perform all excavation of every description and of whatever substances encountered, to depths indicated on the drawings or otherwise specified or required. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. The material piles shall also not obstruct existing sidewalks or driveways unless it cannot be avoided. All excavated materials not required or unsuitable for backfill shall be removed. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water from any source accumulating therein shall be removed by pumping or by other approved methods. Such sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel.

   Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the Engineering Department, the pipe or duct can be safely and properly installed and backfill can be properly tamped in such tunnel sections. If blasting is necessary, the contractor shall notify the City of his blasting schedule and procedures and obtain a blasting permit, and shall observe all reasonable precautions in protecting life and property. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

B. Excavation - Excavation for water lines shall be made only after pipe and other necessary materials are delivered on the work site. After such delivery, trench excavation shall proceed as rapidly as possible, and the pipe installed and the trench backfilled without undue delay.

C. Shoring - All shoring for open excavations shall conform to the State of Utah, Department of Industrial Relations, and Division of Industrial Safety "Construction Safety orders (O.S.H.A)."

   The contractor shall be responsible for adequately shored and braced excavations so that the earth will not slide, move or settle, and so that all-existing improvements of any kind will be fully protected from damage.

   No shoring once installed shall be removed until the trench has been approved for backfill operations. Removal of shoring shall only be accomplished during backfill operations and in such a manner as to prevent any movement of the ground or damage to the pipe or other structures.

   The contractor shall obtain and pay for all permits for any excavations over 5 feet (1.5m) in depth into which a person is required to descend or any excavation less than 5 feet (1.5m) in depth in soils where hazardous ground movement may be expected and into which a person is required to descend.

7.7 BACKFILL AND COMPACTION

A. General - There are several distinct zones to be considered in the backfilling procedure as follows (refer to Plate No. 3).

1. Pipe Zone. This area is from the trench bottom to 12-inches (300 mm) above the pipe. This zone is to be backfilled under the strict jurisdiction of the Engineering Department.
2. Above pipe zone but below pavement subgrade plus the zone including the subgrade and pavement Backfill and compaction in existing streets and in the area above the pipe zone shall be in full accordance with the City excavation permit issued for the specific work, and with the City land development specifications. In both cases, the filling of trenches shall be subject to approval by the City or Engineering inspector who shall have full authority to order compaction tests to demonstrate the actual backfill density.

Section 3.12 of the Culinary Water Design and Construction Standards contains the material designations for both the pipe zone and above pipe zone regions.

7.8 BORING AND JACKING OPERATIONS

A. General - Placement of pipe by boring or jacking methods requires special Engineering Department approval for each instance. However, as a general guideline, the following shall pertain:

1. Except for the use of air or water, the methods and equipment used in boring and jacking operations shall be optional to the contractor provided that the Engineering Department reviews them prior to any work.
2. The placement of pipe shall be to the lines and grades shown on the plans.
3. Voids remaining outside the pipe (or carrier pipe if applicable) shall be backfilled with 200 psi concrete.
7. Where a casing pipe is used, it shall be no less than 8 inches (200 mm) greater in diameter than the pipe to be installed.
5. The placement of pipe in casings shall be supported with redwood skids, shims or wedges to the lines and grades shown on the plans.

B. Bores - The boring machine shall cut a true circular bore to the required line and grade. The bored tunnel shall be no more than 2-inches larger in diameter than the maximum outside diameter of the casing or water pipe to be installed.

C. Jacked Steel Casings - In addition to applicable portions above, the following shall pertain:

1. Where casings are used, the size and wall thickness of the casing shall be at the contractor's option except that the minimum casing thickness shall be not less than 3/8-inch.
2. Field joints of steel casings shall be welded with a continuous circumferential weld.
3. The placement of pipe in casings shall be supported with redwood skids, shims or wedges to the lines and grades shown on the plans.
7. Prior to backfilling the annular space between the pipe and casing, the pipeline shall be tested in accordance with Section 6.0 – Testing.
5. The annular space shall be backfilled with washed concrete sand blown or rammed into place until the entire cavity is filled. Concrete bulkheads shall be placed at each end of the cased section to retain the backfill material.

7.9 CONSTRUCTION WATER

A. General - The developer/contractor shall not take unmetered water from the City's culinary water system. Instead, he or she should sign up at the Public Works Department for one or more construction meters after receipt of a deposit amount. The developer/contractor is not to move the construction meters. Charges for construction water are covered by City Council Resolution. The developer/contractor is put on notice that unpaid invoices will result in removal of the construction meter. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

7.10 SUBGRADE PREPARATION AND PLACEMENT OF BASE MATERIALS

A. General – This work shall provide for the preparation of natural, filled, or excavated roadbed material prior to the placement of subbase or base material, pavement, curbs and gutters, driveways, sidewalks, or other roadway structures.

B. Subgrade Preparation – This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

C. Untreated Base – This work provides for untreated base for pavement, curb, gutter and similar types of improvements that shall be constructed according to their technical specification sections.

7.11 ROADWAY SURFACING

A. General – This section provides for work related to finish surfacing of roadways including oiled roadways and shoulders, granular surfacing, chip seals, asphalt concrete pavement, portland cement concrete pavement and pavement fabrics.

B. Oiled Roadways and Shoulders – The roadway or shoulder to be oiled shall be prepared in accordance with these specifications following which it shall be uniformly water sufficiently to eliminate dust, but not to such extent as to form mud or pools of water. Grade SC-70 liquid asphalt shall then be applied to the dampened surface at a uniform rate of 0.35 gallon per square yard unless otherwise specified.

   The application of oil to the roadway or should shall be scheduled to commence after 7:00 a.m. and shall be completed prior to 1:00 p.m., and is further specified that no oil shall be applied when the air temperature is less than 40-degrees Fahrenheit.

   During all oiling operations, precautions shall be exercised to prevent marring or discoloring adjacent improvements and adequate protection against such possibility shall be provided.
   After the applied oil has dried, or penetrated to such extent that no free oil remains on the surface, and the condition of the oiled area will otherwise permit, the roadway or shoulder shall be opened to traffic.

C. Granular Surfacing – This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

D. Asphalt Concrete Pavement – Asphalt concrete pavement shall consist of one or more course of mixture of paving asphalt and graded aggregate placed upon a prepared roadbed or base, or over existing pavement. The courses shall be of the type of mixture and the dimensions shown on the plans and specifications. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

E. Portland Cement Concrete Pavement – This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

F. Pavement Fabric – Pavement fabric shall be nonwoven polyester or polypropylene materials conforming to the following:

Property	ASTM Test No.	Requirements
Weight, oz./sq.yd.	D3776	3.5 to 5.0
Grab Tensile Strength (1-inch grip), lbs	D1682	90 Min.
Elongation at Break, Percent	D1682	40 Min, 100 Max.
Fabric Thickness, Mils	D461	30 to 50

Pavement fabric shall be accompanied with a test certificate from an approved testing laboratory with actual identification test results. Additional testing may be required of the City Engineer. The fabric shall be protected from exposure to ultraviolet rays.

The surface of the distressed pavement shall be prepared by sweeping and removal of all loose materials prior to placement of the tack coat and pavement fabric. The fabric shall then be covered with an overlay of asphalt concrete.

7.12 CONCRETE AND MASONRY CONSTRUCTION

A. General – This work provides for construction of concrete structures, curbs & gutter, sidewalks, cross gutters and driveways connected to road and bridge projects. This work shall be done in accordance with the *'APWA Manual of Standard Specifications'*.

B. Concrete Structures – Concrete bridges, culverts, catch basins, retaining walls, abutments, piers, footings foundations, and similar structures shall be constructed in conformity with the plans and specifications.

C. Concrete Curbs & Gutters, Sidewalks, Cross Gutters, and Driveways – Concrete curbs, walks, gutters cross gutters, alley intersections, access ramps, and driveways shall be constructed of portland cement concrete of the class and other requirements prescribed in the plans and specifications. The finish coat to be applied to curbs shall consist of Class "B" mortar.

7.13 LANDSCAPE AND IRRIGATION SYSTEMS

A. General – This section shall govern the preparation, planting, and irrigation system construction for landscape areas required by the City.

Existing utilities and improvements not designated for removal shall be protected in place. Unless otherwise provided, walls, curbs, planter boxes, walks, irrigation systems, and similar improvements required by the City shall be constructed following rough grading and before landscaping.

B. Testing - All work on the irrigation system, including hydrostatic and coverage tests, preliminary operational tests of the automatic control system, and the backfill and densification of trenches, and other excavations shall be performed after topsoil work and before planting. This work shall be done in accordance with the following technical specification:

1. Section 02811 - Landscape Irrigation System

7.14 WINTER-TIME WORK REQUIREMENTS

Winter-time work is defined as time past November 1st of each year, where temperatures are typically consistently lower than the 50-degree F requirement and weather conditions are such, that they bring into question the quality of the materials, ability to properly place and compact them, or otherwise perform proper construction of the given facility.

The asphalt placement requirement is 50-degrees F and rising and whether work proceeds, is dependant upon the City Engineer with advice from the Engineering Inspector and Engineering Inspection Supervisor.

Placement of other materials after the November 1st date are subject to the approval of the City Engineer. Situations and weather conditions may also be such that even prior to November 1st, that the ability of the Contactor to adequately construct a facility may result in the City Engineer directing that the construction stop until further directed.

7.15 CONSTRUCTION INSPECTION

All construction inspection is to be done in accordance to the City's most recent version of the City Council adopted *'Private Development Construction Inspection Manual'*. This manual provides the detail for City staff and the Developer and his consultants to provide for inspection during the construction phase of the work. This manual contains the following table of contents:

PRIVATE DEVELOPMENT
CONSTRUCTION INSPECTION
MANUAL

ABBREVIATED
TABLE OF CONTENTS

SECTION	TITLE
1.0	INTRODUCTION AND GENERAL POLICIES
2.0	PRECONSTRUCTION
3.0	CONSTRUCTION
4.0	PROJECT CLOSEOUT

5.0 WARRANTY INSPECTION/ACCEPTANCE REQUIREMENTS
6.0 FINAL INSPECTION/ACCEPTANCE REQUIREMENTS
APPENDICES
Appendix A – Reference Section
Appendix B – Administration Checklists
Appendix C – Preconstruction Checklists
Appendix D – Construction Checklists
Appendix E – Project Closeout Checklists
Appendix F – Warranty Inspection/Acceptance Requirements Checklists
Appendix G – Final Inspection/Acceptance Requirements Checklists
Appendix H - Preconstruction Forms
Appendix I – Construction Forms
Appendix J – Project Closeout Forms
Appendix K – Warranty Inspection/Acceptance Requirements Forms
Appendix L – Final Inspection/Acceptance Requirements Forms

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SECTION 8.0

IMPROVEMENT BONDS & ACCEPTANCE

8.1 GENERAL

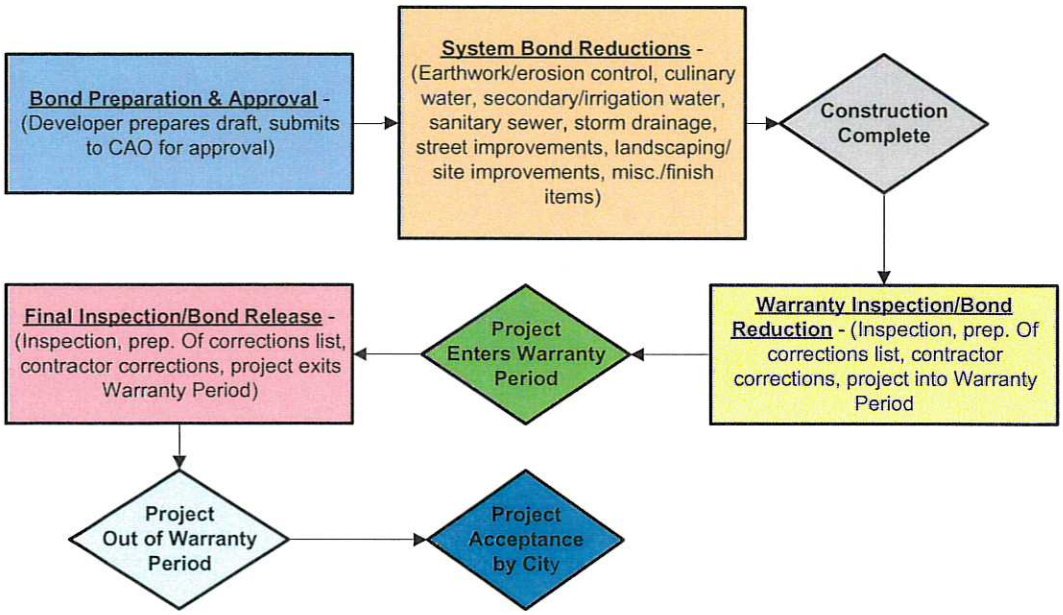
A. General – The purpose of this section is to address issues related to *the 'Public Improvement Bond'* and its various parts. There are four main parts to this process which include:

1. Bond preparation and approval *(8.3,8.4)**
2. System bond reductions *(8.5)**
3. Warranty inspection/bond reduction, *(8.6)** and
4. Final inspection/bond release *(8.7)**

**Note: Denotes subsection references.*

The *'Public Improvement Bond'* consists of processes as shown below:

Flowchart No. 8-01 Overall Public Improvement Bond Process



B. Municipal Code – As indicated above, bond preparation, establishment, reductions and releases are specified in various sections of the City Municipal Code. Developers, their contractors and staff are to be familiar with the various provisions of the Code and how they might apply to the various bonds described in *'Section 8.2 – Private Development Project Bonds – General'* (see Title 89-6-12).

C. Development Processing Manual (DPM) – The City has also adopted a *'Development Processing Manual'*, which is required to be followed in relation to this issue. Various sections of the DPM have been prepared to provide a step-by-step process for preparation, establishment, reductions and releases of various types of bonds. Please refer to this Manual for additional information.

D. Private Development Construction Inspection Manual (PDCIM) – The City has also adopted a *'Private Development Construction Inspection Manual'* which is required to be followed in relation to bond this issue. Various sections of the PDCIM have been prepared to provide a step-by-step process for preparation, establishment, reductions and releases of various types of bonds. In addition, the Manual contains appendices, which include inspection and certification checklists for the various systems to be released for the Public Improvement Bonds. Please refer to this Manual for additional information.

E. Acronyms and Definitions – The following acronyms and definitions apply to this section:

1. Acronyms
   a. CAO – City Attorney's Office
   b. CDD – Community Development Department
   c. DPM – Development Processing Manual
   d. ED – Engineering Department
   e. PDCIM – Private Development Construction Inspection Manual
   f. ODA – Office of Development Assistance
   g. PWD – Public Works Department
2. Definitions
   a. Bond estimate sheet – The spreadsheet used by the Private Development Projects Division of the Engineering Department to prepare cost estimates of the public infrastructure for which bonds will be prepared. Contact the City Engineer for the most current version of this document.
   b. Bond reduction – After the bond for the project has been established, the City will allow the bond to be reduced in its amount, as progress is made on constructing and inspecting those constructions. As the bond is reduced, this is called a bond reduction.
   c. Bond release – Once the *'system-by-system'* bond reductions have been performed, the project is complete, and the project has been through its *'Final Inspection'* and all correction items completed, then the project is ready for a complete release of all bond proceeds. This is called a *'bond release'*.
   d. Certification form – A City prepared form that is used by the Developer to certify the project has reached a certain stage in construction.
   e. Contractor – This is the general contractor for the project, or may be a subcontractor for a portion of the project. In either case, it is the entity that is responsible for the construction in question, and the entity to whom the Developer looks to address a particular construction issue.
   f. Corrections list – A list of items needing to be completed or corrected for a given construction project. Is also referred to as a *'punchlist'*.
   g. Days – Unless otherwise so stated in this section, days refers to *'calendar days'*.
   h. Developer – The entity responsible from the private development side of the project, for due diligence, planning, designing, constructing, and getting the project accepted.

i. Final inspection – That inspection that comes at the end of the Warranty Period, once all City requirements have been met.
j. Final inspection bond release – That inspection and bond release that comes at the end of the Warranty Period, once all City requirements have been met.
k. Finish items – A category within the *'Public Improvement Bond'* list of items. It signifies those items, which are required to be completed in order to fully, complete the construction of the project, such as valve covers, street signs, etc. These are more fully defined on the *'bond estimate sheet'*.
l. Inspection checklist – These are the checklists used for inspection of the *'system'* improvements and are contained in the PDCIM in Appendices C, D, and E.
m. Manual – As used in this section, this refers to the Development Processing Manual.
n. Public infrastructure – Culinary water, secondary water, storm drainage, irrigation, roadways, fencing, etc. infrastructure construction which is to be dedicated to the City. This infrastructure is to be constructed in accordance with all requirements necessary to make them public facilities.
o. Project – The *'project'* is defined as the construction shown on the *'Released for Construction Drawings'*, and is also defined as the project reviewed and approved by the Planning Commission.
p. Punchlist – Please see *'Corrections List'*.
q. Released for Construction Drawings – This is the set of drawings reviewed and approved by the Engineering Department as part of the project approvals which are then signed by the Engineering Project Review Engineer, the City Engineer and other affected City departments.
r. System – These are the 8 items listed under *'Section 8.1 General, D. Public Improvement Bond'* which lists the 8 items considered to be *'systems'*.
s. Warranty bond reduction – This is the bond reduction, which comes after all City requirements have been met, after the Warranty Inspection has taken place.
t. Warranty inspection – The inspection performed at the time of completion of the project, and which is just prior to going into the Warranty Period.
u. Warranty period – That period of time between the Warranty Inspection and Final Inspection, when the City agrees that all items on these corrections lists have been completed, and the project meets all City requirements. The Warranty Period for the *'Public Improvement Bond'* is 2-years, and will be different for the other bonds.

F. Developer's Role – The Developer has the primary and an integral role in the preparation, establishment, reduction and release of these bonds. These responsibilities include:

1. Bond Estimate Sheet(s) - The Developer and his/her engineer, is to submit to the Engineering Department a complete bond estimate sheet(s), on the forms provided by the Engineering Department. The Engineering Department will review and either return the bond estimate sheet(s) to the Developer and his/her engineer for additional work, or will approve the draft bond estimate sheet(s) for further processing. The Developer is responsible for submitting a reasonable listing of public improvements and *'non-public improvements in common* areas' and City staff will review this work. Developer delays in submitting a reasonable bond estimate sheet(s) will result in delays in completing the bond.
2. Bond Form Preparation - The Developer is to work with the City Attorney's Office in preparing the bond form(s). The Developer is responsible for this work, not City staff. The Developer and his/her bonding company must meet the City Attorney Office's

requirements prior to the bond being approved by the City Attorney's Office, and this approval being forwarded on to the Office of Development Assistance (ODA) and the Engineering Department. Developer delays in submitting the bond in the form required by the CAO, will result in delays in completing the bond(s).

3. Developer/Contractor Certification for Bond Reduction/Release - The Developer is responsible for understanding and being involved with the progress on construction of his/her project, prior to submitting a written bond reduction or release request. Manyu times, the Contractor indicates he is ready for a bond reduction or release, when this is not the case. As such, the City has prepared a *'certification form'* for the various *'systems'*, which the Developer and his contractor are to complete as part of the written reduction/release request. This form must be properly completed and submitted to the Engineering Department before the Engineering Department inspection staff will initiate an inspection of the *'system'*, for which a reduction/release is being requested. Once the *'certification form'* is completed and submitted, an inspection by Engineering staff will be promptly completed. If it is found during the inspection that the *'system'* is not ready for inspection, the Engineering inspector will return a written response to the Developer indicating the items that are not complete. Subsequent inspections after the first inspection will be billed to the Developer on an hourly rate basis.
4. Timely Completion of Corrections List (Punchlist) - Once an inspection has been conducted by the Engineering Inspector, and a Corrections List (Punchlist) has been completed, the Developer and his Contractor are responsible for making the required corrections and notifying the Engineering Inspector that the corrections have been made within 30-calendar days, or the Corrections List becomes null and void and a new Corrections List will be required to be prepared. Again, additional inspection work required of the Engineering Inspector will be charged to the Developer for this additional work.

G. City's Role – The City also has an integral role in the review of the preparation, establishment, reduction and release of these bonds. These responsibilities include:

1. Bond Estimate Sheet – City staff are responsible for a timely and complete review of the bond estimate sheet, once it is provided to the Engineering Department by the Developer. The Engineering Department will review and either return the bond estimate sheet to the Developer and his/her engineer for additional work, or will approve the draft bond estimate sheet for further processing.
2. Bond Form Preparation - The City Attorney's Office (CAO) is responsible for the review and approval of the bond agreement form. Once the CAO has completed its review, an approval of the bond will be forwarded to the ODA and ED for their information.
3. Developer/Contractor Certification for Bond Reduction/Release – City staff will review the *'certification form'* and perform an inspection on the *'system'* and will provide the Developer and Contractor a written response regarding their request within 7-days.
4. Timely Completion of Corrections List - Once the Developer has submitted a written indication that the Corrections List is complete, the Engineering Inspector will inspect the project again in relation to the Corrections List. The Engineering Inspector will provide a written response within 7-days as to whether the corrections list was completed, or whether items were not completed.

H. Payment for Extra Inspections – City inspection fee estimates include only one inspection for each type of inspection. The assumption is that the Developer and Contractor have

performed their own inspection based upon the City's inspection forms, that everything is complete, and that it is ready for City inspection. It is not the City's role to provide *'quality control/quality assurance'* for the developer's project, which we feel can be done in one inspection by City staff. Should the inspection require more than one inspection for a *'system'* bond reduction/release, the Developer will be charged on an hourly rate basis for the City's additional work effort.

I. Bond Estimate Unit Prices – The City Engineer is responsible for revising the City's bond estimate unit prices on at least a yearly basis (January or every year). The City Engineer may revise the bond estimate unit prices on a more frequent basis in cases where it is deemed necessary.

8.2 PRIVATE DEVELOPMENT PROJECT BONDS - GENERAL

A. There are also, several other different types of bonds used in the construction of private development projects. These bonds are generally described in this section so the Developer understands what each of these bonds are, what they are used for, who administers them, and where to find additional information concerning them. These bonds are:

1. Land disturbance activities and improvements bond
2. Revegetation bond
3. Restoration bond
4. Public improvement bond – landscaping & street lighting
5. Public improvement bond - infrastructure
6. Non-public improvement bond

B. Land Disturbance Activities and Improvements Bond, Revegetation Bond, and Restoration Bond – The Land Disturbance Activities and Improvements Bond, Revegetation Bond, and the Restoration Bond for the City of West Jordan are administered through *'Title 81, Chapter 4 – Bonds'*. Initiation, processing, reductions and releases of these bonds will be administered through this ordinance. The Developer is to be familiar with its particulars as the City will follow the provisions of the ordinance in administering these bonds.

The Engineering Department is responsible for establishing and releasing these three bonds related to land disturbance, grading, erosion control, revegetation, and restoration of areas disturbed as part of private development projects.

C. Public Improvement Bond – Landscaping & Street Lighting – This type of bond is required as its warranty period is different from the typical *'Public Improvement Bond - Infrastructure'* and it allows the *Public Improvement Bond – Infrastructure'* bond to be released more quickly As such, a separate, specific bond agreement is required to address issues specifically related to landscaping and street lighting.

D. Public Improvement Bond - Infrastructure – This type of bond addresses the public improvements required as part of the *'Released for Construction* Drawings', and only those public improvements shown on these drawings.

Public Improvement Bonds for the City of West Jordan are administered through *'Title 89, Chapter 6, Part 12 – Public Improvement Bonds'*. Initiation, processing, reductions and

releases of these bonds will be administered through this ordinance. The Developer is to be familiar with its particulars as the City will follow the provisions of the ordinance in administering these bonds.

The Engineering Department is responsible for establishing and releasing the Public Improvement Bond - Infrastructure related to public infrastructure improvements. This includes all of the items listed below, which are associated with public improvements.

1. Earthwork/erosion control
2. Culinary water
3. Secondary/irrigation water
4. Sanitary sewer
5. Storm drainage
6. Street improvements
7. Miscellaneous/finish items

Additional categories may be added if approved by the City Engineer. Reduction requests may be made only once every 30-days and no reduction is to be authorized until such time as the Engineering inspector has inspected the improvements and found them to be in compliance with the City's standards and specifications. Reductions are to be made only as they apply to the completion, satisfactory to the City Engineer, of entire systems.

The Warranty and Final bond reduction/release will be processed once all facilities have been completed, inspected and found to be acceptable by the City Engineer. The City will retain 10-percent of the bond amount plus the estimated cost of a one-inch thick asphalt concrete overlay for the roadways until Final Acceptance by the City Manager following the Warranty Period.

E. Non-public Improvement Bond – This bond is applied to projects where on-site, non-public, landscaping, or common area improvements is required as part of the Municipal Code or is conditioned by the Planning Commission. The Developer is to work with the Engineering Department, Community Development Department, and the City Attorney's Office in determining the amount of the bond. The Engineering Department is responsible for the administration of this bond with cooperation from the Community Development Department, which includes bond preparation, establishment, reductions and releases.

F. Planning Commission and Other Project Conditions – During the project review and approval process, a project may be conditioned to provide specified items as part of the project approval which do not fit into the bond categories indicated above. For instance, the Planning Commission may condition a project to construct a wall or landscaping which are on private property, which is not a common non-public improvement, and is not part of the already prepared *'Released for Construction Drawings'* set of drawings. In this situation, the Community Development Department may withhold the issuing of the *'Certificate of Occupancy'* for the project to ensure the completion of these conditions, or such improvements.

8.3 'RELEASED FOR CONSTRUCTION DRAWINGS'

A. General – These documents are mentioned in this section to indicate that it is from these documents that the bond estimate sheet and bond are to be prepared. Once these drawings are stamped and signed, then a final *'bond estimate sheet'* can be prepared.

B. Preparation and Finalizing – These drawings are initiated as part of a *'site plan'* project or the *'preliminary plat'* phase of a *'subdivision'* and are finalized as part of the *'final'* approval portions of these projects. The Developer and his/her engineer may submit draft *'bond estimate sheets'* from these preliminary reviews/approvals, however, only the finalized, stamped and signed version of these documents may be used to prepare the final *'bond estimate sheet'*, and subsequent final bond.

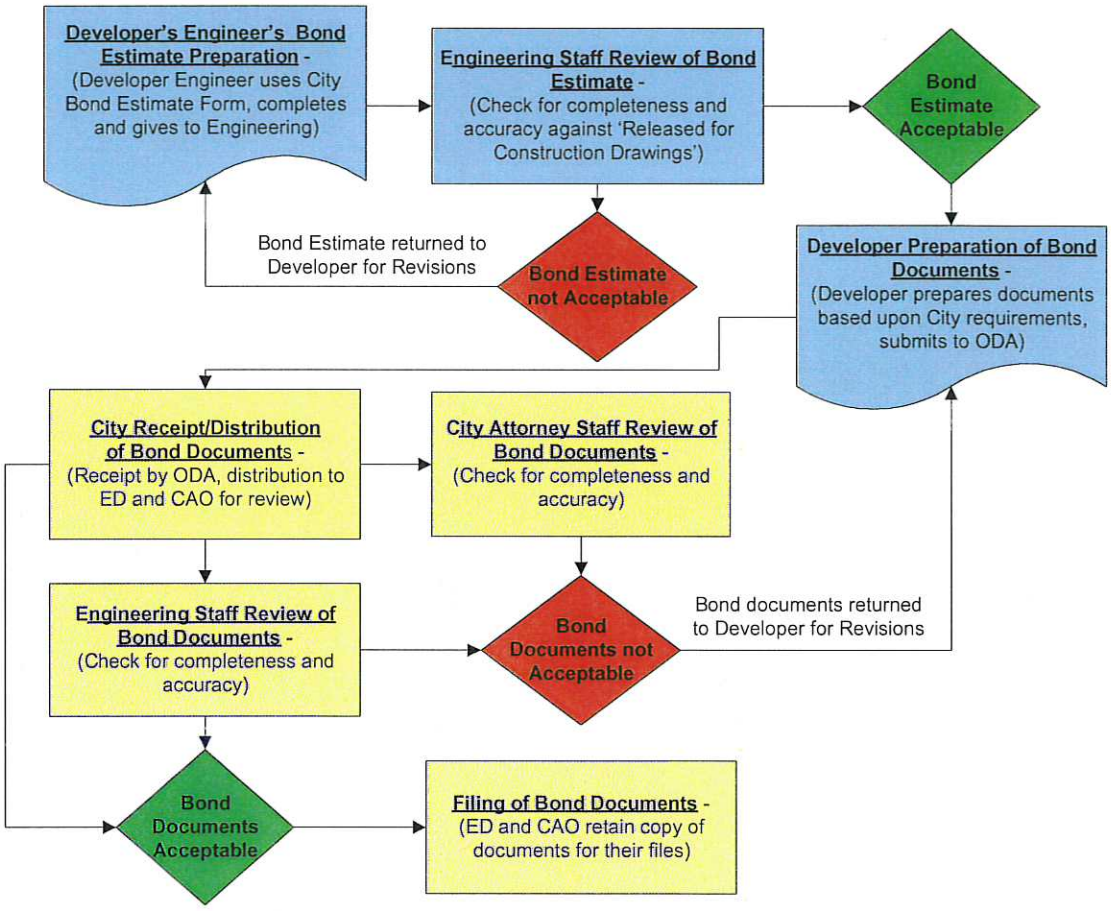
   In the case where items are changed during construction, the Developer and his/her engineer/contractor are to submit proposed revised changes, which the City Engineer will then review, approve or deny, and make part of the *'Released for Construction Drawings'*. If the changes are significant enough, the *'bond estimate sheet'* must also be revised, and a new Public Improvement Bond prepared for these revisions.

C. City *'Released for Construction Drawings'* - *'Released for Construction Drawings'* are a specific set of documents which are signed by the City Engineer and other affected City departments and agencies, which define the specific *'public improvements'* which are to be constructed as part of the project. These drawings are the originating documents used for the preparation of the bond estimate sheet and subsequent bond.

8.4 BOND DOCUMENTS PREPARATION AND APPROVAL

A. General – The Developer has primary responsibility for bond document preparation and submission to the City, and the City is responsible for review of these documents to ensure they meet City requirements. Corrections of these documents are the Developer's responsibility as is coordination with his/her staff and/or consultants used in the preparation of these documents. In general, the process is graphically described as follows:

Flowchart 8-02 – Bond Documents Preparation and Approval Process



B. Developer Engineer's Bond Estimate Preparation – The first step in the preparation of the bond documents, is the Developer's preparation of a draft *'bond estimate sheet'*. This is accomplished by obtaining a blank *'bond estimate sheet'* from the City Engineer, and using the finalized *'Released for Construction Drawings'* for the project to prepare a draft *'bond estimate sheet'* for the project. This document is to be stamped and signed by the Developer's engineer and submitted to the City Engineer for his/her review and approval.

C. City Staff Review of Bond Estimate – Once the *'bond estimate sheet'* has been prepared by the Developer's engineer and submitted to the City Engineer, he/she will review the estimate for completeness, comparing it against the *'Released for Construction Drawings'* and will provide a written response to the Developer and his/her engineer. The Developer is responsible for ensuring the necessary corrections are made and the document returned to the City Engineer for approval.

D. Developer Preparation of Bond Documents – Once the *'bond estimate sheet'* is approved by the City Engineer, he will provide a written response of such to the Developer and his/her

engineer with copies to the CAO and ODA. The Developer is to work with the CAO in ensuring all CAO requirements are met.

E. Developer Submission of Bond – The Developer and his/her bonding company are to contact the CAO, ensure they understand the CAO's requirements, and then work toward addressing the CAO's requirements. Once the Developer feels the documents meet the CAO's requirements, submit these documents to the CAO for review. If the documents are acceptable, the CAO will notify the Developer of such in writing.

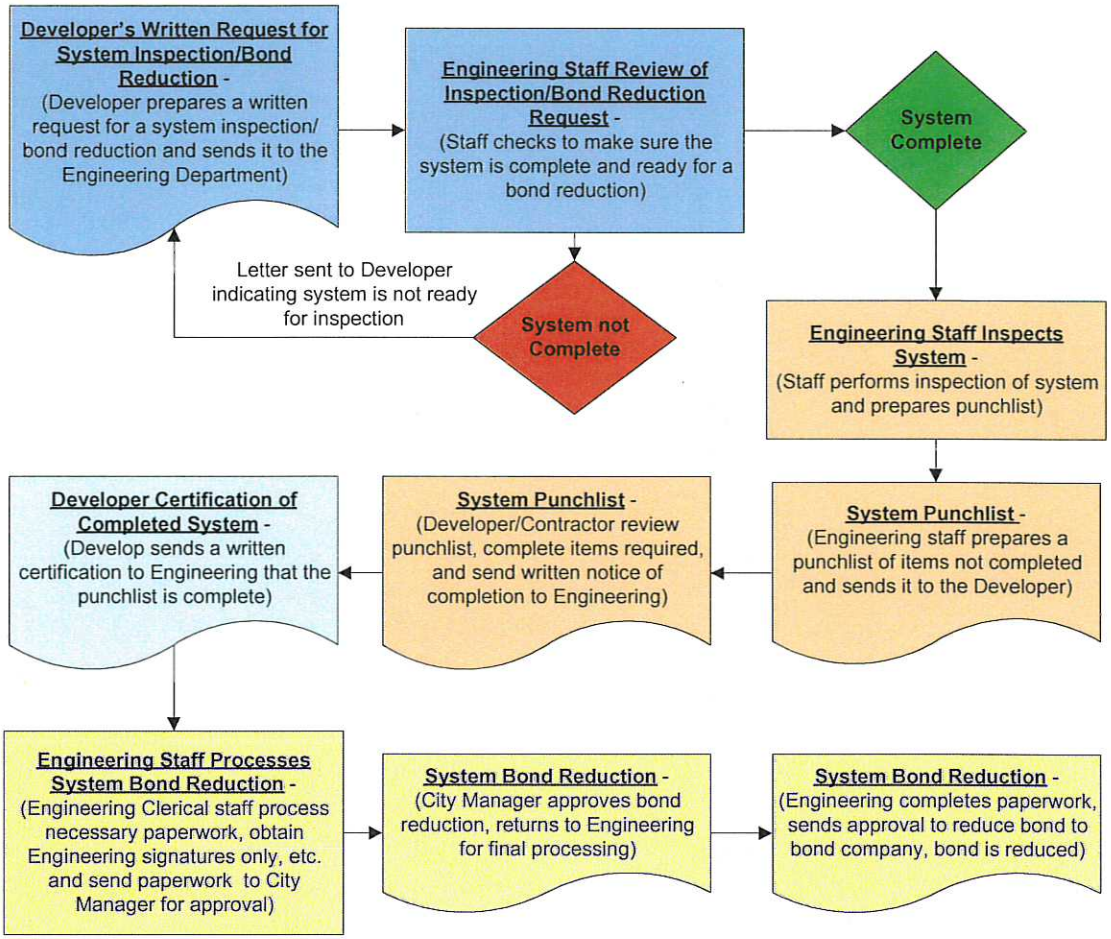
   If the documents are not acceptable, the CAO will also respond in writing to the Developer indicating what still needs to be provided and the ODA will be copied.

F. City Attorney Approval of Bond - Once the CAO is satisfied, it will stamp the documents as approved and send a written response to the Developer of their approval. Once all CAO requirements have been met, final documents will need to be submitted to the CAO and ODA for finalizing and filing with a copy to the ED.

8.5 SYSTEM BOND REDUCTIONS

A. General – The overall philosophy in requiring bond reductions on a *'system-by-system'* basis is ensure the quality of the end product and speed up the acceptance process. By doing this, the City can better ensure that each system, is complete and ready to be put into service, that fewer major fixes will be required at the end of the project, and that by requiring each *'system'* to be complete, that the Warranty Inspection and Final Inspections will be quicker and easier to accomplish, thereby saving. In general, the process is graphically described as follows:

Flowchart 8-03 – System Bond Reduction Process



B. Developer Written Request for System Inspection/Bond Reduction

1. General – The Developer is to provide the Engineering Department with a written request for a bond reduction/release and a certification that the *'system'* work is ready for inspection and reduction/release. A City form has been prepared for this purpose.

   The written request and certification sets the basis for the City inspecting the work, and ensures the Developer/his/her contractor understand what work must be completed and to what level this work must be completed in order to receive a bond reduction/release. It also ensures the City has *'systems'* which are ready to inspect, and results in a quicker reduction in bond proceeds.

   In the past, the City has reduced bond amounts based upon overall general completion of the project resulting a lot of work being delayed until the end of the project, and in not having completed *'systems'* until the very end of the project. This results in a number of

difficulties in reducing or releasing bonds and completing items necessary to complete the Corrections List.

2. Developer written request – The Developer and his/her contractor are required to submit a written request for bond reduction/release along with a *'certification form'* for each *'system'* the Developer wishes to have a bond reduced/released. These forms are including in Appendix AA of the Development Processing Manual. The Developer and Contractor are to review the form and all of its provisions, sign and date the form certifying the *'system'* is ready for a bond reduction.
3. City staff review of request – City inspection staff will review the written request and certification and respond in writing to the Developer if the project is not ready for an inspection. If the request and certification are in order, the Engineering Inspector will complete the inspection.
4. City action – Once a completed *'certification form'* is received by the Engineering Department; the Engineering Inspector will schedule the project for an inspection.

C. City Staff Review of System Inspection/Bond Reduction Request

1. General – Once the Engineering Department has received a written request for a *'system'* bond reduction, Engineering inspection staff will review the request and project to ensure the project/system, is worthy of an inspection. If it is, an inspection will be performed. If it is not, the Developer and Contractor will be notified they have not sufficiently completed the project/system to allow an inspection to be completed.

D. System Inspection and Punchlist Preparation

1. General – Once it is determined the project/system is complete enough to inspect, an inspection will be performed, a punchlist prepared, and the punchlist will be sent to the Developer and Contractor.
2. Inspection checklists – City staff will be using the checklists contained in Appendices C, D, and E of the *'Private Development Construction Inspection Manual'* for inspection of the project. The Developer is required to have gone through these same checklists, and ensured each of the items is complete, prior to requesting a system release for that particular system.
3. Inspection of project – The Engineering inspection staff will use the *'system'* inspection checklist required, and will use it to inspect the *'system'* being requested to be released. If it appears the Developer and Contractor have not reviewed the checklist because there are so many items not completed, the Developer and Contractor will be notified of such. If the *'system'* is worthy of an inspection, then the inspection will be performed and a punchlist prepared.
4. Preparation and transmission of punchlist – Typically the Engineering Inspector and the Engineering Inspection Supervisor will be involved in the inspection. The inspection will be performed; a punchlist of uncompleted items prepared, and each person will sign the inspection form.

E. Developer Punchlist Corrections

1. General – The Developer/Contractor are required to complete all of the items indicated on the system/project punchlist and then notify the Engineering Department in writing through the use of the proper certification form, that the work is complete.

2. Developer completion of punchlist items – Once the punchlist has been prepared and sent to the Developer and Contractor, they are required to complete the items indicated on the punchlist. If there are questions regarding any items on the punchlist, please contact the Engineering Inspector for additional information. The punchlist has a life of 30 calendar days. If items listed on the punchlist are not completed within the 30-day time period, the system/project will need to be reinspected and a new punchlist prepared, which will also have a life of 30-days. One inspection is included in the *'inspection fee'* and therefore, any inspections beyond the first inspection, must be paid for by the Developer in addition to the original inspection fee.
3. Developer Certificate of Completion – Once the Developer/Contractor have completed the City's inspection punchlist, the Developer is to certify the completion by the use of the forms contained in Appendix AA of the DPM. These forms are to be signed and dated, and then forward to the Engineering Department for processing.

F. Bond Reduction Processing

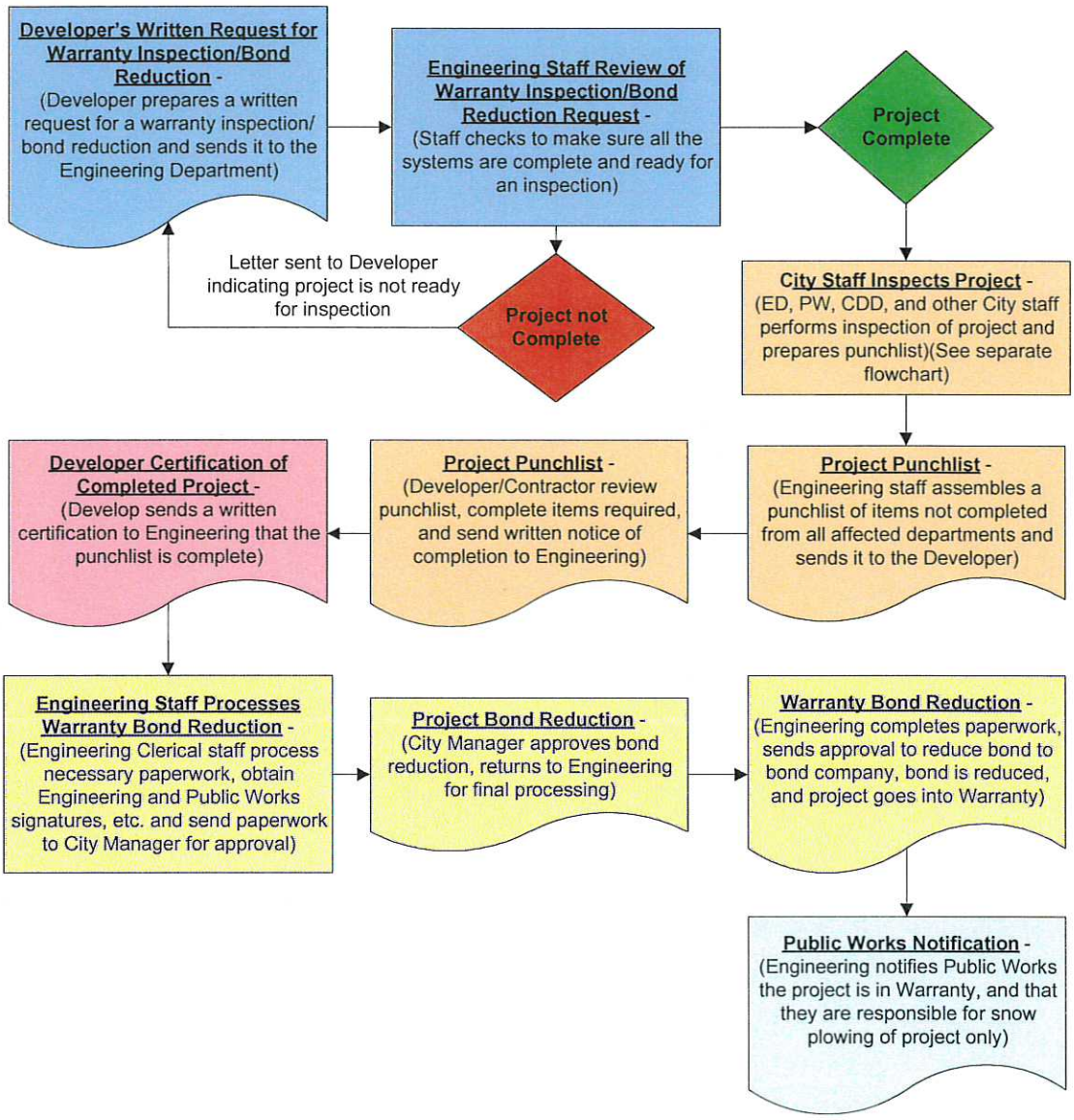
1. Certification of completion for system/project – Once the Engineering Department has received the Developer's/Contractor's certification that the punchlist has been completed, the Engineering inspection staff will reinspect the project and certify all items have been completed. If all items are complete, the Engineering Inspection Supervisor will forward his approval to the Engineering clerical staff for bond reduction processing.
2. Engineering clerical staff preparation of paperwork – With the receipt of certification from the Engineering inspection staff that the system/project is ready; the Engineering clerical staff will initiate the processing of the paperwork necessary to reduce the bond. This will require that the Engineering Inspector, Engineering Inspection Supervisor, and the City Engineer sign the form so the reduction can be processed.
3. Approvals by Engineering staff only – Bond reductions will require only the signatures of the Engineering Inspector, Engineering Inspection Supervisor, and the City Engineer for processing. Once the project reaches the Warranty Inspection, and Final Inspection stage, then other departments will be involved to ensure their concerns are also addressed. This is done in order to reduce the amount of time required to finalize a bond reduction.
4. Approval by City Manager – Once all items have been completed on the *'system'* bond reduction process applications and forms and have been reviewed by the City Engineer, and then the *'system'* bond reduction process documents are ready to be submitted to the City Manager for approval. If the documents are signed and approved by the City Manager, the Administrative Assistant will then copy the documents and distribute them to the Developer.

8.6 WARRANTY INSPECTION/BOND REDUCTION

A. General – The overall philosophy in requiring a Warranty Inspection is to set the time at which the Developer/Contractor and City agree the project is complete, and the Warranty Period can begin. It assumes that an inspection of the entire project will be performed, a punchlist prepared and given to the Developer/Contractor, and that the punchlist is completed. Once it is agreed that the punchlist is completed, then the Warranty Period can begin. In addition to the descriptions contained in this Manual, also please refer to the PDCIM, *'Section 5.0 – Warranty Inspection/Acceptance Requirements'* for additional details regarding this process.

As is described in the Ordinance, bond proceeds will be reduced on a *'system-by-system'* basis, and at the most, once monthly. Once all items under a given *'system'* description have been constructed, inspected and deemed completed by the Engineering Inspector, a written request from the Developer will initiate the processing of the necessary bond reduction. This will result in a 75-percent total reduction in the bond amount for each system prior to the beginning of the Warranty Period, minus the *'Finish Items'* portion of the bond. Once the Warranty Inspection has been completed, all Corrections List items completed and verified by the Engineering Inspector, the remaining *'systems'* amounts plus the 90-percent of the *'Miscellaneous Items'* portion of the bond will be released at this time. At the end of the Warranty Period, the remaining 10-percent of the *'Public Improvement Bond - Infrastructure'* will be released. The *'Public Improvement Bond – Landscaping & Street Lighting'* which has a longer warranty period will not be released until its requirements have been met. In general, the process is graphically described as follows:

Flowchart 8-04 Warranty Inspection/Bond Reduction Process



B. Developer Application for Warranty Inspection

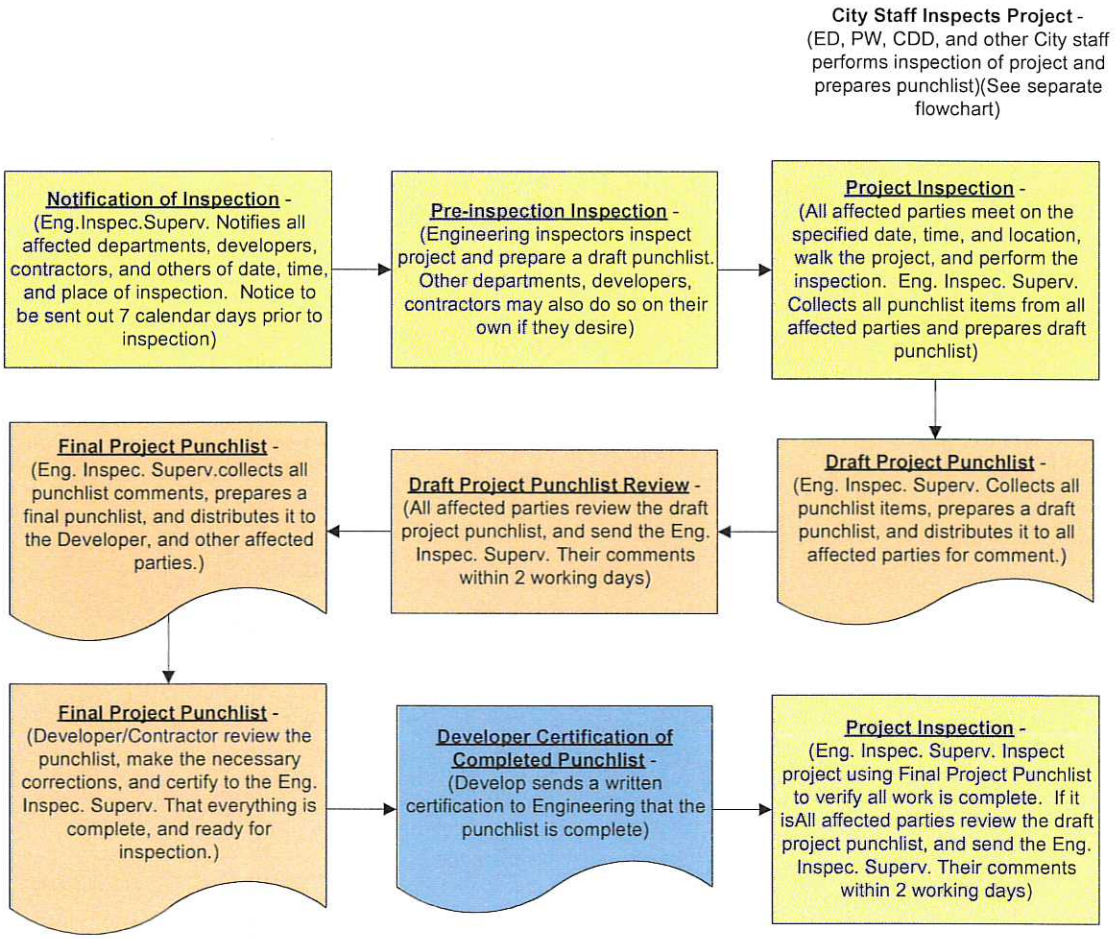
1. General – The Developer needs to provide the Engineering Department with a written request for a Warranty Inspection and a certification that the *'project'* work is ready for inspection and reduction/release. The written request and certification sets the basis for the City inspecting the work, and ensures the Developer/his/her contractor understands what work is to be completed and to what level this work needs to be completed in order to receive a Warranty Inspection. It also ensures the City has a project which is ready to inspect, and results in a quicker inspection, putting the project into the Warranty period, and reduction in bond proceeds.

2. Developer written request – The Developer and his/her contractor are to submit a written request for Warranty Inspection along with a *'certification form'* for each the *'project'*. These forms are included in Appendix F of the Private Development Construction Inspection Manual. The Developer and Contractor are to review the form and all of its provisions, sign and date the form certifying the *'project'* is ready for a Warranty Inspection.
3. City staff review of request – City inspection staff will review the written request and certification and respond in writing to the Developer if the project is not ready for a Warranty Inspection. If the request and certification are in order, the Engineering Inspector will schedule a time for inspection of the project.
4. City action – Once a completed *'certification form'* is received by the Engineering Department; the Engineering Inspector will schedule the project for an inspection.

C. Project Inspection and Punchlist Preparation

1. General – Once it is determined the project/system is complete enough to inspect, an inspection will be performed, a punchlist prepared, and the punchlist will be sent to the Developer and Contractor. In general, the process is graphically described as follows:

Flowchart 8-05 Warranty and Final Inspection/Punchlist Preparation



2. Inspection checklists – Inspection checklists – City staff will be using the checklists contained in Appendices C, D, and E of the Private Development Construction Inspection Manual for inspection of the project. The Developer is to have gone through these same checklists, and ensured each of the items is complete, prior to requesting a system release for that particular system.
3. Inspection of project – The Engineering inspection staff will use the *'system'* inspection checklist required, and will use it to inspect the *'system'* being requested to be released. If it appears the Developer and Contractor have not reviewed the checklist because there are so many items not completed, the Developer and Contractor will be notified of such. If the *'system'* is worthy of an inspection, then the inspection will be performed and a punchlist prepared.
4. Preparation and transmission of punchlist – Typically the Engineering Inspector and the Engineering Inspection Supervisor will be involved in the inspection. The inspection will be performed; a punchlist of uncompleted items prepared, and each person will sign the inspection form.

D. Developer Punchlist Corrections

1. General – The Developer/Contractor is to complete all of the items indicated on the project punchlist and then notify the Engineering Department in writing through the use of the proper certification form, that the work is complete.
2. Developer completion of punchlist items – Once the punchlist has been prepared and sent to the Developer and Contractor, they are to complete the items indicated on the punchlist. If there are questions regarding any items on the punchlist, please contact the Engineering Inspector for additional information. The punchlist has a life of 30-calendar days. If items listed on the punchlist are not completed within the 30-day time period, the project will need to be reinspected and a new punchlist completed, which will also have a life of 30-days. One inspection is included in the *'inspection fee'* and therefore, any inspections beyond the first inspection, must be paid for by the Developer in addition to the original inspection fee.
3. Developer Certificate of Completion – Once the Developer/Contractor have completed the City's inspection punchlist, the Developer is to certify the completion by the use of the forms contained in Appendix AA of the DPM. These forms must be signed and dated, and then forward to the Engineering Department for processing.

E. Warranty Bond Reductions Processing

1. Certification of completion for project – Once the Engineering Department has received the Developer's/Contractor's certification that the punchlist has been completed, the Engineering inspection staff will reinspect the project and certify all items have been completed. If all items are complete, the Engineering Inspection Supervisor will forward his approval to the Engineering clerical staff for Warranty inspection/bond reduction processing.
2. Engineering clerical staff preparation of paperwork – With the receipt of certification from the Engineering inspection staff that the project is ready, the Engineering clerical staff will initiate the processing of the paperwork necessary to put the project into the Warranty Period, and reduce the bond. This will require that the Engineering Inspector, Engineering Inspection Supervisor, the City Engineer, and Public Works Department Director sign the form so the reduction can be processed.
3. Approvals by Engineering and Public Works departments staff – Bond reductions will require only the signatures of the Engineering Inspector, Engineering Inspection Supervisor, the City Engineer, and the Public Works Department for processing. Community Development Department concerns have already been addressed by either a separate bond, which they will administer, or through inclusion of their issues in the Public Improvement Bond, which will be inspected and processed by the Engineering Department. This is done in order to reduce the amount of time required to finalize a bond reduction.
4. Approval by City Manager – Once all items have been completed on the 'warranty' bond reduction process applications and forms and have been reviewed by the City Engineer, and then the 'warranty' bond reduction process documents are ready to be submitted to the City Manager for approval. If the documents are signed and approved by the City Manager, the Administrative Assistant will then copy the documents and distribute them to the Developer.

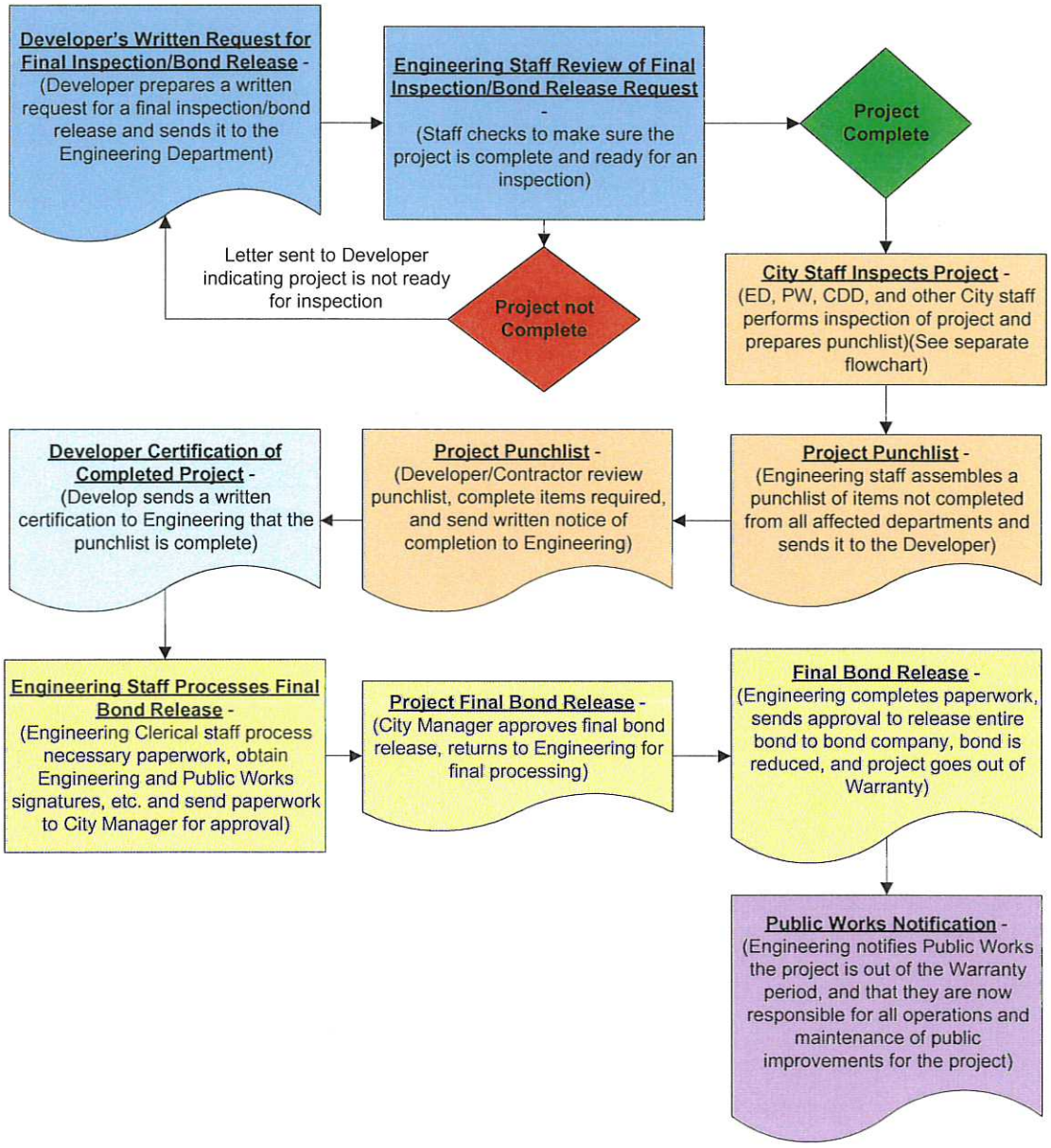
F. Public Works Department Notification

1. Engineering staff notifies Public Works they are responsible for now snow plowing for the project – Once the Warranty Inspection/bond reduction has been fully processed and approved by the City Manager, the City Engineer will notify the Public Works Department of such and inform them they are responsible for snow plowing operations of the project only. All other maintenance activities are still the responsibility of the Developer until the Warranty Period is complete, and the project accepted by the City.

8.7 FINAL INSPECTION/BOND RELEASE

A. General – The overall philosophy in requiring a Final Inspection is to set the time at which the Developer/Contractor and City agree the project is complete, and the Warranty Period is complete, and the City is responsible for taking over the complete operations and maintenance of the public infrastructure. It assumes that an inspection of the entire project at the end of the Warranty Period will be performed, a punchlist prepared and given to the Developer/Contractor, and that the punchlist is completed. Once it is agreed that the punchlist is completed, then the Warranty Period is complete and the City assumes operation and maintenance activities. In general, the process is graphically described as follows:

Flowchart 8-06 Final Inspection Bond Release Process



B. Developer Application for Final Inspection

1. General – The Developer is to provide the Engineering Department with a written request for a Final Inspection and a certification that the *'project'* work is ready for inspection and release.

   The written request and certification sets the basis for the City inspecting the work, and ensures the Developer/his/her contractor understand what work must be completed and to

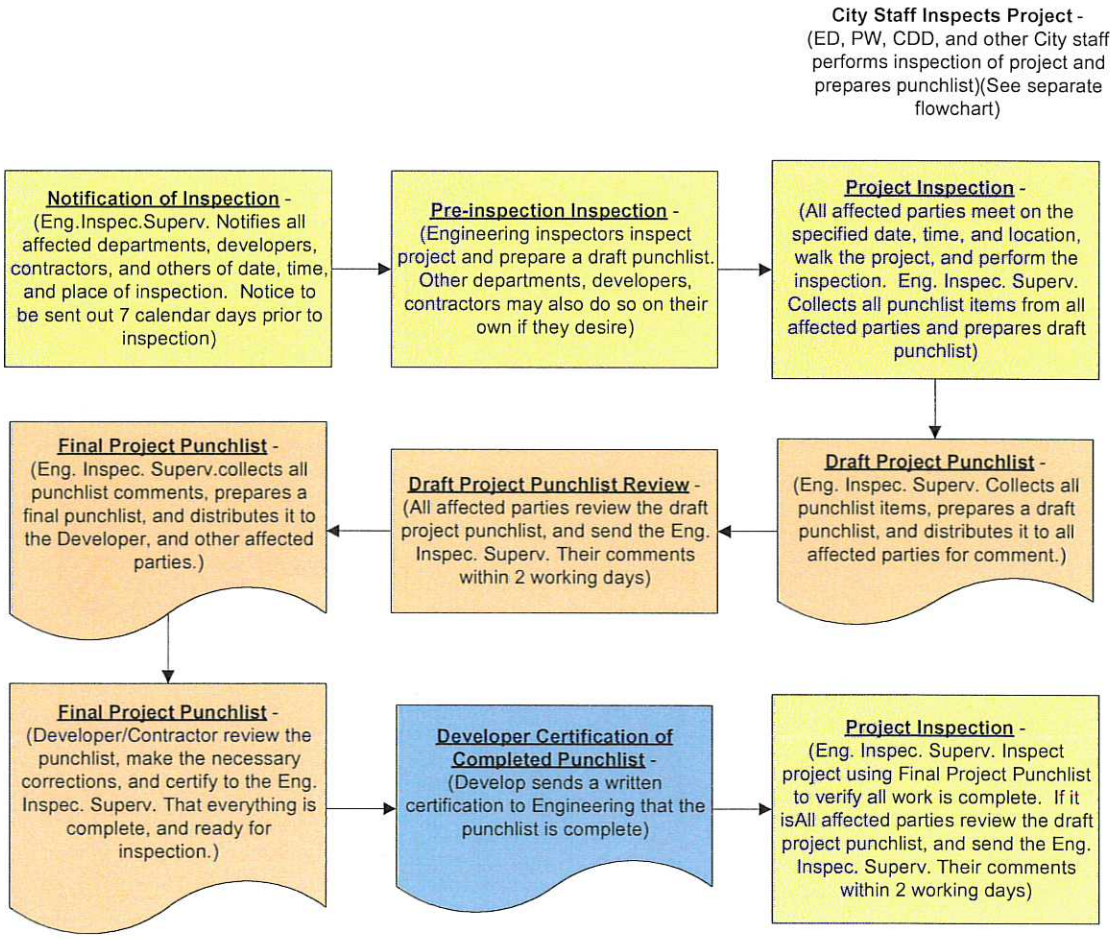
what level this work must be completed in order to receive a Final Inspection. It also ensures the City has a project which is ready to inspect, and results in a quicker inspection, taking the project out of the Warranty period, and release of the bond.

2. Developer written request – The Developer and his/her contractor are required to submit a written request for Final Inspection along with a *'certification form'* for each the *'project'*. These forms are included in Appendix F of the Private Development Construction Inspection Manual. The Developer and Contractor are to review the form and all of its provisions, sign and date the form certifying the *'project'* is ready for a Final Inspection.
3. City staff review of request – City inspection staff will review the written request and certification and respond in writing to the Developer if the project is not ready for a Final Inspection. If the request and certification are in order, the Engineering Inspector will schedule a time for inspection of the project.
4. City action – Once a completed *'certification form'* is received by the Engineering Department; the Engineering Inspector will schedule the project for an inspection.

C. Project Inspection and Punchlist Preparation

1. General – Once it is determined the project is complete enough to inspect, an inspection will be performed, a punchlist prepared, and the punchlist will be sent to the Developer and Contractor. In general, the process is graphically described as follows:

Flowchart 8-05 Warranty and Final Inspection/Punchlist Preparation



2. Inspection checklists – Inspection checklists – City staff will be using the checklists contained in Appendices C, D, and E of the *'Private Development Construction Inspection Manual'* for inspection of the project. The Developer is required to have gone through these same checklists, and ensured each of the items is complete, prior to requesting a system release for that particular system.
3. Inspection of project – The Engineering inspection staff will use the *'system'* inspection checklist required, and will use it to inspect the *'system'* being requested to be released. If it appears the Developer and Contractor have not reviewed the checklist because there are so many items not completed, the Developer and Contractor will be notified of such. If the *'system'* is worthy of an inspection, then the inspection will be performed and a punchlist prepared.
4. Preparation and transmission of punchlist – Typically the Engineering Inspector and the Engineering Inspection Supervisor will be involved in the inspection. The inspection will be performed; a punchlist of uncompleted items prepared, and each person will sign the inspection form.

D. Developer Punchlist Corrections

1. General – The Developer/Contractor are required to complete all of the items indicated on the project punchlist and then notify the Engineering Department in writing through the use of the proper certification form, that the work is complete.
2. Developer completion of punchlist items – Once the punchlist has been prepared and sent to the Developer and Contractor, they are required to complete the items indicated on the punchlist. If there are questions regarding any items on the punchlist, please contact the Engineering Inspector for additional information. The punchlist has a life of 30-calendar days. If items listed on the punchlist are not completed within the 30-day time period, the project will need to be reinspected and a new punchlist completed, which will also have a life of 30-days. One inspection is included in the *'inspection fee'* and therefore, any inspections beyond the first inspection, must be paid for by the Developer in addition to the original inspection fee. This will be done on an hourly rate basis of those involved in the inspection, or preparation of paperwork, in any way.
3. Developer Certificate of Completion – Once the Developer/Contractor have completed the City's inspection punchlist, the Developer must certify the completion by the use of the forms contained in Appendix AA of the DPM. These forms must be properly signed and dated, and then forward to the Engineering Department for processing.

E. Final Bond Release Processing

1. Certification of completion for project – Once the Engineering Department has received the Developer's/Contractor's certification that the punchlist has been completed, the Engineering inspection staff will reinspect the project and certify all items have been completed. If all items are complete, the Engineering Inspection Supervisor will forward his approval to the Engineering clerical staff for Final inspection/bond release processing.
2. Engineering clerical staff preparation of paperwork – With the receipt of certification from the Engineering inspection staff that the project is ready, the Engineering clerical staff will initiate the processing of the paperwork necessary to take the project out of the Warranty Period, and release the bond. This will require that the Engineering Inspector, Engineering Inspection Supervisor, the City Engineer, and Public Works Department Director sign the form so the reduction can be processed.
3. Approvals by Engineering and Public Works departments staff – Bond releases will require only the signatures of the Engineering Inspector, Engineering Inspection Supervisor, the City Engineer, and the Public Works Department for processing. Community Development Department concerns have already been addressed by either a separate bond, which they will administer, or through inclusion of their issues in the Public Improvement Bond, which will be inspected and processed by the Engineering Department. This is done in order to reduce the amount of time required to finalize a bond reduction.
4. Approval by City Manager – Once all items have been completed on the 'final' bond reduction process applications and forms and have been reviewed by the City Engineer, and then the 'final' bond reduction process documents are ready to be submitted to the City Manager for approval. If the documents are signed and approved by the City Manager, the Administrative Assistant will then copy the documents and distribute them to the Developer, the developer's bonding company, and others as noted on the documents.

F. Public Works Department Notification

1. Engineering staff notifies Public Works they are responsible for all operations and maintenance for the project – Once the Final Inspection/bond release have been fully processed and approved by the City Manager, the City Engineer will notify the Public Works Department of such and inform them they are responsible for all operations and maintenance of the project.

   A more complete description of the transition to the Public Works Department is described in the PDCIM, *'Section 6.10 – Public Works Department Assumption of Maintenance Responsibilities'*.

8.8 ACCEPTANCE BY CITY

A. General – The *'project'* will not be accepted by the City until all of the City's requirements have been met. Acceptance requirements are fully described in *'Section 6.0 – Final Inspection, Acceptance Requirements'* of the PDCIM.

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SECTION 9.0

ABANDONMENT

9.1 GENERAL

The developer's engineer shall indicate all existing roadways, and underground infrastructure and utilities, which are to be abandoned, on the project drawings. In general, abandoned lines, which are in service, will be replaced with a parallel line of equal or larger size, and the engineer shall demonstrate in any case that the abandonment does not adversely affect the operation of the system.

All abandonment of property and abandonment and construction of underground pipelines shall be discussed with the Engineering Department and approved prior to any such work.

9.2 WATER LINES

Water lines to be abandoned shall be abandoned by capping the line at both ends and entirely filled by pumping grout/concrete into them. The pump mix shall be a mixture sufficiently workable for the purpose intended and shall be a concrete mix of 200 psi minimum and 500 psi maximum. The engineer shall show on the drawings that portion of the pipeline(s) to be abandoned and the approximate number of cubic yards of concrete/grout to fill the line.

9.3 STRUCTURES

Structures associated with lines to be abandoned shall be removed by the contractor/developer and given to the City if salvageable.

9.4 EASEMENTS OR RIGHT-OF-WAY

All easement and right-of-way abandonments shall be provided for as part of the development processing, not during construction. If it is determined that easements or property must be abandoned during construction, the project will be put on hold until the property issues are resolved to the satisfaction of the City and the Salt Lake County Recorder's office.

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