

ENGINEERING DESIGN STANDARDS FOR PUBLIC IMPROVEMENTS

Developed Jointly by the
Cities of Ashland and Medford

Reviewed by the Technical Advisory Group

TABLE OF CONTENTS

Section I – General Process

	<u>Page</u>
1.01 Purpose.....	1
1.02 Definitions.....	1
1.03 Existing Facilities.....	2
1.04 Pre-Design Meeting	2
1.05 Public Improvement permit	2
1.06 Other Agencies and Permits.....	2
1.07 Improvement Design.....	3
1.08 Concurrent Planning Applications.....	4
1.09 Plan Review and Approval	4
1.10 Public Improvement Permit	5
1.11 Construction Phase.....	5
1.12 Construction Staking.....	5
1.13 Traffic Control Plan	6
1.14 Inspection of the Work.....	6
1.15 As-Built Survey and Record Drawings.....	6
1.16 Final Inspection.....	6
1.17 Postponement of Plan Review	7
1.18 Project Acceptance by City.....	7
1.19 Warranty Release	7

Section II – Design Standards

2.01 Purpose.....	7
2.02 Design Standards – Streets, Bikeways, Access Ways	8
a. Basic Geometry.....	8
b. Street Paving Width	8
c. Vertical and Horizontal Curves	8
d. Maximum Street Grades	8
e. A.C. Pavement Design.....	9
f. Grade Breaks.....	9
g. Minimum Curb Grade.....	9
h. Minimum Valley Gutter Grade.....	9
i. Maximum Gutter Flow	9
j. Street Cross Slope	9
k. Curb height.....	10
l. Curb Return Radii	10
m. Driveway Aprons	10
n. Design Speeds.....	10
o. Barricades	10
p. Easements	11
q. Street Centerline Location	11

r.	Private Streets	11
s.	Street Lights	11
t.	Superelevation.....	11
u.	Curb Grade Below 100-year Flood.....	11
v.	Future curb and Alley Grade Design	11
w.	Traffic Control Devices	11
2.03	General Design Standards – Sanitary Sewers and Storm Drains	
a.	Off-Site Flows.....	12
b.	Sewer and Storm Drain Locations	12
c.	Main Line Alignment.....	12
d.	Cover.....	13
e.	Pipe Extensions.....	13
f.	Watertight Joints	13
g.	Manhole Locations.....	13
h.	Manhole Diameter	13
i.	Manhole Channel Slope.....	14
j.	Manhole Adjustments	14
k.	Hydrogen Sulfide Protection.....	14
l.	Monitoring Manholes.....	14
m.	Anchor Blocks	14
n.	“n” Value	14
o.	Skewed Sewers	14
p.	Flat Top Manhole.....	15
q.	Allowable Pipe Material	15
r.	Location of Sanitary, Sewer Pump Stations and Stormwater Control Structures	15
s.	Vehicular Access	15
t.	Sanitary Sewer & Storm Drain Laterals	15
2.04	Design Standards – Sanitary Sewers.....	15
a.	Sewer Study	15
b.	Watertight Manhole Covers.....	16
c.	Sewer and Water Line Separation Requirements	16
d.	Design Approach	16
2.05	Design Standards – Storm Drains	16
a.	General Design Requirement.....	16
b.	Drainage Study.....	16
c.	Drainage Basin.....	17
d.	Ditch Design	17
e.	Curb Inlets.....	17
f.	Hydraulic Grade Line	18
g.	Minimum Velocity.....	18
h.	Hydrologic Studies.....	18
i.	Flow Depth.....	18
j.	Detention Basins	19

2.06	Erosion Control.....	19
------	----------------------	----

Section III – Drafting Standards

3.01	General Requirements.....	20
3.02	Cover Sheet.....	20
3.03	Plan and Profile Sheets	21
3.04	Detail Sheets	26

Section IV – Construction

4.00	General.....	26
4.01	Preconstruction Conference.....	27
4.02	Standard Specifications.....	28
4.03	Standard Details.....	29
4.04	Erosion Control.....	29
4.05	Traffic Control	29

Section V – “As Built” Submittal – Submittal Requirements

5.01	General.....	30
5.02	Specifications for Submittal of As-Built Surveys.....	30
5.03	Specifications for Record Construction Drawing Submittals.....	33

Appendices

Part I – General Process

Part II – Design

Part III – Drafting.....

Part IV – Construction

Part V – As-Builts

SECTION I

GENERAL PROCESS

1.01 PURPOSE

This manual is provided to assist private consulting engineers and Public Works Department staff in coordinating, processing, and constructing public improvements.

The manual identifies the responsibilities of the City, owner, engineer, and the project contractor. A flow chart and project checklist addressing the general sequence of events is provided in the Appendices, Part I - Process.

A majority of the City design and drafting standards are included in this manual to assist the engineer. The standards included address the more common design situations encountered however it does not represent a formal, total set of City standards. Additional design and drafting requirements may also be conditioned by the City to ensure accurate and complete plans, records, and fieldwork.

1.02 DEFINITIONS

City - The City of Medford, or the City of Ashland, acting by and through the Public Works Department; or any other local jurisdiction, which have adopted these standards as their own,

City Engineer – The City Engineer of the City of Medford, or City of Ashland acting either directly or through authorized representatives.

Engineer – shall be assumed to mean the Engineer of Record for the purposes of the ESPI. This convention differs from the APWA/ODOT standard specification definition (SSD 00110.20), which assumes that “Engineer” refers to the “Agency Engineer”.

Owner – A person, firm, corporation, partnership, syndicate, local agency, city, county, state or federal government or any district of or division thereof, who or which causes the development of real property and is the owner of record or owner under contract to purchase or lease for purposes of development, the real property to be developed or improved.

Public Improvement - For the purpose of this manual, public improvements shall mean all infrastructure constructed within the public right-of-way, or public easement, and maintained by the City.

The following discussion outlines the general process:

1.03 EXISTING FACILITIES

Record drawings and other as-built information for existing streets, sidewalks, sewers, etc., is available at the Engineering Division of Public Works. The engineer is responsible for obtaining all record information for the project from the City, public utilities, and other agencies with interest within the project scope.

1.04 PRE-DESIGN MEETING

A pre-design meeting may not be mandatory, but is strongly recommended. The intent of the pre-design meeting is to facilitate a forum where the engineer and City staff may jointly review the proposed development and identify any special design elements or concerns, necessary easements, and extent of off-site improvements. The engineer is responsible for coordinating the pre-design meeting. The City will provide applicable master plan information if available.

1.05 PUBLIC IMPROVEMENT PERMIT

A "Public Improvement Permit" (PIP) is required for all public improvement projects with exception of those projects initiated and administered by the City's Public Works Engineering Division. The owner, or engineer representing another City department shall file with the City Engineer an executed copy of the Engineering Division form titled "Public Improvement Permit Application" (*Appendices, Part I - Process*). When the conditions of Section 1.08 are met, the Public Improvement Permit, signed by the City Engineer, will be issued to the owner or engineer.

1.06 OTHER AGENCIES & PERMITS

Work within County or State right-of-way requires a right-of-way use permit from the appropriate jurisdiction. The owner is responsible for identifying and filing the necessary application(s) to the appropriate agency.

Depending on the type of work to be performed and existing conditions, other permits may also be required when:

- The contractor's work will disturb one acre or more of land, an Erosion Control Permit (formerly known as NPDES 1200-C permit) must be secured from DEQ;
- A Corps of Engineers permit is required for disturbance of any jurisdictional wetland;
- A joint Corps of Engineers/Division of State Lands #404 permit is required for excavation or embankment of 50-cubic yards or more of material within "waters of the State". The purpose of the permit is to regulate activity in rivers, streams, wetlands, areas identified as "natural resource areas," etc.;
- A PUC/railroad permit is required for work crossing or adjacent to RR right-of-way;
- A City Building Permit is required for private storm drains, retaining walls, excavation and fill (including stockpiles) on private property;

- Special approvals are required by Planning Commission Decisions.

The above list is included to assist the owner on commonly known permits that may be required. The list is by no means complete and the City does not take any responsibility for notification of permits that may be required and are not included in the above list. It is the owner's responsibility to determine and apply for all necessary permits.

Plan review may proceed before a required permit(s) is secured provided proof of permit application(s) is included with the submittal. However a copy of the required executed permit(s) is required prior to City final review and acceptance of the construction documents.

1.07 IMPROVEMENT DESIGN

The engineer shall design the improvement(s) in accordance with sound engineering practices and City policies and practices as bound herein:

- a. Street paving design shall be in accordance with adopted City design methods and policies.
Including:
 - i) Asphalt-Concrete Pavement Structure Design Guidelines (Appendices, Part II - Design);
 - ii) City Planning Ordinance;
 - iii) Conformance with the tentative approved plat.
- b. Sanitary sewer designs shall be in accordance with Sections 2.03 and 2.04 of this manual, DEQ, Oregon Standard Specifications for Construction as amended by the City, and the City Standard Drawings.
- c. Storm drain designs shall be in accordance with Sections 2.03 and 2.05 of this manual, DEQ, Oregon Standard Specifications for Construction as amended by the City, and the City Standard Drawings.
- d. Pedestrian/bicycle ways shall be in accordance with City adopted design standards.
- e. Construction Specifications shall be the Oregon Standard Specifications for Construction 2002, as amended by the City.
- f. Sewer locations shall be coordinated with utility company facilities and City sewer master plans.
- g. All calculations and studies submitted (for pavement design, pipe strength, storm drain design, sanitary sewer design, etc.) shall be presented in neat, professional format and shall be stamped and signed by the engineer. Any submittals of unacceptable quality and accuracy will be returned for correction and resubmittal.
- h. Plans shall be prepared using City's drafting format and standard notations included in this manual.
- i. Designs of storm drains and sanitary sewers shall take into account present and future flows from all properties within the service limits of the systems under design.

- j. Street light plans (if applicable) shall be submitted concurrent with the street, sewer and storm drain plans as part of the design package, and shall be coordinated with electric utility and the City Engineer.
- k. When required by the tentative plat, street trees shall be included on the design plans.

The engineer shall submit to the City Engineer for approval the required number of copies of construction plans as indicated on the "Public Works Engineering Review Flowchart" (*Appendices, Part I - Process*), easements, and all design criteria, studies and calculations pertaining to paving, sanitary sewers, storm drain, and other required systems. All the required information shall be submitted with the initial plan set submittal.

The City Engineer may provide some assistance to the engineer in securing design concurrences when requested. However, the engineer is ultimately responsible for making all arrangements for securing these concurrences.

1.08 CONCURRENT PLANNING APPLICATIONS

If the proposed development has a pending Planning application that is being reviewed concurrently with design submittal of public improvement construction plans, the final review of the improvement plans and the issuance of Public Improvement Permit for construction are dependent on the status of the Planning application as follows:

- a. If the Planning application is a subdivision or partition, the tentative plat must have received formal approval and a copy of the Preliminary Final Plat must be submitted with the improvement plans. Submittal of the Preliminary Final Plat allows staff to compare the public improvement construction plans with the plat, verify dimensions, and identify conditions which may affect the design or location of the improvements.
- b. If the Planning application is a Site Review, a Final Planning Site Review approval is required prior to final review of the public improvement construction plans.
- c. If the Planning application is a Planned Unit Development, a Final Planning approval is required prior to final review of the public improvement construction plans. However, some initial but limited site preparation work may proceed if specifically authorized by the Planning Commission.

1.09 PLAN REVIEW AND APPROVAL

Public improvement plans, including required documentation, shall be submitted to the City for review. The City Engineer will prepare Plan Review Comments and return them to the engineer indicating corrections needed. A copy of the plan review comments will also be provided to the project applicant. After making the requested changes, the engineer shall resubmit prints of the revised plans for a follow-up review. When the plans and all other items are acceptable, the City will request submittal of the original drawings to execute a signature of final review.

1.10 PUBLIC IMPROVEMENT PERMIT

A Public Improvement Permit (PIP) is required for all new Public Improvements. Before the PIP is issued, the applicant shall submit to the City Engineer:

- a. The name, address, phone number of the contractor's designated emergency contact personnel;
- b. Six (6) copies of the City reviewed and accepted construction plans;
- c. Traffic control plan, if required;
- d. Copies of all required permits;
- e. Pre-construction conference schedule and agenda

1.11 CONSTRUCTION PHASE

Work shall not begin until the PIP has been issued *and* the pre-construction conference has been held. A current prequalification, approved by the City Engineer, shall be required of all contractors performing work on public improvements and/or work performed within the public right-of-way. The City will inspect the work for compliance with the City reviewed and accepted plans and specifications. The engineer shall perform construction observations, and recommend any needed or desired changes to the City engineer for review and acceptance. The contractor shall not deviate from the current reviewed and accepted plans until the proposed design changes are approved by the engineer and accepted by the City Engineer. The engineer shall make the changes on the plans and submit three copies to the City Engineer for review and acceptance. The Contractor shall have a set of current approved plans on-site during construction.

On sanitary sewer construction, the contractor shall provide air testing, water or vacuum testing of manholes, and mandrel testing as part of project contract. The contractor shall coordinate the TV inspection of sanitary sewers with the City.

On storm drain construction, the contractor shall provide mandrel testing of all flexible pipe up to and including 24-inches in diameter as part of project contract. The contractor shall coordinate the TV inspection of storm drains with the City.

The engineer shall verify sewer and storm drain flow lines of manholes and slopes of pipes prior to City acceptance of the systems. The City may require removal and reconstruction of pipes not constructed to proper grade and alignment.

1.12 CONSTRUCTION STAKING

The owner shall provide project construction staking by a licensed land surveyor or engineer. Staking shall include all industry standard staking information, such as cut/fill, offset, station, etc.

1.13 TRAFFIC CONTROL PLAN

All construction projects shall be managed in a way that will minimize traffic safety problems and delays. The contractor shall make every effort to prevent adverse traffic impacts to adjacent properties. When needed, the applicant shall direct the engineer or contractor to provide a Traffic Control (TCP) Plan to the City for review at least five days prior to the start of construction. Projects that do not need a TCP shall employ traffic control measures meeting or exceeding the guidelines in set forth in the City of Medford's Traffic Control Manual for Maintenance and Construction, dated September, 2001.

All control measures shall be in-place prior to rerouting the traffic and shall be maintained throughout the project duration.

ODOT certified flaggers shall be provided when construction activity is at a level that flaggers are required. Once construction is complete, all the temporary traffic control shall be removed from the site.

1.14 INSPECTION OF THE WORK

The Public Works Inspector will be the City's authorized inspection representative to insure that the project meets City standards and/or special requirements. Inspection by the City will normally be available from 7:00 a.m. until 3:30 p.m. weekdays. The City Engineering Division shall be notified at least 2 working days prior to commencing any project construction. If the owner's contractor elects to work extended hours, weekends, or holidays, the City's inspection representative shall be notified in advance. The owner shall be responsible for any additional cost to the City that is a result of extended hours, weekend, or holiday inspection. For the purpose of this section, additional cost shall mean "time and a half" of the inspector's current hourly wage.

1.15 AS-BUILT SURVEY AND RECORD DRAWINGS

An As-Built survey of the project shall be submitted prior to final inspection, and record drawings shall be submitted within 60 days of final inspection for all public improvements. These submittals shall be in conformance with Section V of this manual. The record drawings shall be accompanied by the original reviewed and accepted plans with the appropriate approved revisions. All changes noted during construction and field verification of infrastructure locations shall be included on the original and final plan sets.

Record drawings shall also be submitted for private improvements that requires review and sign-off from the City Engineer. As-built surveys will not be required for these, but shall meet all other conditions of Section V.

1.16 FINAL INSPECTION

The final inspection is conducted prior to formal acceptance of the project by the City. The City Engineer and/or his designee(s), representatives from Building Department, Department Community Development, Public Works Operations (Street, Sewer, and Traffic) will as a group inspect the project. The City

Engineer will schedule the Final Inspection with the above stated representatives *after* the City's Inspection representative has indicated that the project is complete. After the Final Inspection with the above stated representatives has been conducted, the City's inspection representative will meet with the owner, engineer and/or the owner's contractor and convey any corrections or deficiencies noted in the Inspection. *The Final Inspection must be completed and all items accepted by the City Engineer before building permits for the development can be submitted. (Medford only)*

1.17 POSTPONEMENT OF PLAN REVIEW

These procedures are written to assist the City and the engineer in developing private projects in an orderly manner. In the event the consulting engineer fails to adhere to requirements and/or required submittals listed herein, the City Engineer may postpone project review until the deficiencies are corrected, and plans are complete.

1.18 PROJECT ACCEPTANCE BY CITY

When all work shown on the City reviewed plans has been completed and accepted by the City, the City Engineer will send a letters to the engineer, contractor and owner accepting improvements and specifying the warranty period. See construction specifications and local ordinances for warranty period requirements.

1.19 WARRANTY RELEASE

City will inspect the project one month prior to the conclusion of the warranty period. The owner shall be responsible for correcting any deficiencies prior to the warranty expiration. The City Engineer will authorize the release of the warranty upon successful completion of any noted deficiencies and conclusion of the warranty period.

SECTION II

DESIGN STANDARDS

2.01 PURPOSE

The purpose of the design standards is to provide a consistent policy under which the physical aspects of design and plan preparation are to be implemented. The majority of the elements contained in this manual are Public Works oriented with respect to private development of the public infrastructure; however, it is intended that they apply to both public and private development of the public infrastructure.

It is not intended that the following standards will address all conditions encountered for there will be unique situations that these standards will not apply. They are intended to assist but not to substitute for competent work by design professionals. The engineer is solely responsible for all design. The City's review and acceptance of the plans does not guarantee that all regulations and requirements have been met.

The standards are not intended to unreasonably limit any innovative design which could result in a better quality product. Any proposed departure from the standards will be judged, however, on the likelihood that such variance will produce a comparable or improved result, in every way adequate for the user and the City. The final decision of any proposed deviation from the standards is at the City's discretion.

2.02 DESIGN STANDARDS – STREETS, BIKEWAYS, ACCESS WAYS

a. Basic Geometry

Unless otherwise authorized by the City Engineer, street design shall conform to the City's current adopted Street Design Standards.

b. Street Paving Width

Street paving width shall be determined by applying standards governed by the Municipal Code and other adopted policies. The required street widths are normally provided in the Planning Commission Final Order.

c. Vertical and Horizontal Curves

Vertical and horizontal curves shall be of adequate lengths to provide safe sight/stopping distances based on AASHTO road design standards using the design speeds outlined in this section.

Deviations from the design speeds and/or horizontal and vertical AASHTO standards may be allowed at the discretion of the City Engineer providing that:

- 1) Attempts have been made to meet the standard but have been exhausted;
- 2) Deviation from the AASHTO standard is minimized;
- 3) The non-conforming condition is delineated with the appropriate MUTCD warning and speed advisory signs;
- 4) When required headlight stopping sight-distance cannot be achieved for sag vertical curves, a street light shall be installed at the sag.
- 5) The engineer provides a bona fide justification and calculations supporting the deviation.

d. Maximum Street Grades

Street grades shall conform to AASHTO standards except when City codes permit additional street slope. The standards represent a maximum condition. The engineer should make an effort to reduce steep grades where possible through an alternative design.

e. A.C. Pavement Design

Asphalt-concrete pavement structure shall be designed in accordance with the City of Medford/Ashland Public Works Department Asphalt-Concrete Pavement Structure Guidelines located in the Appendices Part IIB, or other approved methodology that provides the same or better section.

f. Grade Breaks

Vertical curves for curb grades are not always necessary. Grade breaks may be used when the point of grade change is:

- 1) 0.6% or less for arterial and collector streets;
- 2) 1.0% or less for residential streets;
- 3) 1.25% or less for residential streets in excess of 8%.

Grade breaks for curb returns at intersections and bulb-outs may exceed the above values, but shall not exceed 10% under any circumstance.

When joining an existing curb, the engineer shall show and identify the grade of at least 100 feet of the existing curb on the plan.

g. Minimum Curb Grade

The minimum tangent gutter grade shall be 0.5%. Curb grades along short-radius curves, such as curb returns and cul-de-sac bulbs, shall be 0.6% or greater.

h. Minimum Valley Gutter Grade

The minimum grade for valley gutters shall be 0.5%.

i. Maximum Gutter Flow

Curb inlets shall be designed to capture all gutter flow with no bypass. The engineer shall submit calculations for inlet spacing. The maximum gutter length between curb inlets, regardless of street grade, shall be 400 feet or one block; whichever is shorter. When maximum spacing is reached, at least one curb inlet shall be provided to direct gutter flow to a storm drain or ditch. In no case shall the width of the gutter flow encroach in the travel lane, which is established to be a minimum of 10 feet. The maximum allowed depth of gutter flow for streets with shed cross sections is 0.15 feet and 0.20 feet for curbside walks and setback walks respectively. The above criterion is based on 10-year design storm flows.

j. Street Cross Slope

Streets shall normally be designed with curbs on each side at the same longitudinal grade as the street's centerline grade. The standard cross-slope shall be 3% each way. Upon approval of the City, deviations from the standard cross-slope may vary between 2% and 4%, when it materially improves service to abutting properties. Streets located on hillsides may, upon approval by the City,

be designed using a single cross-slope that extends all the way across the street (shed-sections). The maximum allowable shed-section cross-slope is 3%.

k. Curb Height

The standard curb height is 6 inches, and shall conform to the Standard Drawings in the Appendices Part IIA.

l. Curb Return Radii

Unless otherwise approved by the City, curb return radii shall be:

- a. 20 feet for local streets within the City of Medford and 15 feet for local streets within the City of Ashland;
- b. 35 feet for arterial, collector, and industrial streets.

Other radii may be required by the City to accommodate pedestrians, buses, trucks, and historic districts, etc.

m. Driveway Aprons

Driveway aprons shall conform to the following:

- a. Residential: Standard Drawing No. 96-01 for driveways with sidewalk adjacent to the curb, or Standard Drawing No. 92-02 for driveways where a planter is adjacent to the curb.
- b. Commercial, Industrial, Multiple Family Dwellings of greater than 6 units: Standard Drawing No. 03-1 (At grade approach with radius curb return).

When it is desired to provide curb drops for driveway aprons during street construction, they shall be shown on the construction plans by the engineer of record, and staked in the field by the project surveyor.

n. Design Speeds

Except for hillside streets, the minimum design speeds for classified streets shall be as follows:

- a. Alleys & Private Drives 15 mph
- b. Residential streets 25 mph
- c. Collectors 35 mph
- d. Arterials 45 mph

Design considerations for all street geometrics shall reflect these design speeds.

o. Barricades

Barricades or other approved barriers shall be placed at the ends of dead-end streets when hammerhead or cul-de-sac turnarounds are not provided.

p. Easements

Easements shall be reviewed and approved by the City and recorded by the owner prior to final review of the construction plans, except when on-site easements will be recorded as part of an Official Plat. The easements shall be shown on the preliminary final plat as part of the plan review submittal.

q. Street Centerline Location

The centerline of a proposed street shall be positioned on the centerline of the right-of-way.

r. Private Streets

Private streets and drainage systems for private streets shall be privately owned and maintained, and shall be so identified on construction drawings when shown thereon for reference.

s. Street Lights

Street light plans shall be submitted as part of the total design package when an arterial or collector street is included in the project, or when pedestrian-scale street lights are being constructed. Standard Drawings for street light installations are located in Appendices Part IV C. Plans for development on residential streets shall show the street light layout on the utility plan.

t. Superelevation

Superelevation meeting AASHTO design standards is required on collector and arterial streets.

u. Curb Grade Below 100-Year Flood

Top of curb shall be no more than 2 feet below the FEMA designated 100-year base flood elevations.

v. Future Curb and Alley Grade Design

Tentative grade designs for future extensions of curbs and alleys shall be shown on the profiles and shall extend sufficiently to verify the proposed design. In no case shall the profile extension be less than 100 feet.

w. Traffic Control Devices

Street design plans shall include the following traffic control device installation or removal as required by the City:

- Street name signs at all intersections;
- Traffic control devices;
- Barricades;
- Pavement markings (collectors and arterials streets only)

2.03 GENERAL DESIGN STANDARDS – SANITARY SEWERS AND STORM DRAINS

a. Off-Site Flows

When land outside a new development will logically direct flow into a storm drain or sanitary sewer within the new development, the system shall be “public” and shall be extended to one or more of the upstream development boundaries. The pipes shall be sized to accommodate all off-site flows, based on a fully developed condition using the current Comprehensive Plan.

b. Sewer and Storm Drain Locations

All manholes for public sanitary sewers and storm drains shall be located within the public right-of-way. Generally, sanitary sewer pipes and storms shall also be placed within the public right-of-way, although in some instances the piped sections may be outside the public right-of-way, provided the manholes are within the street public right-of-way.

Where sewer mains cannot be located within a public right-of-way, they shall be located within an easement. Easements for sewers shall have a width equal to twice the depth of the sewer main, or 10 feet, whichever is greater. The entire easement shall be located on one side of the property line. Unless otherwise approved by the City, sanitary sewers and storm drains in easements shall be positioned such that outer edge of the pipe is 3 feet or more from the easement boundary. Other utilities within the same easement shall maintain 3 feet of separation on either side of the sewer or storm drain.

c. Main Line Alignment

1. Sewer mains shall generally be constructed in straight lines from manhole to manhole within the public right-of-way. Horizontal and vertical curves are generally discouraged. However, if conditions warrant:
 - a. One horizontal curve is permitted between any two manholes.
 - b. The horizontal curve shall either begin or terminate at a manhole.
 - c. A maximum of two vertical curves is permitted between any two manholes.
2. Curved sanitary sewer and storm drain mains may be used under certain conditions using the following minimum radii:

Pipe size	Minimum curve radius
8-inch	420 feet
10-inch	525 feet
12-inch	630 feet
15-inch	735 feet

The minimum pipe segment length shall be 12.5 feet for PVC pipe. No deflection will be allowed in metal pipe.

d. Cover

Sanitary Sewers –At least 3 feet of cover shall be provided over sanitary sewers from expected finish grade, except that 4 feet of cover or more shall generally be provided over sanitary sewers in streets.

Storm Drains – Two feet of cover shall be maintained over the top of the storm drain pipe.

Localized mounding over the storm drain to obtain minimum cover shall not be permitted. Where 2 feet of cover cannot be maintained, reinforced concrete pipe shall be used. Refer to Appendices Part IIC for the Concrete Pipe Design Chart to determine the class of pipe to be used. Concrete caps or encasement shall not be permitted to compensate for lack of cover.

e. Pipe Extensions

For pipes that are to be extended as part of a project, the Engineer shall have the end of the line potholed and obtain exact location and elevation of the existing pipe. This information is to be provided on the plans.

f. Watertight Joints

Watertight joints shall be used for all storm drains and all sanitary sewers. The pipe joints shall be pressure testable.

g. Manhole Locations

Whenever possible, manhole covers shall be positioned outside normal wheel travel locations. Distances between manholes shall not exceed 500 ft. except as approved by the City. Manholes shall be located at all sewer main intersections, at all changes in vertical or horizontal alignment, and at the beginning and/or end of curved sewer sections. Manholes shall also be provided at the end of all terminating sewers. Cleanouts may only be used on a sewer that will be extended in the near future that is less than 180' to the next downstream manhole.

h. Manhole Diameter

Manholes 48 inches in diameter shall be used for pipes up to and including 18 inches diameter and depths up to 15 feet. Manholes 60 inches in diameter shall be used for larger pipes up to and including 36 inches diameter and depths up to 22 feet, or where the alignment of the main lines is such that the distance between pipe openings would be less than 1.5 feet using a smaller manhole. Manholes 72" inches in diameter shall be used for larger pipes up to and including 60" diameter pipes. Above 60 inch diameter pipes shall use specially designed manholes.

i. Manhole Channel Slope

Fall through manholes shall match the slope of the upstream pipe except when the minimum fall across the manhole base is less than 0.1 feet. The minimum allowable fall through a manhole shall be 0.1 feet for straight runs and 0.2 feet where a change in horizontal alignment of 45° or more, or intersecting pipes occur. The maximum fall through a manhole shall be 2 feet.

Manholes with falls greater than 2 feet shall be constructed with outside drop structures using the Standards Drawings found in Appendices Part II – Design.

j. Manhole Adjustments

Manhole frames and covers shall be adjusted to finished grade within any traveled way.

Manholes constructed in easements outside a traveled way shall project 6 inches above the adjacent ground. The manhole shall have a 3-inch minimum height of extension rings. The maximum height of extension rings shall be 12 inches for new construction and 18 inches for modifications to existing manholes. The Adjustments beyond these limits shall be made with full manhole barrel sections.

k. Hydrogen Sulfide Protection

Downstream transition manholes originating from a pump station or manholes where turbulence is a factor shall be coated with hydrogen sulfide resistant material.

l. Monitoring Manholes

Monitoring manholes may be required at commercial/industrial service connections at the direction of the City.

m. Anchor Blocks

Anchor blocks shall be used on sanitary sewers and storm drains with slopes in excess of 20% per the Standard Drawing found in Appendices Part II – Design.

n. Manning's "n" Value

The design "n" value for pvc and hdpe pipe used for storm drain applications shall be 0.011.

The design "n" value for concrete pipe and all sanitary sewer pipes regardless of material shall be 0.013.

The design "n" value for storm drain metal pipe is as indicated in the metal pipe handbook, with the exception that .011 is the minimum "n" allowed for any pipe.

o. Skewed Sewers

Sewers in streets shall be designed parallel to street centerlines. Exceptions must be approved by the City Engineer.

p. Flat Top Manhole

A flat top manhole shall only be used in shallow conditions where use of a manhole cone is not possible, or where the manhole diameter is greater than 48 inches.

q. Allowable Pipe Material

Allowable pipe materials are listed in Appendices Part II – Design.

r. Location of Sanitary Sewer Pump Stations and Stormwater Control Structures

Sanitary sewer pump stations and stormwater control structures shall be located outside the street section or traveled areas.

s. Vehicular Access

Year-round vehicular access roadways shall be provided to all sanitary sewer and storm drain manholes, pump stations, and detention control structures not located within a paved access. The minimum vehicle access roadway shall be 8 inches of compacted crushed rock, 10 feet wide.

t. Sanitary Sewer and Storm Drain Laterals

A separate lateral or service from the main shall be extended to each Lot, Parcel, or building, and the lateral shall be extended to a point two feet beyond the property line or back of the PUE as applicable.

2.04 DESIGN STANDARDS – SANITARY SEWERS

a. Sewer Study

A sanitary sewer study will be required when an 8-inch diameter gravity sewer is inadequate to serve the current or future development or when the City Engineer determines that a recently annexed area situated outside the limits of the currently adopted sanitary sewer master plan warrants a study. The study shall incorporate the proposed design system including features as the pipe slope, cover, and size; the study shall include, but not be limited to, a detailed map of the sanitary sewer service, sewage flow calculations, and pipe hydraulic calculations. Sanitary sewer design criteria are included in the Appendices, Part II - Design.

The study map shall include as a minimum the following:

- 1) Streets and street names;
- 2) Lot lines;
- 3) Contours or other form of ground surface elevation information;
- 4) Existing, proposed and future pipe systems, complete with manholes, pipe slopes, manhole invert elevations, and pipe sizes;
- 5) Ultimate service area boundaries as determined from the City's adopted Sewer Master Plan and consultation with the City Engineering Division;

- 6) Sub-service area boundaries, with each individually identified and highlighted;
- 7) North arrow, scale, etc.;
- 8) Owner's name, engineer's name and firm, date, etc.

b. Watertight Manhole Covers

Watertight manhole covers shall be used when the cover is either below the 100-year flood plain or in a location where overland runoff could enter the manhole.

c. Sewer and Water Line Separation Requirements

Minimum separations between sanitary sewers and water line shall conform to the current DEQ regulations. The regulations are included in the references .

d. Design Approach

The minimum desirable manhole depth at the extreme upstream end of a service area is 5 feet. Peak design flow design depth shall not exceed 0.80 full. The minimum design velocity shall be 2 fps. The minimum design slope for 8-inch mainline sewers is 0.4%. Minimum design slopes for other pipe sizes are tabulated in Appendices, Part II - Design. Where minimum sewer depth is not a factor in the design control, the grade of an 8-inch pipe used in the last two upstream segments of a collection system branch should be 1% or more so that the typically encountered low flows can achieve cleansing velocities.

The Medford Code does not permit public system sanitary sewer pump stations. Pump stations constructed within the City of Ashland shall be located outside the street section or normal travel way.

2.05 DESIGN STANDARDS – STORM DRAINS

a. General Design Requirement:

Storm drain design shall be in conformance to the City's current Drainage Master or Management Plan. Rational Method may be used for a drainage area up to 300 acres, above 300 acres use TR-55 method. Peak flow shall be based on application of HEC-1 or equivalent model.

City of Medford - Drainage designs shall use the 10-year event for the design storm unless the flows from the 25-year event exceed 200 cubic-feet-per-second.

City of Ashland – Use 25-year storm recurrence interval for drainage areas less than 300 acres, and 50-year recurrence interval for areas greater than 300 acres.

b. Drainage Study

A complete drainage study is required if any of the following circumstances apply:

- 1) New projects, which are adding impervious area and require planning action.
- 2) Projects that will be discharging into inadequate down stream facilities.

- 3) Projects constructed in areas not addressed in the Master Plan.

The study shall include the following:

1. A hydrological study map that contains the following:
 - (a) A detailed map of the entire drainage basin including a sufficient amount of area beyond the basin limits adequate to clearly indicate the adjacent drainage conditions;
 - (b) Sub-basin area boundaries, with each individually identified and highlighted;
 - (c) Streets and street names;
 - (d) Arrows indicating the flow direction within streets and ditches;
 - (e) Contours or spot elevations for verification of direction of overland flow and pipe cover;
 - (f) Drainage areas of all sub-basins;
 - (g) Collection points (nodes) at downstream limits of all sub-basins, complete with node numbers;
 - (h) Existing and proposed storm drain pipes and ditches with sizes included;
 - (i) Future pipes in the system, complete with proposed sizes, slopes, pipe cover, flow line elevations at manholes, etc.;
 - (j) City drainage master plan information such as node numbers, basin names, drainage boundaries, etc.;
 - (k) North arrow, scale, company name/logo, designer, date, etc.
- 2) Hydrologic calculations, sufficient to determine design pipe flows, shall be submitted on the form supplied in Appendices, Part II – Design; or in software formats provided by the engineer of record. . Whatever calculations, which are provided, must clearly correspond to the hydrology map.
- 3) Hydraulic calculations establishing pipe size, flow velocity, hydraulic grade line, etc.

c. Drainage Basin

Drainage systems shall be designed to carry calculated runoff from the entire upstream drainage basin. Runoff calculations shall be based on the assumption of a totally developed basin according to the City's most current Comprehensive Plan.

d. Ditch Design

If an open ditch is approved for drainage in place of a pipe system, a complete study shall be submitted to verify adequacy of the ditch relative to erosion resistance as well as capacity.

e. Curb Inlets

Maximum depth of the inlet box from the lowest flowline invert to the outside top of inlet shall be 5 feet, not including the sump. The maximum allowable pipe size connecting into the side of a

standard curb inlet shall be 15". Oversized inlets may be provided for pipe sizes from 18" to 24". Larger pipes will require construction of a manhole, or manhole inlet combination. Curb inlets accommodating more than one pipe shall be type 4A.

f. Hydraulic Grade Line

The drainage system design shall include a hydraulic analysis of all pipes and ditches existing downstream to the point of outfall for the required improvements unless an as-built plan for the existing downstream system, FEMA, or the City's drainage master plan provides a design hydraulic grade line (HGL) that can be used as a starting point for the new design. If the hydraulic analysis of an existing downstream drainage system is exceptionally complicated, an alternate method acceptable to the City Engineer may be used to determine the beginning design HGL for the system under design.

The hydraulic analysis shall account for all energy losses, including but not limited to, bend losses, manhole losses, friction losses, minor losses, and differences in flow characteristics between surcharged systems and open channel systems. Minor losses shall be computed using formulas in the Oregon Department of Transportation hydraulics manual or other acceptable publications.

Curb grades shall be established such that the HGL for the design storm event is no less than 1 foot below the gutter at any point where water could surcharge into the street through curb inlets, catch basins, manholes, etc.

If the ultimate plan is for future construction of a pipe between an existing pipe downstream and the current project, and if the current condition through this reach is a temporary ditch or an interim pipe system, the design HGL for the system under design shall be based on the hydraulics of the future pipe rather than on the interim system, and shall be labeled "future HGL" on the design plan profiles. However, if the interim system results in an HGL higher than that of the ultimate system, the HGL for the interim system shall also be shown on the plans.

g. Minimum Velocity

The minimum velocity allowed for the full-pipe flow shall be 3 fps.

h. Hydrologic Studies

Hydrologic studies shall be performed using the method recommended in the Current Master Plan.

i. Flow Depth

Storm drain pipes shall be designed for full flow using the design storm indicated in the City's master plan. A particular design may result in deeper or shallower flow, but pipes shall not be

designed to flow surcharged unless outfall conditions or other hydraulic conditions prevent open channel flow.

(There are some on the TAC that do not agree with this standard)

j. Detention Basins

When the City requires a detention basin, the following criteria shall apply:

Engineers are encouraged to use computerized methods to design detention basins. However, regardless of the method used, the following criteria shall prevail unless special arrangements are made:

- 1) Design rainfall data used shall be 24-hour, SCS Type 1A rainfall,
- 2) Computed flows into and out of the basin shall be in the form of runoff hydrographs,
- 3) All basin features including but not limited to basin inlet, basin outlet, basin overflow, basin depth and edge treatment, sedimentation removal, and maintenance shall be generated in accordance with principles of detention basin design commonly used in the civil engineering community, and
- 4) Earth embankments greater than 4 feet in height or other above ground structures created to form any part of the basin boundary shall be designed in accordance with design standards generally required for storage dams.
- 5) An overflow spillway shall be provided capable of sustaining excess runoff from all storms up to a 25-year for systems conveying less than 50 CFS or 100-year rainfall event for systems conveying greater than 50 CFS. The overflow spillway shall be designed such that downstream properties will not be impacted to a greater extent by overflows than they would have been prior to construction of the detention basin.

2.06 DESIGN STANDARDS – EROSION PREVENTION & SEDIMENT CONTROL

- a. Designs shall comply with the Oregon Department of Transportation Hydraulics Manual, Volume 2, "Erosion & Sediment Control".
- b. Sites Greater than One Acre – Submit Erosion Prevention & Sediment Control (EPSC) Plan.
 1. Obtain DEQ Permit
 2. Incorporate the EPSC Plan with the construction plan set.
 3. Cover all disturbed earth with approved ground cover once street construction is complete.
- c. Sites Less than One Acre – Implement Track-out prevention measures
 1. Keep vehicles on gravel or paved surface
 2. Good construction timing and sequenceInlet Protection Measures (fabric-sod type protectors)

SECTION III

DRAFTING STANDARDS

Final plans shall conform in appearance, format, and quality to the standards set forth in this manual. Sample plans are included in the Appendix IIID. Acceptable abbreviations, line and lettering standards are included in Appendix IIIB.

3.01 GENERAL REQUIREMENTS

1) Drawing size and scale:

- a) Plans shall be on 22" x 34" ANSI B sheets, and shall be able to be reproduced at one-half scale at 11"x17", including the border.
- b) The overall project plan shown on the cover sheet should be 1" = 50' or 100'
- c) The plan horizontal scale shall be 1" = 10', 20', 40' or 50'. (1"=20' scale is preferred)
- d) The profile vertical scale shall be 1" = 2', 4', 5', or 10'. A vertical scale of 1" = 20' is not allowed.
- e) The same scale shall be used on all plan/profile sheets within the project.

2) Vertical Datum:

The vertical datum used shall be the datum established and adopted by the City. Assumed datums will not be accepted except for projects which are entirely private with no public improvements.

3) Drafting Media

- a) Record Drawings and As-Built Surveys must be plotted on archive quality matt mylar film.
- b) Construction plans may be plotted on reproducible vellum or mylar film.

3.02 COVER SHEET

1) Cover sheet Requirement

Projects consisting of three or more plan sheets shall have a cover sheet.

2) Purpose of the Cover Sheet

The purpose of the cover sheet is to:

- a) To provide an overall view of the project and its design features;
- b) To orient the individual plan sheets;
- c) To be used as an index for construction plan/profile sheets;
- d) To show the relationship of the project with surrounding areas, lots, etc.

3) Items to be Included

The cover sheet shall include:

- a) Index to the plan design sheets;
- b) Vicinity map in the upper right corner;
- c) General Notes;
- d) List of standard drawings used;
- e) Typical street sections (these may be plotted on a second sheet if needed);
- f) Bench mark;
- g) Geospatial reference point;
- h) Lots or parcels significant to the project;
- i) Tax lot numbers including tax map number;
- j) Subdivision lot numbers;
- k) City limits line as applicable;
- l) Right-of-way lines;
- m) Proposed curbs, sidewalks, sewers, and other improvements, if not provided on the utility plan;
- n) Existing curbs, sidewalks, sewers, etc., to be matched by the new project;
- o) Streets and street names;
- p) Easements of significance;
- q) North arrow and scale including bar scale;
- r) Title block information using the City's standard title block provided in electronic format;
- s) Wetlands, riparian areas, and flood zones.

4) General Notes

The applicable General Notes shall be included on the cover sheet. An electronic file of commonly used general notes is available from the City.

5) Contact List

The contact list is a distribution list of those with interest in the project. The list shall include the address, telephone and fax numbers, and e-mail addresses of contact individuals within the City and utility companies, the owner, surveyor, and engineer.

3.03 Plan and Profile Sheets

A. Plan View

- 1) Each plan sheet shall contain all the items required for the cover sheet as outlined in 3.02, paragraph 3 with the exception of item "a through g". Plan sets not requiring a cover sheet shall have items "a thru g" plotted on first sheet of the set.

2) Plan Format

The plan and profiles of sanitary sewers and storm drains that are situated within the proposed street limits should be shown on the same sheet as the street design. However, if the plan sheet becomes too complex, the sanitary sewer and storm drain may be submitted on a separate plan sheet provided that the street with its appropriate stationing and dimensioning are clearly shown on that sheet.

The plan and profile common to a section of improvement shall be plotted on the same sheet, and shall be aligned vertically on the sheet to the greatest extent possible.

“Match lines” shall be used from sheet to sheet. Adjacent sheet numbers shall be identified and duplication of information outside the match line shall be minimized.

The design engineer shall observe the following when using match lines:

- a. The match line shall not be placed within an intersection area;
- b. The match line shall not be located at the same station as manholes, curb inlets, or other structures;
- c. The match line shall not be placed within curb tapers or horizontal curves. If this is not practical, complete taper or curve information shall be shown on all pertinent sheets.

3) Existing Utilities: Show all underground or overhead utilities on the plan view. Show the underground utilities in the profile when appropriate.

4) Wetlands: Wetland areas shall be shown and clearly labeled.

5) Stationing: Street stationing shall be west to east and north to south. Profile stationing shall be consistent in direction to that in the plan. Important stations, such as centerline intersection points, beginning of curb return, PC, PT, etc., shall be included on the plan.

Stationing or lot line offsets shall be shown for all sanitary service connections and for those storm connections not defined by a manhole or curb inlet. Sewer and storm drain stationing shall keep the following guidelines:

Sanitary Sewers and Storm Drains in Streets:

- a. If the street is being improved, and the sanitary or storm is located in the street, the profile for the sanitary and storm may be shown in the street profile. In this instance, use street stationing for all manholes and appurtenances so that only one set of stationing is used.

- b. If the sanitary or storm is located in the street or street right-of-way, but the street is not being improved, provide a separate profile for the storm and sanitary, beginning at the lowest downstream manhole and progress upstream, and provide an identifier for that sewer or storm drain on the plan and profile, ie Line 1 or Line A.
- c. If the entire line to be profiled is partially in street and out of the street, then provide a separate profile for the entire line and follow directions for sewers and storm drains not within streets below.

Sewers and storm drains not within streets:

Provide a separate profile, beginning at the lowest downstream manhole and provide an identifier as indicated above.

Sanitary sewer and storm drain mains within the right-of-way shall be dimensioned off the street centerline. Manholes and other structures shall indicate the street stationing and off-set along with the mainline stationing.

- 6) North Arrow and Scale: The preferred location for the north arrow is on the right side of the sheet and shall not point downward except when sanitary sewer or storm drain project profile stationing dictates otherwise. The numerical scale and bar scale shall also be included directly beneath the north arrow.
- 7) Line Types: Line widths and types shall generally conform with the standards located in the appendix IIIB
- 8) Construction Notes: When the plan scale is greater than 1" = 20', and the project includes street paving, the engineer shall use the standard construction notes and symbols contained in Appendix IIIB. The construction notes shall be located to the right of the plan view, and shall be listed numerically according to the note numbers as identified in Appendix IIIB. They shall be included on the plan sheets where the referenced items appear. The plan sheets shall not contain construction notes for items not appearing on that particular sheet. Nonstandard construction notes specific to a project shall be numbered between 900 & 999.
- 9) Topography: All pertinent topography shall be shown on the drawing and topography identification notes shall be placed at the outside extremes of the plan view area opposite the item (tree, pole, etc.) See sample plans located in appendix IIIE. Station and offset dimensions should not be included except for significant features of design. Utility pole numbers and tree diameters shall be included in the plans. The engineer shall indicate on the plans the method and date the topography information was obtained.

10) Tax Lot Numbers: Indicate the tax lot numbers, and addresses, of existing properties along existing streets, which are being improved,. The number sign symbol (#) shall proceed the street address number.

11) Trees: When trees must be cleared to build a new street, every tree over 6 inches in diameter shall be plotted. A note indicating the presence of numerous trees to be removed will be adequate for trees less than 6 inches in diameter. Historic trees near the work area and trees that are subject to root damage from construction activity shall be clearly identified with a "Protect Tree" note. A general note specifically addressing the tree preservation requirements shall be included in the plans.

Six-inch diameter and larger trees located within or within 20 feet of an easement where sanitary sewers and storm drains are to be constructed shall be accurately plotted and noted.

12) Structure Referencing: New structures, such as manholes, shall be referenced by station and offset from the street centerline, if in a right-of-way. Any controlling factor (i.e., dimension from a building or property line) affecting such a location shall be shown also. All horizontal ties shall be to the center of a structure, except that measurements for curb inlets and curb catch basins shall be referenced to the curb face.

13) Horizontal Curves: Horizontal curve data including the delta angle, radius, semi-tangent, length and PC and PT stations shall be shown in a table that appears on the same sheet as the horizontal curve.

The horizontal curve shall be identified on the plan by a capitalized alpha character located within a square symbol as shown:



14) Existing Sewer Services: Existing sanitary sewer service connections for all buildings within the project influence shall be shown on the plans.

15) Manhole Numbers: Manhole numbers, issued by the City, shall be shown on both plan and profile for all new and existing manholes.

16) Saved or Protected Features: A special note for any existing feature that must be saved or protected shall be included (i.e., tree, shrub, area drain, historical pavement markers, etc.).

- 17) Private Improvements: Any City required private improvements shall be shown on the public improvements plans as reference only and shall be labeled 'PRIVATE.'
- 18) Curb Return Data: Complete curb return curve data and grades shall be clearly indicated.
- 19) Non-concentric Curbs: When a curb is non-concentric with centerline, a table shall be used to show curve data and top of curb grades.
- 20) Driveways: The improvement plans shall show all driveway aprons that are to be constructed as part of the initial improvement. The following driveway and apron information shall be shown on the plans:
 - Apron length which is defined as the length of the fully-depressed curb, without flares;
 - The type of existing driveway (concrete, asphalt, gravel, etc.).
 - The cut-line for any existing driveway adjustments.
- 21) Sanitary Sewer and Storm Drain Line Designators: Plans containing two or more sanitary sewer mainlines shall be designated alphabetically as "Line A", "Line B", etc., in both the plan and the profile. Plans containing two or more storm drain mainlines shall be designated reverse alphabetical order using lower case characters as "Line z", "Line y", "Line x", etc., in both the plan and the profile.

B. PROFILE

- 1) The profile view shall show existing curbs, sewers, and underground structures such as manholes and vaults as well as curbs and sewers being constructed. New curbs and sewers shall be heavy, bold lines, and shall be annotated with pipe diameter and slope. Existing curbs, sewers, and underground structures shall be dashed lines.
- 2) Significant underground utilities and other structures shall be shown based on potholed information.
- 3) Manhole numbers, stationing, flowline and rim elevations shall be shown for all new and existing manholes.
- 4) Pipe diameter and type shall be indicated
- 5) When making underground improvements through existing surface improvements, trench backfill material type shall be indicated in the lower part of profile.
- 6) Both invert and top of pipe shall be shown in the profile.

- 7) Existing and finished ground profiles at left and right top of curbs and at centerline shall be shown in three separate profiles along with the profile grade of the respective top of curb or centerline. Each of these profiles, as well as future or existing top of curbs, shall be shown at least 100 feet beyond the end of the proposed streets.
- 8) All lines shall be labeled on each sheet.
- 9) For sewer easements, only one existing ground profile is required above the pipe centerline.
- 10) Pipe hydraulic data shall be placed below each pipe segment for all storm drain mainlines, with diameters greater than 36-inches , and for all sanitary sewers 10-inches and larger.

Data shall include: Qd, Qc, V, d/D, drainage area, diameter, and slope.

When velocity for a surcharged design is less than 3 fps. V for low flow conditions (non-surcharged) shall also be included and shall be greater than 3 fps.

- 11) The HGL shall be shown in the profile for all storm drains 15" and larger and for all surcharged storm drain or sanitary sewers pipes. The computed HGL elevation shall be included at each manhole. In lieu of showing the HGL on the plans, the engineer may provide a working drawing or computer generated profile with the storm drain calculations.

3.04 Standard details shall be on separate full size sheets placed at the end of the plan set, and shall be numbered separately.

SECTION IV CONSTRUCTION

4.00 GENERAL

Work shall not begin until the Public Improvement Permit (PIP) has been issued and the Preconstruction conference has been held. . . The engineer shall notify the City of any proposed changes as soon as possible and shall make the corrective changes on the plans for review by the City, and submit 3 copies to the City Engineer for review and acceptance.

The contractor shall not proceed with construction of any changes until approved by the engineer and accepted by the City Engineer. The City Engineer or his designee will be the City's authorized inspection representative to insure that the project meets City requirements and standards.

On sanitary sewer construction, the engineer shall include air testing, water or vacuum testing of manholes, and mandrel testing in the General Notes . The contractor shall coordinate the TV inspection of sanitary sewers and storm drains with the City. The engineer shall verify exact location and elevation of existing pipe being connected to or terminated prior to backfill of the sewer.

4.01 PRECONSTRUCTION CONFERENCE

On-site construction work shall not commence until a pre-construction conference (precon) has occurred. The engineer of record shall make arrangements for a precon to be conducted within 30 calendar days of the Notice to Proceed. The precon may be delayed, by mutual agreement of the project manager and contractor, if project work is not scheduled to start until a later time. However, the precon shall still occur prior to commencing on-site work.

The objectives to be accomplished by conducting a pre-construction conference include:

- Establishing working relationships;
- Identifying key persons and channels of communication;
- Identifying emergency contact personnel;
- Reviewing the project schedule;
- Sharing the project schedule with utilities and receiving information on utility relocations and potential conflicts with utility facilities;
- Assuring that the Contractor is aware of project work and responsibilities, including safety, quality control and documentation, surveying, environmental and permit regulations and requirements, etc.;
- Informing the Contractor of procedures for progress payments, change orders, and adjustments of contract time;
- Identifying potential problem areas, and establishing procedures to resolve those problems in a timely fashion.

Persons who shall attend a precon:

- The engineer or his designee;
- The City Engineer or his designee;
- Key personnel from Contractor and subcontractors;
- Representatives of involved or affected utilities;

- Representatives of involved or affected agencies;
- Project surveyor, ;

The engineer shall provide a written agenda using the sample format found in Appendix IVA. A copy of the agenda shall be made available for each precon attendee. Topics to be addressed at the precon and any subsequent meetings shall include:

1. Identification of key personnel, channels of communication, and authority for approval of change orders;
2. Utility involvement, relocation, and potential impacts, including the relation to the Contractor's schedule;
3. Protection of public;
4. Erosion Control and Pollution Control Plans;
5. Quality Control;
6. Field Change Procedure;
7. Construction surveying;
8. Progress payments, quantity measurements, and lump sum breakdowns as applicable;
9. Pertinent special provisions for the project;
10. Potential problem areas;

4.02 STANDARD SPECIFICATIONS

All Public Works Construction within the City Limits and its Utility Service Boundary, or locations likely to become a part of a system owned or operated by the City shall be constructed in accordance with the 2002 edition of the "Standard Specifications for Public Works Construction" ODOT/APWA as amended by the "City's most current "Addendum to the 2002 APWA Standard Specification", as well as any special provisions included with the plans. All number references in the "Addendum" and Special Provisions shall be understood to refer to the Sections and Subsections of the Standard Specifications bearing like numbers and to Sections and Subsections contained herein in their entirety.

The Standard Specifications and "Addendum" are available to view at the City's Public Works Offices. Copies of the Standard Specifications & ODOT APWA standard drawings may be obtained from the ODOT Contractor Plans office, Room 28 Transportation Building, 355 Capitol St. NE, Salem, Oregon 97301; phone (503) 986-3720.

The Standard Specifications are also available on line at ODOT's Web Site:

www.odot.state.or.us/techserv/roadway/specs/2002-std-specs.htm

4.03 STANDARD DETAILS

The Standard Drawings provided in the Appendices, Section IV shall have precedence over all other Standard Details. It is expected these Drawings will be reviewed and updated semiannually. The APWA-ODOT Standard Drawings may be used in cases not covered by the Standard Drawings bound herein. The APWA-ODOT Standard Drawings are available on line on ODOT's FTP Site:

ftp://ftp.odot.state.or.us/techserv/roadway/standards/odot-apwa/odot_apwa700

4.04 EROSION CONTROL

Every effort shall be made to prevent adverse impacts to adjacent properties, water quality and related natural resources resulting from construction activities. All construction projects shall be managed in a way that will prevent and minimize the potential for erosion. Projects shall provide an Erosion Prevention and Sediment Control (EPSC) plan with the plan set, conforming to DEQ's and City requirements. The engineer shall obtain the necessary DEQ approvals prior to the City's issuance of the PIP.

All EPSC measures shall be in-place prior to the commencing any construction and shall be maintained throughout the project duration.

All work performed on public facilities shall include track-out prevention measures in addition to measures to eliminate the flow of mud and gravel into the storm drain system.

Once construction is complete, an approved material such as hydro seeding, straw, or an erosion control blanket shall be placed to cover all areas that were disturbed by the construction activity. The storm drain system within the project influence shall be completely cleaned and flushed prior to the final inspection.

4.05 TRAFFIC CONTROL

When required by the City, the owner shall direct the engineer or the contractor to prepare and submit a traffic control plan to the City for review and acceptance at least five (5) working days prior to anticipated start of construction. No construction may commence in the affected area until the traffic control plan is reviewed and accepted by the City.

Traffic control devices, signing, etc., shall, at a minimum, comply with the City of Medford Public Works Department Transportation Division's current "Traffic Control Manual for maintenance and construction" and the City's Standard Specifications.

Additional temporary traffic controls may be required over and above those defined in the Traffic Control Manual to provide a safe work zone for workers, motorists, bicyclists, pedestrians, and other users of the right-of-way, and to accommodate special construction methods and non-standard work-site related

characteristics often found in urban areas. All temporary traffic control devices shall be maintained at all times, including evenings and weekends, and shall be removed or covered when not applicable.

Existing traffic controls shall not be visually obstructed, damaged, or tampered with in any fashion that would reduce the effectiveness of their intended purpose unless otherwise specifically included and authorized as part of the traffic control plan.

The contractor shall not remove any permanent sign installations in the right-of-way. Permanent sign installation removals shall only be performed by the agency responsible for its installation. The contractor is responsible for coordinating the permanent sign installation removals with the proper agency.

SECTION V “AS BUILT” SUBMITTAL

SUBMITTAL REQUIREMENTS

5.01 General

Prior to final inspection of any public project an As-Built survey shall be submitted in conformance with the requirements outlined in Section 5.02, and within 60 days of final inspection the Engineer of Record shall submit Record Construction drawings in conformance with Section 5.03.

5.02 Specifications for Submittals of As-Built Surveys

As-Built Surveys shall be prepared by a Professional Land Surveyor or Professional Engineer registered in the State of Oregon. The Survey shall be provided in electronic form, on a disc, in an AutoCAD version 2000 compatible format, and accompanied with a paper copy.

A. The As-Built Survey shall include the following:

Geo-reference: (Indicate Reference on Survey)

Horizontal Control: Oregon State Plane South Zone; NAD 83/91; International feet

Vertical Datum: City of Medford: NGVD 1929, US Survey Feet (Unadjusted)

City of Ashland and RVS: NGVD 1929 (56), US Survey Feet

Linework and Associated Text:

The requirements for the linework and associated text related to “As-Built” Surveys is provided in the Appendices, Section V.A. At a minimum, survey and identify each of the features indicated in this list as applicable. Lettering, linetype, abbreviations, and symbol standards shall conform with appendix III.C.

B. Electronic Acceptance Standards for As-Built Surveys:

1. **Purpose** - This section outlines electronic standards, layering conventions and valid object/entity requirements. Files shall conform to the following minimum standards for:
 - a. Layering protocols
 - b. List of Required Layers for Infrastructure Components
 - c. Standard abbreviation lists as required and definitions.
2. **Accuracy** - All as-built drawing information shall accurately represent as-built construction and shall be graphically and mathematically correct. Field data may be collected using survey grade GPS equipment or conventional survey methods. Drawings shall also adhere to requirements in the Drafting Standards of this manual.
3. **Consistency Between Electronic Copy and Hard Copy** - Submit all information required to reproduce a hard copy from the electronic file. The electronic copy and hard copy shall be identical with the exception that the hard copy shall have the original signature on the surveyor's stamp. On the electronic copy, indicate, "Electronic Copy" over the Surveyor's Stamp, and "Not an Original" near the title block. Use only standard AutoCAD line types, fonts and shapes. If the Agency encounters significant problems accompanying reproduction, the drawings will not be accepted. Indicate in clear legal terminology that agency has permission to copy materials indicated as copyrighted.
4. **Electronic As-Built** – Submit a complete electronic as-built survey for each project. This drawing shall conform to the minimum standards specified in this section.
 - a. All infrastructure components shall be in model space. Drawing objects not directly tied to the model and/or sheet specific information may be placed in model space or paper space.
 - b. All specific construction notes shall be in model space. General construction notes maybe located in either model space or paper space.
 - c. Include and attach all detail information generated by automated design software that describes infrastructure components.
 - d. Non-referenced images, standard drawings, specifications, and/or blocks shall be bound in the drawing and not attached as an external reference.

5. Final Submission Formatting

- a. If Xrefs are used with a drawing, bind all Xrefs before submission. The City will not accept drawing with Xrefs. Exception – if drawing file exceeds 5 mb, do not bind x-referenced photography of base maps in drawing.
- b. Purge all drawings of empty layers and unused blocks, line types, shapes, etc. and make sure all infrastructure components are clean, i.e.:
 - i. Ends of arcs, lines and p-lines are snapped end-point to end-point,
 - ii. Duplicate objects are removed.
 - iii. Features representing areas (detention ponds, etc.) are composed of closed poly lines are, at a minimum, a series of valid objects snapped end to end with no gaps.
- c. Purge all invisible drawing objects before submission. Test to make certain that UCS=world, and that the drawing, if x-referenced into another drawing at insertion point 0,0,0 with rotation= 0 will place all objects in the correct x&y state plane coordinates without rotation or scaling. Z=0 at all points.
- d. All infrastructure components shall be composed of the following valid object types in order to be accepted by the City.
 - i. Arc
 - ii. Circle
 - iii. Dimension
 - iv. Ellipse (including elliptical arcs)
 - v. Image
 - vi. Insert (also known as a Block Reference)
 - vii. Leader
 - viii. Line
 - ix. Multiline Text
 - x. Point
 - xi. Polyline
 - xii. Text

- e. All infrastructure objects shall be drawn as valid 2D objects.
 - f. Point features shall be the center point of surface feature being represented on plan.
6. Media - Clearly label all electronic submissions with City project number, project name, file name and extension(s), AutoCAD version, and date. Check with City for currently accepted media formats.

5.03 Specifications for Record Construction Drawing Submittals

The engineer shall submit a paper copy of the most current reviewed and accepted construction plans, along with a paper copy of the Record Drawings. The revisions shown on the Record Drawings shall be based on the As-Built Survey data, information from the City inspector's set, and any other changes in the field noted by the Engineer of Record. Once the proposed Record Drawings have been reviewed and accepted, the Engineer of Record shall submit mylars to the agency along with one paper copy in 11x17 50% format. The Record Drawings shall show the following revisions:

- A. Revised construction notes shall be lined out with a single line from the original plan, so that the original information is still readable. The revisions shall be documented adjacent to the lined out items. DO NOT ERASE THE ORIGINAL INFORMATION. If an item was not constructed as part of the project, the engineer shall clearly delineate it and identify it as "not a part of this project" or "to be constructed in a future phase". Added items to the plans shall also be clearly noted and delineated.
- B. All Revisions shall be noted in the Revision Block of the appropriate plan sheet(s);
- C. Plan revisions shall be identified by drafting the revision number within a triangular symbol adjacent to the revision;
- D. All revisions shall conform to the drafting standards appropriate to this set of drawings and shall be at least the same line density as the original and stand out in contrast to the background.
- E. The contractor's name shall appear on the title sheet.
- F. The title block shall include the project Inspector's first initial and last name (e.g. INSPECTED by M. CAIRO);
- G. The title block shall include the first initial and the last name of the person that "AS BUILT" the plan along with the date the work was performed.

H. The following paving items shall be reviewed, verified for accuracy, and construction notes, dimensions and locations modified as necessary. Unless noted, changes in the original plan location greater than 10% of scale horizontally, and 0.5 feet vertically shall be re-plotted:

1. Beginning and ending stations of paving placed;
2. Pavement width and right-of-way width;
3. Curb return radii;
4. Curb cut widths and locations;
5. Driveway widths and locations;
6. Curb location relative to right-of-way line and/or centerline.
7. Sidewalk locations;
8. Curb grades;
9. Curb elevations;
10. General Notes;
11. Show field verified invert and top of manhole elevations on profile.

I. The following sanitary sewer items shall be reviewed and verified for accuracy with the construction notes, dimensions and locations revised as necessary. Unless noted, changes in the plan location greater than 10% of scale horizontally, or 0.5' feet vertically shall be re-plotted:

1. City assigned identification number on all manholes shown on both the plan and profile;
2. Manhole locations and stationing;
3. Pipe length, size, material, and slope;
4. Field measured top of structure and invert elevations for each pipe entering or exiting the structure;
5. Field measured lengths shown on profile portion of drawing of all sanitary sewer line segments. Measurement shall be from center of manhole to center of manhole. When a segment continues from one plan sheet to the next, the measured length shall be shown on both plan sheets;
6. Revised design data if field measured flowline varies more than 0.5 feet from plan flowline or pipe diameter is changed;
7. As-Built "Tee" or "Wye" locations. If there is no service line to a lot, indicate the reason on drawing;
8. Provide service line information as follows:
 - a. Service line and tee locations measured or stationed from the nearest downstream manhole.
 - b. Service line length measured from the sewer mainline to capped end.
 - c. For the end of the service lines, which are not perpendicular to the street or right-of-way line, locate with a dimension to closest property line or corner.

- d. End of lateral depths other than the recognized standard depth of 4 to 6 feet deep, shall be noted on plans.
- J. The following storm drain items shall be reviewed and verified for accuracy with the construction notes, dimensions and locations modified as necessary. Unless noted, changes in the plan or profile location greater than 10% of scale horizontally and 0.5 feet vertically shall be re-plotted:
 - 1. All manholes, curb inlets, catch basins, detention basins, and constructed wetlands shown on the drawings shall have a City assigned identification number. The engineer shall obtain identification numbers from the City;
 - 2. Add or delete the above referenced storm water facilities on drawings (plans, cover sheets and assessment) as required per inspection notes and field verified locations;
 - 3. Remove out all design stationing that is no longer applicable and make corrections per notes;
 - 4. When a segment continues from one drawing to the next, the field measured length shall be shown on both drawings;
 - 5. Revised storm drain design data shall be required when field verified flow lines differ from design by more than 0.50 feet, or when the pipe size is changed;
 - 6. Storm drain structure top, sump, and invert elevations shall be shown on the plans.