

DIVISION 00

DESIGN STANDARDS

SECTION 00500
DESIGN STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Codes and Standards
- B. Design Standards
- C. Construction Drawing Requirements

1.02 RELATED SECTIONS

- A. Section 00620 - Documentation

1.03 SUBMITTALS

- A. Construction Drawings
 - 1. One copy of Construction Drawings shall be submitted to the City Engineer for preliminary review.
 - 2. Two copies of Construction Drawings shall be submitted to the City Engineer for final approval.
 - 3. Five full size copies of Construction Drawings shall be submitted to the City Engineer before start of construction. These drawings shall be stamped by the City Engineer and distributed as required.
- B. Easements and Land Acquisition
 - 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. One signed copy of all necessary Easement forms shall be submitted to the City Engineer for final approval and recordation.
 - 4. 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.
 - 5. All necessary permits and easements must be submitted prior to final approval being granted by the City.
- C. All Commercial Developments must be submitted to the pretreatment coordinator at Timpanogas Special Service District for approval.

1.04 CITY ENGINEER'S AUTHORITY

- A. The City Engineer shall review submitted Construction Drawings for compliance to these Design Standards and Construction Specifications.
- B. The City Engineer shall note any changes to Construction Drawings, required to bring Construction Drawings into compliance with these Design Standards and Construction Specifications.
- C. Required changes shall be made to Construction Drawings and returned to the City Engineer for final approval.

- D. The City Engineer shall have additional authority such as is stated in these Design Standards and Construction Specifications.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 CODES AND STANDARDS

- A. Design shall be based on the following:
 - 1. Sanitary Sewer Systems.
 - a. ASCE Manual and Reports on Engineering Practice No. 60, Gravity Sanitary Sewer Design & Construction.
 - b. Utah State Department of Health Code of Waste Disposal Regulations.
 - c. Utah Division of Water Quality Administrative Rules for Design Requirements for Wastewater Collection, Treatment and Disposal Systems.
 - d. Uniform Plumbing Code, Latest Edition.
 - 2. Culinary and Secondary Water Systems.
 - a. State of Utah Administrative Rules for Public Drinking Water Systems.
 - b. Uniform Plumbing Code, Latest Edition.
 - 3. Storm Drainage Systems.
 - a. Guidelines, procedures and design criteria as defined by Utah County.
- B. All Work not specifically described in these design standards and technical specifications shall conform to the APWA "Manual of STANDARD SPECIFICATIONS" as published by the Utah Chapter of the American Public Works Association. The latest edition at the time of the Work shall be used.

3.02 DESIGN STANDARDS

- A. Design shall conform to the City of Saratoga Springs Capital Facilities Plan; and to these design standards and technical specifications.
- #1 1. These Design Standards are design guidelines. The developer's engineers shall examine local project conditions, and shall modify these standards as necessary and as acceptable to the City Engineer.

B. SANITARY SEWER SYSTEMS:

- 1. The impact of any proposed sewer system on the existing sewer system will be reviewed by the City Engineer. The developer may be required to add additional off-site sewer systems in order to provide adequate sewer service to his development.
- 2. Areas that will be serviced through the proposed development will be considered and the method of service to those areas will be determined and approved by the City Engineer. Increased system size may be required for future development, as approved by the City Engineer.
- 3. The minimum size of sewer main line shall be 8-inch diameter.
- 4. Sewer lines shall be designed to maintain a velocity of two feet per second (2 fps) during peak flows, unless otherwise accepted and approved by the City Engineer.
- 5. Unless otherwise accepted and approved by the City Engineer, the minimum sewer slopes shall be as follows:
 - a. 8-inch sewer lines – 0.0040 foot/foot
 - b. 10-inch sewer lines – 0.0028 foot/foot
 - c. 12-inch sewer lines – 0.0022 foot/foot

- d. 15-inch sewer lines – 0.0015 foot/foot
 - e. 18-inch sewer lines – 0.0012 foot/foot
 - f. 21-inch sewer lines – 0.0010 foot/foot
 - g. 24-inch sewer lines – 0.0008 foot/foot
 - h. Larger than 24-inch per City Engineer's recommendation
6. The minimum sewer depth shall be 13.0 feet under normal conditions.
 - a. In areas of shallow sewer, the following note shall be added to the development plat: "Shallow Sewer Depths! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement."
 - b. The City Engineer may increase the minimum sewer depth if required to meet overall system requirements.
 7. Check topography for low lots and problem service connections.
 - a. In areas of low lots, the following note shall be added to the development plat: "Low Lots! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement."
 8. A minimum of four feet of cover shall be required over all sewer lines, where acceptable to the City Engineer.
 9. Sewer grades shall be based upon Utah County or City benchmark elevations.
 10. Sewer shall be located on the low side of streets, preferably 5 feet from street centerlines; and a minimum of 5 feet from the lip of gutters.
 11. A minimum of five feet shall be maintained between the edge of manhole collars to edge of the street pavement.
 12. Sewer shall be located at 10-foot minimum horizontal distance from culinary waterlines.
 13. Where possible, sewer shall be located at 10-foot minimum horizontal distance from all other public utilities, including but not limited to storm drains, and secondary water lines.
 14. Sewer main lines shall be extended to property lines as per City Engineer's request to service future development. Ten-foot sewer stubs shall be extended beyond terminal manholes to facilitate future development. No connections may be made to a sewer stub.
 15. In the locations where the sewer leaves the public right-of way a twenty-foot wide sanitary sewer easement will be required. This easement shall be centered on the sewer line, unless otherwise approved by the City Engineer. Sewer easements shall extend ten feet beyond dead end manholes. Show easements on the development plat and on the City's Standard Easement forms, which grant the easements to the City. Easements must be executed and returned to the City Office prior to final approval being granted.
 16. No plugged ends of sewer lines will be allowed. Manholes must be constructed at the ends of sewer lines.
 17. The minimum size manhole shall be 4-foot diameter.
 18. 5-foot diameter manholes shall be used in the following situations:
 - a. At all intersections of three or more 8-inch or larger pipe lines.
 - b. Where the deflection angle of the pipe line exceeds 90 degrees.
 - c. When both items "a" and "b" are designed in the same manhole, a six-foot manhole is required.
 19. Recommended maximum manhole spans shall be approximately 400 feet, but no more than 450 feet, from center to center of manholes.

20. A 0.2-foot minimum elevation step shall be provided in all junction manholes; except where accepted otherwise by the City Engineer.
 - a. The maximum allowable drop, between inlet and outlet inverts, through a manhole is two feet. When the drop in a manhole is between one and two feet, a five-foot manhole is required.
21. Where pipes of different diameters connect into a manhole, the inside top of the smaller pipe shall match the inside top of the larger pipe, unless approved otherwise by the City Engineer.
22. Where incoming slopes at manholes are greater than or equal to 5 percent, the incoming slope shall be carried through the manhole, unless otherwise accepted and approved by the City Engineer.
23. Where incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than or equal to 45 degrees but less than 90 degrees, a five-foot manhole with an extra deep trough is required.
24. Where incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than 90 degrees, a six-foot manhole with an extra deep trough is required.
25. Where new sewer lines are connected to existing sewer lines, a 5-foot diameter manhole shall be constructed over the existing sewer line.
26. The invert of the new sewer line shall match the top of the existing sewer line at connection of new pipe to existing sewer; except where accepted otherwise by the City Engineer.
27. The minimum lateral size shall be 4-inch for residential connections; and 6-inch for commercial and industrial connections.
28. Sewer laterals shall tie directly into manholes in cul-de-sacs and at dead end manholes.
29. Sewer laterals may tie directly into manholes wherever possible and practical.
30. Sewer laterals shall conform to the requirements of the Utah State Department of Health Code and the Uniform Plumbing Code; with cleanouts at not more than 100-foot spacing; and no more than two bends in excess of 45 degrees without a cleanout.
31. Each building and/or unit of separate ownership shall require a separate sanitary sewer lateral, unless otherwise approved by the City Engineer.
32. Sewage Lift stations, where required, shall be designed to conform to all requirements of the State's Administrative Rules; and shall be approved by the City Engineer.
 - a. Lift stations shall be built where required to pump sewage from low areas into the gravity systems.
 - b. Lift stations shall be enclosed in a permanent structure as approved by the City Engineer.
 - c. Lift station enclosures shall be sized to adequately accommodate all pumps (both present and future), wet wells, all required plumbing items, electrical equipment and all appurtenant items, as approved by the City Engineer.
 - d. Equipment for a SCADA system shall be provided inside the lift station. The SCADA system equipment shall be as required to monitor and control the station operation. The equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - e. Property for lift stations shall be deeded to the City. The property shall be sized to adequately accommodate the lift station and all appurtenant items, as approved by the City Engineer; and may need to sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - f. Lift stations shall be provided with standby power systems are required by the State Code.
 - g. The lift station property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.

C. CULINARY WATER SYSTEMS:

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1. The State of Utah Administrative Rules for Public Drinking Water Systems, R309-510, provide minimum sizing requirements for drinking water facilities.
2. Water systems shall sized as described in the City's Capital Facilities Plan.
3. The minimum fire flow shall be 2000 gpm. The fire flow may be increased as determined by the City Fire Marshal.
4. The normal minimum pressure in all parts of the system is to be 40 psi.
5. The anticipated maximum operating pressure is to be 100 psi; unless otherwise approved by the City Engineer.
 - a. The construction drawings shall show maximum water line pressures and pipe classifications.
6. The maximum pipe line flow velocities will be 6 feet per second; unless approved otherwise by the City Engineer.
7. Water systems shall be designed so that pressures conform to the pressure zones shown in the City's Capital Facilities Plan; and as approved by the City Engineer.
8. The impact of any proposed water system on the existing water system will be reviewed by the City Engineer. The developer may be required to add additional off-site water systems in order to provide adequate water supply to his development.
9. Areas that will be supplied through the proposed development will be considered and the method of service to those areas will be determined and approved by the City Engineer. Increased system size may be required for future development, as approved by the City Engineer.
10. The system storage requirements will be considered for each development and approved by the City Engineer.
11. The minimum cover over top of water lines is to be 48-inches.
12. Water lines shall be placed in the park strips as required by the City Standards.
 - a. Location shall be on the east side of north/south streets.
 - b. Location shall be on the north side of east/west streets.
13. Valve placement:
 - a. Valves shall be placed at the projection of the end of curb and gutter radius sections.
 - b. Valves shall be placed at intervals not to exceed 800 feet, unless approved otherwise by the City Engineer.
 - c. At intersections, valves shall be placed on at least three branches of the system, as approved by the City Engineer.
 - d. Valves shall be placed within 10 feet of the upstream and downstream ends of casing pipes.
14. Blow-offs shall be placed at the ends of water lines, at low points in the system, and at other locations as shown on the City's Standard drawings and as approved by the City Engineer.
15. Fire Hydrants:
 - a. Fire hydrants shall have a maximum spacing of 500 feet in residential areas; and a maximum spacing of 300 feet in commercial and industrial areas.
 - b. Fire hydrants shall be placed at the end of cul-de-sac pipe lines and at the end of dead end streets. These hydrants shall not be considered as fire protection hydrants; but shall be used for flushing lines.
 - c. Fire hydrant spacing shall be approved by the City Engineer; additional fire hydrants may be required by the City Fire Marshal.

16. Air-Vacuum Valve Stations:
 - a. Air-vacuum valve stations shall be placed at high points on transmission lines and at other locations as required for proper system operation, and as approved by the City Engineer.
 - b. Air-vacuum valve stations shall be constructed as indicated on the drawings.
17. Water Service Connections include the corporation stop at the main line, type "K" copper tubing service line to the meter yoke, an angle stop, back-flow angle valve, PVC meter box, and cast iron frame and cover, as shown on the City Standard drawings.
18. In the locations where the water lines leave the public right-of way a ten-foot wide easement will be required. This easement shall be centered on the water line, unless otherwise approved by the City Engineer. Water easements shall extend ten feet beyond dead ends. Show easements on the development plat and on the City's Standard Easement forms, which grant the easements to the City. Easements must be executed and returned to the City Office prior to final approval being granted.
19. Each building and/or unit of separate ownership shall require a separate water service line, unless otherwise approved by the City Engineer.
20. PRESSURE REGULATING STATIONS shall be constructed, where required to provide water supply between pressure zones, as indicated on the City Standard drawings and as approved by the City Engineer.
 - a. The station plumbing shall consist of a main line and a by-pass line. The combined capacity of the main line and by-pass plumbing shall equal the capacity of the incoming pipe line. The main line will normally be one pipe size smaller than the incoming line and the by-pass line will be sized as required.
 - b. Plumbing will include pressure regulating valves on each line, isolation valves on each side of each regulating valve, and all appurtenant plumbing items, as indicated on the standard drawings and as approved.
21. PUMP STATIONS shall be designed to conform to all requirements of the State's Administrative Rules; and shall be approved by the City Engineer.
 - a. Pump stations shall be built at wells; and where required to boost system pressure.
 - b. Pump stations shall be enclosed in a permanent, above-ground structure, unless directed otherwise by the City Engineer. The structure shall be acceptable to the City Engineer.
 - c. Pump station enclosures shall be sized to adequately accommodate all pumps (both present and future), all required plumbing items, electrical equipment and all appurtenant items, as approved by the City Engineer.
 - d. All pump motors shall have "soft-start" controllers, as approved by the City Engineer.
 - e. Equipment for a SCADA system shall be provided inside the pump station. The SCADA system equipment shall be as required to monitor and control the operation of the pump station. Equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - f. Property for pump stations shall be deeded to the City. The property shall be sized to adequately accommodate the pump station and all appurtenant items, as approved by the City Engineer; and may need to sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - g. The pump station property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.
22. STORAGE RESERVOIRS shall be designed to conform to all requirements of the State's Administrative Rules; and shall be approved by the City Engineer.
 - a. Storage reservoirs shall be constructed of reinforced concrete, with all appurtenant items; unless approved otherwise by the City Engineer.
 - b. Equipment for a SCADA system shall be provided at the reservoir. The SCADA system equipment shall be as required to monitor and control the operation of the reservoir. Equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - c. Property for reservoir sites shall be deeded to the City. The property shall be sized to adequately accommodate the reservoir and all appurtenant items, as approved by the City Engineer; and may need to sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - d. The reservoir property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.

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- #1 23. SCADA SYSTEM equipment shall be provided and installed as described herein.
- a. Wire and conduit shall be installed from the SCADA equipment to the location designated for a RTU to be installed by the City's SCADA contractor.
 - b. The City's SCADA contractor shall connect all SCADA equipment to the RTU.

D. SECONDARY WATER SYSTEMS:

1. The State of Utah Administrative Rules for Public Drinking Water Systems, Part II, R309-200 through R309-211, provide minimum sizing requirements for secondary water facilities.
 2. Water systems shall sized as described in the City's Capital Facilities Plan.
 3. The normal minimum pressure in all parts of the system is to be 40 psi.
 4. The anticipated maximum operating pressure is to be 100 psi; unless otherwise approved by the City Engineer.
 5. The maximum pipe line flow velocities will be 6 feet per second; unless approved otherwise by the City Engineer.
 6. The impact of any proposed water system on the existing water system will be reviewed by the City Engineer. The developer may be required to add additional off-site water systems in order to provide adequate water supply to his development.
 7. Areas that will be supplied through the proposed development will be considered and the method of service to those areas will be determined and approved by the City Engineer. Increased system size may be required for future development, as approved by the City Engineer.
 8. The system storage requirements will be considered for each development and approved by the City Engineer.
 9. SECONDARY WATER STORAGE PONDS shall be sized according to the Capital Facilities Plan and constructed as shown on the City's Standard Drawings, and as approved by the City Engineer.
 - a. Equipment for a SCADA system shall be provided at the storage ponds. The SCADA system equipment shall be as required to monitor and control the operation of the pond. Equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - b. Property for storage pond sites shall be deeded to the City. The property shall be sized to adequately accommodate the pond and all appurtenant items, as approved by the City Engineer; and may need to sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - c. The storage pond property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.
- #1 10. The minimum cover over top of water lines is to be 36-inches.
11. Secondary water lines shall be placed in the park strips as required by the City Standards.
 - a. Location shall be on the west side of north/south streets.
 - b. Location shall be on the south side of east/west streets.
 - c. Location shall be on the opposite side of the street from culinary water lines.
 12. Valve placement:
 - a. Valves shall be placed at the projection of the end of curb and gutter radius sections.
 - b. Valves shall be placed at intervals not to exceed 800 feet, unless approved otherwise by the City Engineer.
 - c. At intersections, valves shall be placed on at least three branches of the system, as approved by the Engineer.
 - d. Valves shall be placed within 10 feet of the upstream and downstream ends of casing pipes.
 13. Blow-offs shall be placed at the ends of water lines and at other locations as shown on the City's Standard drawings and as approved by the City Engineer.

14. Water Service Connections shall be as shown on the City Standard drawings.
15. In the locations where the water lines leave the public right-of way a ten-foot wide easement will be required. This easement shall be centered on the water line, unless otherwise approved by the City Engineer. Water easements shall extend ten feet beyond dead ends. Show easements on the development plat and on the City's Standard Easement forms, which grant the easements to the City. Easements must be executed and returned to the City Office prior to final approval being granted.
16. Each building and/or unit of separate ownership shall require a separate water service line, unless otherwise approved by the City Engineer.
17. PRESSURE REGULATING STATIONS shall be constructed, where required to provide water supply between pressure zones, as indicated on the City Standard drawings and as approved by the City Engineer.
 - a. The station plumbing shall consist of a main line and a by-pass line. The combined capacity of the main line and by-pass plumbing shall equal the capacity of the incoming pipe line. The main line will normally be one pipe size smaller than the incoming line and the by-pass line will be sized as required.
 - b. Plumbing will include pressure regulating valves on each line, isolation valves on each side of each regulating valve, and all appurtenant plumbing items, as indicated on the standard drawings and as approved.
18. PUMP STATIONS shall be designed to conform to all requirements of the State's Administrative Rules; and shall be approved by the City Engineer.
 - a. Pump stations shall be built at wells; storage ponds; and where required to boost system pressure.
 - #1 b. Pump stations shall be enclosed in a permanent, above-ground structure, unless directed otherwise by the City Engineer. The structure shall be acceptable to the City Engineer.
 - c. Pump station enclosures shall be sized to adequately accommodate pumps, all required plumbing items, electrical equipment and all appurtenant items, as approved by the City Engineer.
 - d. All pump motors shall have "soft-start" controllers, as approved by the City Engineer.
 - e. Equipment for a SCADA system shall be provided inside the pump station. The SCADA system equipment shall be as required to monitor and control the operation of the pump station. Equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - f. Property for pump stations shall be deeded to the City. The property shall be sized to adequately accommodate the pump station and all appurtenant items, as approved by the City Engineer; and may need to sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - g. The pump station property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.
19. Air-Vacuum Valve Stations:
 - a. Air-vacuum valve stations shall be placed at high points on transmission lines and at other locations as required for proper system operation, and as approved by the City Engineer.
 - b. Air-vacuum valve stations shall be constructed as indicated on the drawings.
20. Drains shall be installed at all low points on pressure irrigation lines, and at other located as directed by the City Engineer.
21. Connections between secondary water lines and culinary water lines shall be done as indicated on the drawings and as directed by the City Engineer; and shall conform to State requirements.
- #1 22. SECONDARY WATER FILTER STATIONS shall be constructed where directed by the City Engineer; and shall be acceptable to the City Engineer.
 - a. Filter stations shall be enclosed in a permanent, above-ground structure, unless directed otherwise by the City Engineer. The structure shall be acceptable to the City Engineer.
 - b. Filter stations shall be sized adequately to accommodate filters, all required plumbing items, electrical equipment and all appurtenant items, as acceptable to the City Engineer.
 - c. Equipment for a SCADA system shall be provided inside of the filter stations. The SCADA system equipment shall be as required to monitor and control the operation of the filter stations. Equipment shall be compatible to the City's system and shall be acceptable to the City Engineer.

- d. Property for the filter station shall be deeded to the City. The property shall be sized to adequately accommodate the filter station and all appurtenant items, as acceptable to the City Engineer; and may need to be sized to accommodate future facilities. Deeds for the property must be executed and returned to the City offices prior to final approval being granted.
- e. Where directed by the City Engineer, the filter station property shall be fenced with a 6-foot high chain link or other type of fence and appurtenances, as acceptable to the City Engineer.

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23. SCADA SYSTEM equipment shall be provided and installed as described herein.
 - a. Wire and conduit shall be installed from the SCADA equipment to the location designated for a RTU to be installed by the City's SCADA contractor.
 - b. The City's SCADA contractor shall connect all SCADA equipment to the RTU.

E. WATER WELLS:

1. Water wells shall be designed and constructed as described in Section 02520 of these standard Specifications and conforming to the State of Utah Administrative Rules for Public Drinking Water Systems, R309-204, Facility Design and Operation: Source Development.
2. Well pump houses shall be designed and constructed for each well, as described in these standard Specifications and as described in the appropriate sections of the Administrative Rules.

F. STORM DRAIN SYSTEMS:

1. The impact of any proposed storm drain system on the existing drainage system will be reviewed by the City Engineer. The developer may be required to add additional off-site storm drain systems in order to provide adequate drainage for his development.
2. Areas that will be drained through the proposed development will be considered and the method of drainage for those areas will be determined and approved by the City Engineer. Increased system size may be required for future development, as approved by the City Engineer.
3. Drainage structures, consisting of bridges, culverts, storm drain pipe lines, and appurtenant structures, shall be designed to convey the anticipated storm water discharge.
 - a. Bridges shall be designed to convey the greater of a 100-year snow melt or 25 year cloudburst.
 - b. Culverts shall be designed to convey the greater of a 100-year snow melt or 25 year cloudburst.
 - c. Storm drain lines shall be designed to convey 25 year cloudburst.
 - d. Consideration will be given to lesser frequencies for storm drains where sufficient justification is presented to the City Engineer.
4. Drainage structures shall be constructed as indicated on the City Standard drawings.
5. Cleanout boxes shall be located at every change in alignment or slope and at junctions with other lines, as approved by the City Engineer.
6. Inlet boxes shall be placed as follows:
 - a. Spaced at no more than 700 feet apart to collect sheet flow of storm water.
 - b. Located at the uphill end of radius sections.
7. Recommended maximum spans between structures shall be approximately 400 feet, but no more than 450 feet, from center to center of structures.
8. All storm drains shall be constructed with reinforced concrete pipe; with minimum size of 15-inch diameter.
9. Storm drain lines shall be designed to maintain a velocity of two feet per second (2 fps) during peak flows unless otherwise accepted and approved by the City Engineer.
10. Unless otherwise accepted and approved by the City Engineer, the minimum pipe slopes shall be as indicated in the section for sanitary sewer lines.

11. A minimum of one foot of cover shall be required over all reinforced concrete drain lines.
12. Storm drains shall be located as indicated on the City's Standard drawings.
13. Where pipes of different diameters connect into a drainage structure, the inside top of the smaller pipe shall match the inside top of the larger pipe, unless approved otherwise by the City Engineer.
14. A 0.2-foot minimum elevation step shall be provided in all junction manholes; except where accepted otherwise by the City Engineer.
15. Storm drain lines shall be extended to property lines as per City Engineer's request to drain future development. Ten-foot sewer stubs shall be extended beyond terminal structures to facilitate future development.
16. Street and sewer grades shall be based upon Utah County or City benchmark elevations.
17. In the locations where the storm drain leaves the public right-of way a twenty-foot wide drainage easement will be required. This easement shall be centered on the drain line, unless otherwise approved by the City Engineer. Drainage easements shall extend ten feet beyond dead end structures. Show easements on the development plat and on the City's Standard Easement forms, which grant the easements to the City. Easements must be executed and returned to the City Office prior to final approval being granted.
18. Storm Water Treatment Systems shall be constructed where and as directed by the City Engineer.
 - a. Treatment systems shall be designed to treat all of the flow from the areas where storm water needs to be treated, with no overflow into the City storm water system.
 - b. Systems shall be designed to remove all of the oils and floatables from the storm water and 80% of the total suspended solids (TSS).
 - c. Treatment systems shall be constructed as described in the City Standards.
18. Detention Ponds.
 - a. The capacity of all detention ponds shall be sufficient to contain the anticipated runoff volume from a 100-year storm event over those portions of the gross aggregate area under design; with a maximum release of 0.2 cfs/acre. Provide calculations and hydrographs to the City Engineer for approval.
 - b. Ponds shall be constructed as described and as shown in the City's Standards.
 - c. Equipment for a SCADA system shall be provided at the ponds. The SCADA system equipment shall be as required to monitor the operation of the pond. Equipment shall be compatible to the City's system and shall be approved by the City Engineer.
 - d. Property for detention pond sites shall be deeded to the City. The property shall be sized to adequately accommodate the pond and all appurtenant items, as approved by the City Engineer; and may need to be sized to accommodate future facilities. Deeds for the property must be executed and returned to the City Office prior to final approval being granted.
 - e. The detention pond property shall be fenced with a 6-foot high chain link fence and appurtenances, as approved by the Engineer.
19. Install fabricated galvanized steel trash grates over the ends of all exposed pipes, 15-inch and larger. Grates shall be acceptable to the City Engineer.

#3 G. STREET SYSTEMS:

1. Streets systems, consisting of curb and gutter, sidewalks, handicap ramps, street pavement, and appurtenant items shall be designed as described below, as shown in Tables 1, 2, 3 and 4, and as shown in the City Standards.
 - a. Table 1 shows the ROADWAY DESIGN STANDARDS; including right-of-way widths, pavement widths, street grades, and appurtenant design criteria.
 - b. Table 2 shows the TRAFFIC CLASSIFICATIONS to be used for design of City streets.
 - c. Table 3 shows the SUBGRADE SOIL CLASSIFICATIONS to be used for design of City streets.
 - d. Table 4 shows the ASPHALTIC CONCRETE PAVEMENT STRUCTURAL SECTION to be used for design of City streets with various Traffic Classifications.

2. Street system designs shall be shown on the construction drawings and shall be acceptable to the City Engineer.
3. Streets shall be constructed with asphalt surface course, gravel road base, and granular borrow material for sub-base, as required.
 - a. Standard drawings indicated minimum thicknesses of pavement courses.
 - b. Thickness of each course shall be as indicated in Table 4, as shown on the standard drawings, and as accepted by the City Engineer.
 - c. Thickness may be modified by design of a geotechnical engineer, which is acceptable to the City Engineer.
4. No new street pavement will be cut into for three years after acceptance of pavement, unless otherwise approved by the City Engineer.
5. Speed tables shall be constructed as indicated on the drawings; where and as directed by the City Engineer.
6. Round-about intersections may be constructed where and as accepted by the City Engineer.
 - a. Round-about designs shall be as indicated on the standard drawings.
 - b. The standard drawings indicate minimum round-about dimensions.
7. Type 3 slurry seal shall be placed on streets at the end of the 2-year warranty period.

TABLE 1

ROADWAY DESIGN STANDARDS				
	RESIDENTIAL	MINOR COLLECTOR	MAJOR COLLECTOR	ARTERIAL ROAD
ROW Width	56'	68'	104'	180'
Pavement Width	26'	36'	46'	60'
Number of Lanes	2	2	2	5
Design Speed	25	30	40	55
Design ADT		12,000	21,000	30,000
Vehicle Design	Passenger	Passenger	WB40	WB40
Stopping Sight Distance	200	300	300	425
Horizontal Alignment & Radius	200	300	565	1190
Grades	0.5 - 10	0.5 - 8	0.5 - 8	0.5 - 8
Intersection Sight Distance	335	445	445	555
Intersection Spacing	200	300	300	1/4 mile
Corner Curb Radius	25	25	35	40

TABLE 2

TRAFFIC CLASSIFICATIONS			
Traffic Class	Maximum EAL (a)	Type of Street	Total Heavy Trucks During Design Period
I	5,000	Light Traffic Cul-de-sac (56' R.O.W.) (less than 20 residents)	7,000
II	10,000	Residential Streets (56' R.O.W.)	7,000-15,000
III	100,000	Urban Minor Collector (68' R.O.W.) Minor Collector	70,000-150,000
IV	1,000,000	Arterial or (180' R.O.W.) Major Collector (104' R.O.W.)	700,000-1,500,000
(a) Equivalent axle load for 20 year design period (b) Roadway serving as access for construction vehicles may require additional structure design prior to approval			

TABLE 3

SUBGRADE SOIL CLASSIFICATIONS			
Sub grade Class	Resilient Modulus (Mpa)	Characteristics of Soil	CBR Value
Very Poor Soil	<30	Clay and fine silt - Extremely soft and plastic	3
Poor Soil	30-80	Clay, fine silt and sandy soils - soft and plastic when wet	3 thru 8
Medium Soil	80-170	Loans, silty sands and some clayey sand gravel, retains moderate degree of firmness with moisture	3 thru 17
Good to Excellent Soil	170	Clean sands, sand gravel and free of plastic materials, retains load support when wet	17

TABLE 4

ASPHALTIC CONCRETE PAVEMENT STRUCTURAL SECTION					
Subgrade Class	Pavement Section	Traffic Classification			
		I	II	III	IV
Very Poor Soil CBR <3	Asphaltic Concrete Surface Untreated Aggregate Base Aggregate Subbase	3" 10"(b) -	3" 12"(b) -	4" 8"(b) 12"(b)	6" 12"(b) 16"(b)
Poor Soil CBR 3-8	Asphaltic Concrete Surface Untreated Aggregate Base Aggregate Subbase	3" 8" -	3" 8" -	4" 8" 6"	6" 8" 12"
Medium Soil CBR 9-17	Asphaltic Concrete Surface Untreated Aggregate Base Aggregate Subbase	3" 8" -	3" 8" -	4" 8" 4"	6" 6" 6"
Good to Excellent Soil CBR >17	Asphaltic Concrete Surface Untreated Aggregate Base Aggregate Subbase	3" 8" -	3" 8" -	4" 8" -	6" 8" -

(a) Subbase soil must be of sufficient depth for the stabilization of the road structural section.

(b) Road classification and structural design must be submitted by a licensed and qualified engineer for review and approval by the City Engineer.

(c) Traffic classifications III & IV requires the addition of an appropriate geotextile fabric conforming to AASHTO M288-96 to separate the base course, or subbase course, from the subgrade.

(d) Traffic classifications I & II require a 1/2" mix design

(e) Traffic classifications III & IV require a 3/4" mix design

(f) If collapsible soils are identified in the initial soils investigation or during construction, the subgrade soil shall be over-excavated and recompacted a minimum of 18-inches or deeper as directed by a licensed and qualified geotechnical engineer.

H. SPECIAL SOILS DESIGN:

1. There are many areas within the City where collapsible soils exist. Where these collapsible soils exist within a proposed development, the soil's bearing capacities shall be determined by an approved geotechnical engineer. The foundations for all facilities to be constructed on these soils shall be designed by the geotechnical engineer to support the facilities as required. These facilities shall include utility lines, roadways, structures and appurtenant items.
2. The City Engineer may designate areas where known collapsible soils exists. Soils reports done for a proposed developments shall also be used to define if and where any areas of collapsible soils may exist. Where these areas exists, special care shall be taken with all construction, as described herein.

I. RESTORATION OF OFFSITE IMPROVED SURFACES:

1. Where offsite construction is required, all improved surfaces shall be restored to match original conditions, as acceptable to the City Engineer.
2. Paved surfaces shall be restored to the thickness and types as required to match adjacent paved surfaces; conforming to City standards.
3. Landscaped areas shall be restored to match adjacent areas, conforming to the City Standards and as acceptable to the City Engineer. Landscape materials shall conform to adjacent materials.

4. Cultivated areas shall be restored to match adjacent areas, conforming to the City Standards and as acceptable to the City Engineer. These areas shall be seeded with material conforming to adjacent materials.
5. Open areas shall be restored with native grasses to match adjacent areas, conforming to the City Standards and as acceptable to the City Engineer. These areas shall be seeded with material conforming to adjacent materials, as acceptable.

3.03 DRAWINGS

- A. Construction Drawings shall include the following information:
 1. Street names and widths
 2. Subdivision lot numbers
 3. Street centerline stations and property line stations; plan stations must agree with profile stations
 4. Drawing scale
 5. North arrow
 6. County or City benchmark elevations.
 7. Sewer system, to include:
 - a. Size of all manholes.
 - b. Rim elevation of all manholes.
 - c. Invert-in and invert-out elevations at all manholes.
 - d. Sewer pipe size, type, and class.
 - e. Location and complete details of sewage lift stations.
 8. Water systems, to include:
 - a. Pipe line sizes, types and class.
 - b. Locations of all valves and fire hydrants.
 - c. Locations and types of all pipe line fittings.
 - d. Location and complete details of well pump houses and booster pump stations.
 - e. Location and complete details of well construction, equipment and appurtenant items.
 9. Storm drain system, to include:
 - a. Size of all structures.
 - b. Rim elevation of all structures.
 - c. Invert-in and invert-out elevations at all structures.
 - d. Drain pipe size, type, and class.
 - e. Location and complete details of detention basins and appurtenant structures.
 10. The following notes:
 - a. "Contractor shall field verify locations and invert elevations of existing manholes and other utilities before staking or constructing any new sewer lines."
 - b. "Contractor shall field verify locations and invert elevations of existing storm drain structures and other utilities before staking or constructing any new storm drain lines."
 - c. "All construction shall comply to the Standard Technical Specifications and Drawings for the City of Saratoga Springs, Utah."
- B. Any conflicts between new pipe lines and other existing utilities, including but not limited to sewer lines, culinary water lines, secondary water lines and/or storm drains shall be noted on the drawings.
- C. Dimensions to pipe lines from monument lines or property lines shall be shown.
- D. "Match to Drawing" notes shall refer reader to adjacent drawings.

- E. Connecting structures and pipe lines shall be labeled as existing or proposed.
- F. Drawings shall be designed, signed and stamped by a professional engineer;
- G. Construction Drawings shall include a signed dedication plat.
- H. Construction Drawings shall include a final grading plan.
- I. Construction Drawings shall contain plan and profile views of all sewer lines and storm drain lines. Profile views shall show existing and final surface profiles.
- J. All submitted preliminary Construction Drawings shall be Standard B-size drawings (11" x 17").
- K. All submitted final Construction Drawings shall be Standard D-size drawings (22" x 34").

END OF SECTION