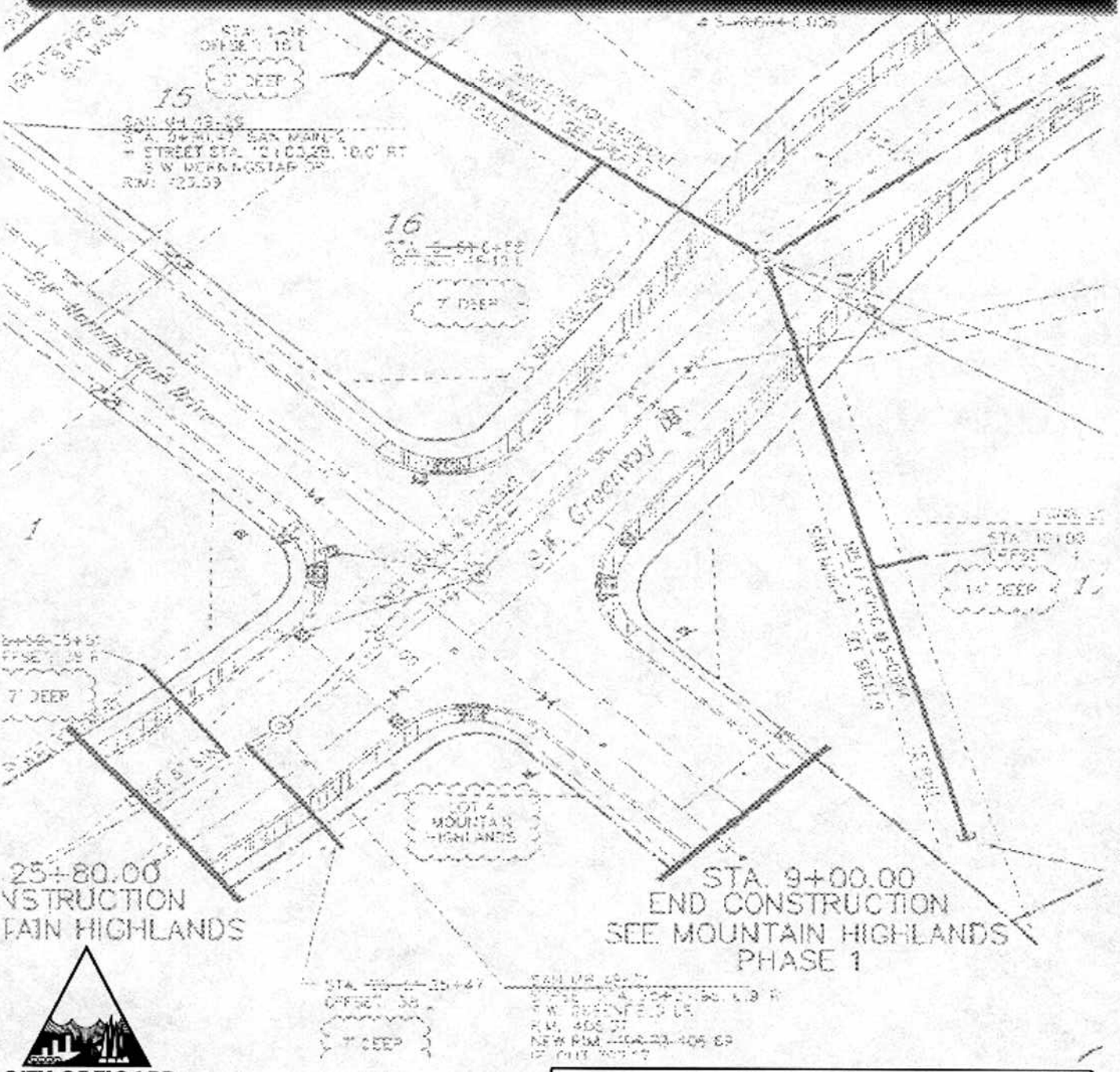
CITY OF TIGARD

ENGINEERING DEPARTMENT

PUBLIC IMPROVEMENT DESIGN STANDARDS

Effective Date:
July 15, 1998



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PREFACE

The City of Tigard Public Improvement Design Standards have been developed to provide a uniform set of standards and procedures to assist the City and private consulting engineers in coordinating, processing and constructing public improvement projects. The Washington County Uniform Road Improvement Design Standards have been used as a guide in creating these standards. These standards are intended to result in the construction of public facilities, which will provide an adequate service level for the present as well as for future development. The form has been kept brief and no attempt has been made to cover all possible situations or to provide detailed explanations. This manual is intended to be read with the Tigard CDC (Community Development Code) and Chapters 12 and 15 of TMC (Tigard Municipal Code).

It is anticipated that revisions to the design standards will be made from time to time. The date appearing on the bottom of each page is the date of the latest revision.

A. GENERAL

1. These standards shall apply to all improvements within the existing and proposed right-of-way and easements, to all improvements to be maintained by the City, and to all improvements for which the Development Code requires approval by the City. These standards are for designers and developers in preparing their plans and for City staff in reviewing plans. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used whenever practical.

2. Requests for variances to these standards shall be based on topography, right-of-way, geography, or existing physical conditions, which impose an economic hardship on the applicant. Requests must show that the variance will not compromise safety or cause an increase in maintenance.

3. The 1990 Standard Specifications and Drawings for Public Works Construction of the Oregon Chapter of the APWA (American Public Works Association), as currently modified, are hereby adopted as the physical standards for the construction of streets and related work, sewers, storm drains, water lines, and structures, except as provided herein or by amendment within each contract. APWA manuals can be purchased from KCM, 7110 SW Fir Loop, Tigard, Oregon 97223-8022, Phone No. 503-684-9097, Fax No. 503-598-0583.

4. The current USA (Unified Sewerage Agency) standards and specifications, as adopted by ordinance, are additional physical standards for the design and construction of sanitary sewers and storms drains. Manuals can be obtained by calling USA at 648-8621.

5. All other utility improvements, including telephone, electrical power and lighting, gas, and cable TV, shall meet the current standards of the appropriate agency as well as City standards.

6. All other work not covered by the above standards shall conform to the current Oregon Department of Transportation Standard Specifications for Highway Construction and Standard Drawings for Design and Construction.

7. Standards for the construction of water facilities shall be in accordance with American Water Works Association standards except as provided herein.

B. PROVIDING FOR FUTURE DEVELOPMENT

All public improvements shall be designed as a logical part of the development of the surrounding area. Storm sewers and sanitary sewers shall be sized to accommodate the entire drainage basin, which they will ultimately serve. Utilities and street improvements will be extended to the boundaries of the development for future extensions to the adjoining areas. The City Engineer may require oversizing of utility lines to accommodate future growth of the City.

Where existing City utility lines do not adjoin the proposed development, the developer will be required to extend the lines to the development as necessary. Where existing roadway improvements do not extend to the proposed development, the developer may be required to improve the roadway to the development.

C. PLAN REVIEW SUBMITTAL REQUIREMENTS

1. General

All items should be submitted with a letter of transmittal addressed to the Engineering Department and specifying the requested action. Items submitted for Building Permits should not be included.

Review of public improvement plans is initiated by the submittal of plans that are at least 95% complete. Following review, the plans will be returned approved or with comments. In order to be entitled to further review, the applicant's engineer must respond to each comment of the prior review (except that request may be made that requirements as to form of the submittal, such as drafting, not necessary to further review of the plans, be delayed until issues of design are resolved). All submittals and responses to comments must appear throughout to be a bona fide attempt to result in complete plans. In general, the submittal shall include plan and profile for streets, water, storm drainage and sanitary sewers, storm drainage calculations, storm drainage basin map, sanitary sewer basin map, erosion control plan, utility and outside agency notification and verification, materials quantity and cost estimate, and may also include a traffic study, legal descriptions and a traffic control plan.

See Appendix C for a complete list of potential plan submittal items.

2. Design Plan Format

The plans shall be submitted on sheets 24" x 36".

Vicinity Maps shall be located on the first sheet of all plans and shall show the location of the project in respect to the nearest major street intersection.

A north arrow shall be shown on each plan view sheet of the plans and adjacent to any other drawing which is not oriented the same as other drawings on the sheet. The preferred orientation of the north arrow is up or to the right on the plan sheet with stationing from left to right.

The scale shall be 1" = 2', 4', 5', or 10' vertically and 1" = 10', 20', 40', 50' or 100' horizontally for all drawings except structural drawings. The scale of corresponding sheets shall be the same.

Letter size shall not be smaller than 0.10 of an inch high.

All detail drawings, including standard drawings, shall be included in the drawings.

The location and elevation of a National Geodetic Survey, United States Geological Survey, State Highway, Washington County, or City of Tigard benchmark shall be shown. Temporary benchmarks shall be shown or referenced on the plans.

A title block shall appear on each sheet of the plan set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block shall include the name of the project, the engineering firm, the sheet title and the owner if not shown on the first sheet.

The seal of the Registered Professional Engineer responsible for preparation of the plans shall appear on each sheet.

2.1 Plan View

Plan Views shall show the following where applicable:

Right-of-way, property, tract, and easement lines.

Subdivision name, lot numbers, street names and other identifying labels. New street names are subject to the approval of the City and Washington County.

Location and stationing of existing and proposed street centerlines and curb faces.

Horizontal curve data of street centerlines and curb returns.

Centerline stationing of all intersecting streets; use existing stationing where available.

Utilities and vegetation in conflict with the construction or operation of the street and drainage facilities. Vegetation to include trees greater than 6 inches in diameter and landscape plantings.

Relocated utilities and other relocated facilities.

Location, stationing, and size of drainage facilities. Drainage facility stationing shall be located in relationship to the street stationing at all manholes or other key locations. Show drainage facilities above and below the project to illustrate conditions affecting the design.

Floodplain and wetland boundaries.

Location and size of water mains, sanitary sewers services and appurtenances. Identify type and location of cross-connection control. Each manhole shall be identified with a number provided by the Engineering Department and stationed to facilitate checking the plans with the profile.

Match lines with sheet number references.

Tops of curb elevations along curb returns at quarter-points or curb return profiles.

Location of the low points of street grades and curb returns.

Sidewalk ramp locations.

Crown lines along portions of streets, transitioning from one typical section to another.

Location and description of existing survey monuments, including but not limited to, section corners, quarter corners and donation land claim corners within the limits of the work area.

Legend.

Any additional information required by the City.

2.2 Profile View

Profile Views shall show the following where applicable:

Stationing, elevations, vertical curve data and slopes for center of streets or top of curbs. For offset or superelevation cross-sections, both curbs shall be profiled. The centerline of the street and ditch inverts shall be shown where curbs are not to be constructed.

Original ground along the centerline and if necessary at the edges of the right-of-way if grade differences are significant.

Extension of the profile of streets that will be extended in the future (stub streets). The extended profile shall be at least 300 feet for local and minor collector streets and as required for streets with higher classifications and be designed to be compatible with the restraints of the terrain.

The top of curb for all cul-de-sacs and intersection curb returns or show elevations at quarter points on plan view.

Storm and sanitary sewer profiles shall show the following information unless noted elsewhere:

(a) Location of manholes and other appurtenances with each manhole numbered and stationed

(b) Profile of existing and proposed ground surface and sewer inverts specified at each manhole.

(c) Size, material, and class of pipe. Slope and length of sewer and class of backfill measured between centerline of consecutive manholes.

(d) Profile of hydraulic grade line for the 25-year storm.

Existing drainage facilities, including offsite facilities, upstream and downstream that affect the design (e.g., downstream restrictions that back water onto project site).

Profiles for ditch and creek flow lines shall be extended as appropriate to illustrate conditions affecting the design beyond the project, both upstream and downstream. Typical cross sections shall also be submitted.

All proposed water, sanitary sewer, and storm pipes crossing the profile and any existing utilities, which potentially are in conflict with construction of the improvements.

3. Site Grading Plan

A site grading plan is required by the Tigard Community Development Code as part of the application for subdivisions, site development permits, and conditional use permits which may be covered by these standards. The grading plan shall show proposed finished floor and building pad elevations, the existing and proposed contours extended beyond the improvement and erosion control facilities.

All subdivision projects shall require a proposed grading plan prepared by the design engineer. The engineer will also be required to indicate which lots have natural slopes between 10% and 20%, as well as lots that have natural slopes in excess of 20%. This information will be necessary in determining if special grading inspections will be required when the lots develop. The design engineer will also be required to shade all structural fill areas on the construction plans. In addition, each homebuilder will be required to submit a specific site and floor plan for each lot. The site plan shall include topographical contours and indicate the elevations of the corners of the lot. The builder shall also indicate the proposed lot elevations at the four corners of the proposed building.

4. Drainage Calculations

Drainage calculations shall be presented in a clear, concise and complete manner on calculation forms. These calculations shall address all runoff into the drainage system. Areas contributing flow to each inlet must be computed separately and each inlet with contributing area shall be designated and shown on an accompanying contour map work sheet. The drainage basin shall be shown on 1" = 100' topography sheet available from the City.

Hydraulic grade line and initial time of concentration calculations with charts and nomographs used shall also be included with drainage calculations.

5. Review Procedure

Contact the Engineering Department for the required number of plan sets to submit. Incomplete submittals will be returned with deficiencies noted. Upon completion of the preliminary review, the City will return one set of plans with required revisions. Once the City has approved the revisions, the design engineer will be notified of the required number of sets to be submitted for stamping. The City will expect the design engineer to circulate a set of plans to affected utility companies for their review. The design engineer shall submit proof that the plans have been circulated.

6. Pre-construction Conference

A pre-construction conference will be scheduled before beginning construction. The meeting is to include the developer's representative, engineer, and prime contractor. The purpose of the conference is to discuss the construction schedule and items of the work, which require special coordination.

7. As-Built Drawings

As-built drawings are required whenever the work results in new or modified public improvements and shall describe all revisions to the previously approved construction plans. Submit previously approved as-built drawings on 3 mil minimum thickness mylar. If the construction drawings are prepared with the use of CAD, a diskette of the drawings in “DWG” or "DXF" format shall be provided in addition to the hard copy mylar.

8. Other Utilities and Agencies

The applicant is responsible for the coordination with the various utilities and agencies during design and construction. The City will require letters of transmittal or other written verification that the appropriate utilities or agencies have been provided with plans and have had an opportunity to comment upon the proposed improvements; this written verification shall be submitted with the plans. The utilities and agencies may include those shown in Appendix G.

After the first City redline, the applicant shall obtain all utility company comments and plans and shall show such improvements on the plans prior to City approval.

9. Easements

Residential subdivision utility easements shall include a six foot utility easement along all front lot lines, as shown on Figure D-1, as well as easements for utility vaults, light poles, mail boxes, etc., that are not within a right-of-way.

Public utility easements created by separate instruments shall be on forms provided by the City. Once executed, return to the City for review. If approved, the City will cause the easement to be recorded and will return a copy.

10. Traffic Control Plan

The applicant’s engineer shall submit a traffic control plan for approval at least five days before beginning construction if the work will affect movement or safety of vehicles, bicycles or pedestrians.

Traffic control devices shall meet the standards of the current Manual of Uniform Traffic Control Devices, available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

All traffic control devices shall be continuously maintained, including nights and weekends.

11. Performance Assurance

Before the construction plans are approved, performance assurance shall be provided to guarantee faithful and complete performance of the work in accordance

with a Subdivision Compliance Agreement (or similar agreement for other types of projects) prepared by the City. A sample is shown at Appendix J.

Optional kinds of performance assurance are permitted by ordinance. Assurance forms will be prepared and provided by the City. A sample of the City's bond form is shown at Appendix K.

The bond amount shall be equal to 100% of the approved estimate of the applicant's engineer. This amount may be reduced to 10% during the warranty period. During construction, the City Engineer may authorize partial releases of the performance assurance in accordance with the following:

a. Only one request for partial release will be considered each month. Releases will be made upon written request from the developer accompanied by adequate documentation of completion of work.

b. Releases will be considered for each individual line item at the time that the line item is 100% complete, including all required testing and documentation. The line items shall be as outlined in the assurance document.

c. If a line item is fully completed for a portion of the project but other portions remain incomplete, a partial release will be made for the completed portion if it forms a logical, usable complete unit. For example, for a project requiring 10,000 feet of sewer, in a month when the first 3,000 feet of sewer has been fully completed (including manholes and testing) a request could be considered for partial release of the portion of the assurance representing 3,000 feet of sewer.

d. In addition, releases will be considered upon partial completion of certain line items as outlined below:

    (1) Site Preparation/Restoration: 80 percent of the site preparation line item will be released when clearing and grubbing are completed, if all required erosion control is in place with adequate maintenance.

    (2) Sanitary Sewer and Storm Sewer: 60 percent of the sewer line item will be released when the pipeline is completed, including backfill and air testing; and manholes, cleanouts, catch basins and other structures are completed except for the grouting of the frames and covers.

In evaluating subsequent requests for partial release, the City may reconsider the items previously released and withhold additional amounts for items where the criteria for partial release are no longer satisfied. For example, if funds have been released for site preparation but adequate maintenance of erosion control has not been provided, the funds previously released for site preparation may be deducted from any subsequent partial releases.

D. STREET AND ROAD REQUIREMENTS

1. General

The Tigard Comprehensive Plan Transportation Map establishes the classification of arterials and collectors; industrial and commercial streets are established by the surrounding land use designation.

Figure D-1 summarizes the improvement standards for each road classification.

The volume of traffic shall determine the number of travel lanes for arterial and major collector roads. The City may require additional turning lanes or a traffic engineer's report evaluating the need for additional turning lanes.

Additional pavement and right-of-way width may be required to accommodate turning lanes, parking, and bike lanes.

The private engineer may submit an alternate pavement design in lieu of the standard section and a justification by providing a soils report.

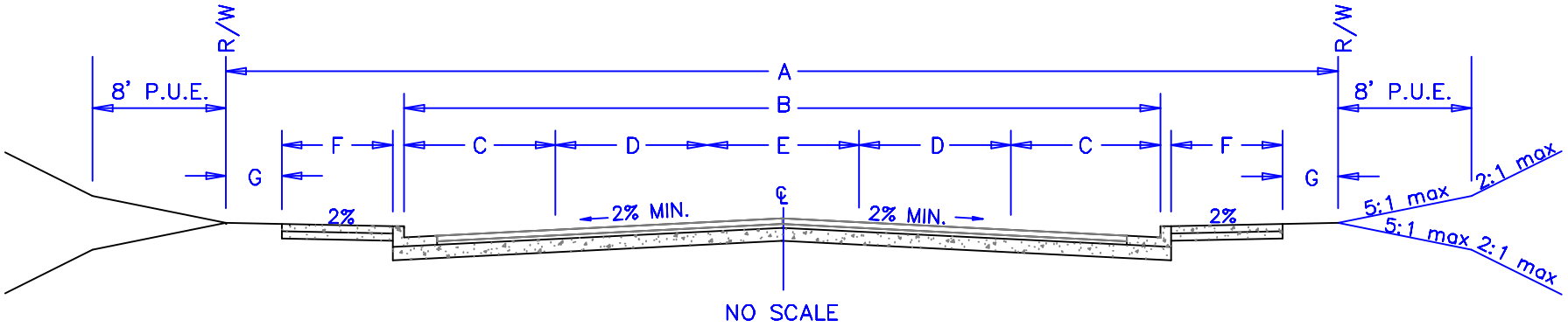
Projected traffic loadings or poor soil conditions may require a special pavement design section.

Portland Cement Concrete pavements may be substituted for the typical asphaltic concrete pavement section. The applicant shall provide the design of the PCC section.

DRAWING NO. 100 REV 3\98

FIGURE D-1

CITY OF TIGARD
TYPICAL ROAD PAVEMENT SECTION



NO SCALE

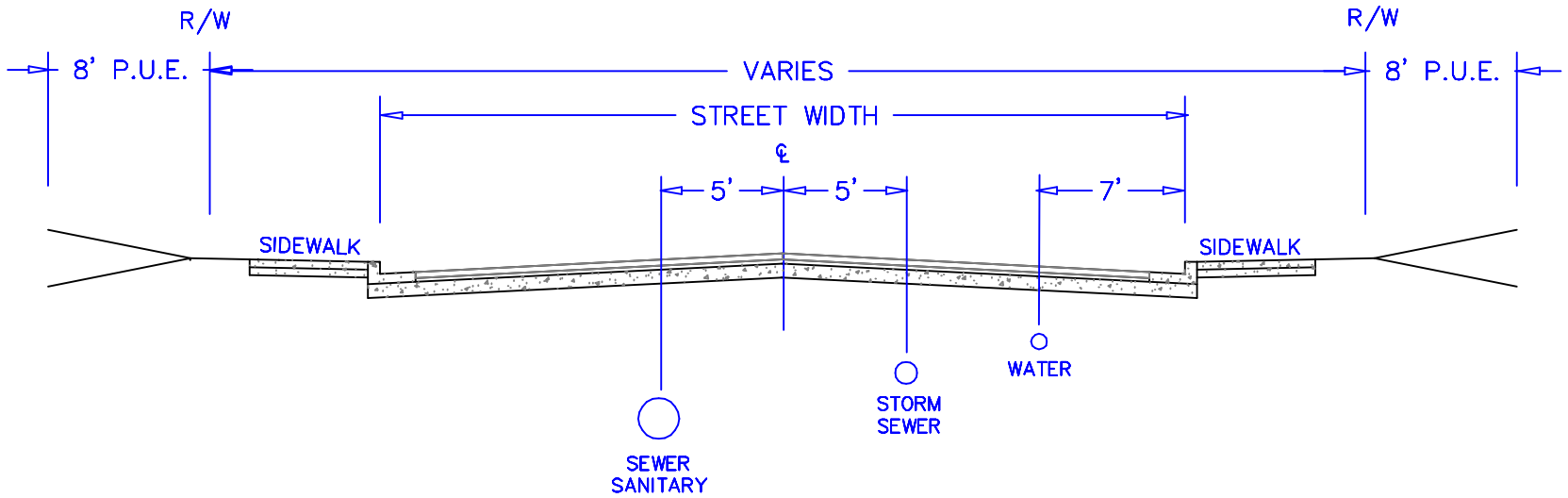
CLASSIFICATION	R/W WIDTH (MIN.)	PAVED WIDTH (MIN.)	CURB LANE	TRAVEL LANE	CENTER TURN LANE	TYPICAL AVERAGE DAILY TRAFFIC	DESIGN SPEED	(MIN.) PAVEMENT SECTION	SIDEWALK (MIN.)	SHOULDER (MIN.)
	A	B	C	D	E				F	G
ARTERIAL	60' – 90'	TRAFFIC STUDY REQUIRED	14'	12'	12'	> 6,000	45	DESIGN REQUIRED	8'	1.5'
MAJOR COLLECTOR	60' – 80'	44'	16'	---	12'	1,500 – 10,000	35	4" AC 3" (3/4"–0") 12" (2"–0")	6'	1.5'
MINOR COLLECTOR	60'	40'	14'	---	12'	500 – 3,000	25	4" AC 3" (3/4"–0") 12" (2"–0")	5'	2.5'
LOCAL (COMMERCIAL & INDUSTRIAL)	50'	34'	17'	---	---	< 1,500	25	4" AC 3" (3/4"–0") 12" (2"–0")	5'	2.5'
LOCAL (RESIDENTIAL)	50' 46' 42'	32' 28' 24'	16' 14' 12'	--- --- ---	--- --- ---	< 1,500 < 500 < 200	25	3" 1/2" AC 2" (3/4"–0") 7" (2"–0")	5'	2.5'

NOTE: RESIDENTIAL STREET WIDTH TO BE DETERMINED BY APPROVING AUTHORITY PER CDC 18.164.030.E.1

DRAWING NO. 102 REV 3\98

FIGURE D-2

CITY OF TIGARD
UTILITY LOCATION



NOTES

REFER TO UNIFIED SEWAGE AGENCY DESIGN AND CONSTRUCTION STANDARDS FOR OTHER LOCATION CRITERIA FOR SANITARY AND STORM SEWERS.

TABLE D-1

DESIGN SPEED/MINIMUM CENTERLINE RADIUS

(Standards below are proposed;
See CDC at 18.164.030 M 1 a for current standards)

DESIGN SPEED	MINIMUM CENTERLINE RADIUS (Centerline Crown)
25 MPH	166'
30 MPH	275'
35 MPH	415'
40 MPH	710'
45 MPH	930'

NOTES:

The use of superelevation will be permitted only if approved in advance. Where permitted, calculations shall be provided for the proposed centerline radius. Street curves should be designed for a maximum superelevation rate of 0.04. If terrain dictates sharp curvature, a maximum superelevation of 0.06 is justified if the curve is long enough to provide an adequate superelevation transition. The minimum superelevation shall be 0.01.

Exceptions to the centerline radius request will be considered for cul-de-sacs and low volume, local streets which serve only the immediate residences and are not a through street. See items A.2 and J.2.

TABLE D-2

DESIGN CONTROLS FOR CREST VERTICAL

CURVES BASED ON STOPPING SIGHT DISTANCE

DESIGN SPEED	K
25 MPH	20
30 MPH	30
35 MPH	40
40 MPH	60
45 MPH	80
50 MPH	110
55 MPH	110

TABLE D-3

DESIGN CONTROLS FOR SAG VERTICAL CURVES BASED ON STOPPING SIGHT DISTANCE

DESIGN SPEED	K W/O STREET LIGHTS	K WITH STREET LIGHTS
25	30	13.4
30	40	19.4
35	50	26.3
40	60	34.4
45	70	43.5
50	90	53.8
55	100	65.1

WHERE K = L = Feet
:
A Percent

A = Algebraic Difference in grades, percent.
L = Length of vertical curve, feet.

SOURCE OF TABLE D-1, 2, & 3: A Policy on Geometric Design of Highways and Streets, AASHTO, 1984, pp. 177-316.

TABLE D-4

INTERSECTION TURNING RADII (FEET)

Minimum radius along edge of pavement or curb

Street Classification	Arterial Street	Major Collector Street	Minor Collector Street	Transit* Street	Commercial Industrial Street	Local Street
Arterial Street	55	40	35	40	40	30
Major Collector Street	40	40	35	40	40	30
Minor Collector Street	35	35	30	35	30	25
*Transit Street	40	40	30	40	40	25
Commercial Industrial Street	40	40	30	40	40	25
Local Street	30	30	25	25	25	25

If bike lane or on-street parking exists, above radii may be reduced by five feet.

*Streets along Tri-Met bus routes.

2. Horizontal Alignment

Horizontal centerline alignments of improvements shall be parallel with the centerline of the right-of-way.

Centerline of the proposed street extension shall be aligned with the existing street centerline.

Horizontal curves shall meet the minimum radius requirements as shown in Table D-1.

Streets intersecting an arterial or collector street but not continuing through the arterial or collector street along the same horizontal alignment (i.e., a staggered or tee intersection) shall not be located within 300 feet of another street intersecting the opposite side of the arterial or collector street. Local street intersections shall have a minimum separation of not less than 125 feet. Intersection spacing shall be measured from the centerlines of the streets.

3. Vertical Alignment

Minimum tangent street gradients shall be 0.5 percent along the crown and curb.

Grade shall not exceed ten percent on arterials, 12 percent on collector streets, or 12 percent on any other street (except that local or residential access streets may have segments with grades up to 15 percent for distances of no greater than 250 feet).

Streets intersecting with a greater functional classification street or streets intended to be posted with a stop sign shall provide a landing averaging five percent or less. Landings are that portion of the street within 20 feet of the edge of the intersecting street at full improvement.

Grade changes of more than 1 percent shall be accomplished with vertical curves.

Street grades, intersections and superelevation transitions shall be designed to not allow concentrations of storm water to flow across travel lanes.

Offset crowns shall conform to Washington County Standard Drawing M-403.

Streets intersected by streets not constructed to full urban standards shall be designed to match both present and future vertical alignments of the intersecting street. The requirements of this manual shall be met for both present and future conditions.

Vertical curves shall conform to the values found in Tables D-2 and D-3.

Slope easements shall be dedicated or obtained for the purposes of grading outside of the right-of-way.

4. Intersections

An intersection is defined as being the meeting of two streets having at least three legs.

The interior angle at intersecting streets shall be kept as near to 90 degrees as possible and in no case shall it be less than 75 degrees. A horizontal tangent section shall be carried a minimum of 25 feet each side of intersecting right-of-way lines.

Curb radii at intersections shall be as shown in Table D-4 for the various functional classifications. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the lower classified street.

Sidewalk access ramps shall be provided at all corners of all intersections where crossing is permitted, regardless of curb type, and shall conform to the City's standard drawing.

5. Cul-de-sacs, Turnarounds, Stub Streets

The following specifies the minimum requirements for cul-de-sacs, and turnaround areas. Other turnaround geometrics may be used when conditions warrant and City Engineer approves the design and application of its use.

The minimum curb radius within the bulb shall be 40 feet. The minimum curb radius for transitions into cul-de-sac bulbs shall be 25 feet and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the road. Cross slope is limited to 5 percent.

Stub streets allow for future street extensions. A temporary, all weather turn around shall be provided at the end of stub streets that exceed 150 feet in length. Barricades shall be place at the end of all stub streets.

6. Standard Curb, Curb and Gutter, Sidewalks

Curb or curb and gutter shall be provided with sidewalks on both sides for all road classifications. Standard curbs may be used in areas with slopes greater than 1 percent gradient. Curb and gutter shall be used for grades of 0.5 percent to 1 percent. Where required the curb and gutter shall extend to the next intersection. Water meters, utility poles etc. are not permitted within sidewalks.

7. Driveways

Driveways shall conform to the City of Tigard Standard Drawing. Curb removal for driveways shall be by saw cutting.

8. Cross Section

Local Street and Commercial/Industrial functional classifications shall have a 2 percent upward grading to the right-of-way line, a 5:1 upward or downward grading within the public utility easement and no steeper than 2:1 up or down outside the public utility easement.

Cross-slope of streets shall be not less than two percent or greater than five percent. Wherever practicable, the crown of the street and top of curb shall have the same elevation.

9. Bikeways

The City based on the Tigard Pedestrian/Bike Path Plan shall determine bikeway locations. Bikeway facilities shall meet the requirements of this document and the American Association of State Highway and Transportation Officials publication, Guide for Development of Bicycle Facilities, 1991, as amended and adopted by the Oregon Department of Transportation.

A bikeway may be constructed adjacent to the curb within the pavement area.

Structural sections of bikeway facilities on streets shall conform to that of the street or be integral with the curb. Bikeways not within a street shall be constructed upon compacted subgrade that has been sterilized if an asphaltic concrete bikeway, to one of the following pavement section designs:

Four inches of asphalt concrete (full depth) or 2-1/2 inches of asphalt concrete with 4 inches of ¾"-0 rock base, or 4 inches of Portland cement concrete.

Design standards regarding horizontal alignment, grade, sight distance, intersections, signing, marking, structures, drainage and lighting shall conform to the AASHTO standards. When bikeways are integrated with a curb all inlet grates shall be designed to protect the bicyclist from the grate or opening.

10. Subsurface Drainage

Subsurface street drainage must be considered in the design of each street. Subsurface drains shall be designed and constructed per the recommendations of the soil report.

Subsurface drains shall connect and drain into the storm drainage system at catch basins, curb inlets, gutter inlets, manholes or road side ditches. Surcharge from the storm drainage system shall not be allowed to back up into the subsurface drains. Alternative subsurface drainage measures may be used if approved by the City.

11. Transitions

Street width transitions from a narrower width to a wider width shall be designed with a 3:1 taper. Delineators, as approved by the City, shall be installed to define the configuration.

Street width transitions from a wider width to a narrower width or lane alignment transition shall be designed with the length of transition taper as follows:

$L = S \times W$: for S = 45MPH or more

$L = \frac{W \times S^2}{60}$: for S less than 45

Where L = minimum length of taper (feet)
S = Design Speed (MPH)
W = EP to EP offset width

Delineators, as approved by the City, may be installed to define the configuration. Maximum spacing of delineators shall be the numerical value of the design speed, in feet (i.e., 35 foot spacing for 35 MPH).

In situations where a tapered transition cannot be provided, a barricade shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the City. The barricade shall conform to MUTCD Standards.

12. Soil Testing

Soil testing may be required to determine the soil type and strength if a pavement section design is requested due to high traffic loadings or variations in the existing subgrade soils from the typical Tigard sandy silts.

Soil sampling and pavement design shall follow the guidelines in the Washington County Uniform Road Improvement Design Standards, Section 210.

13. Final Lift of Pavement

The top lift of asphalt concrete on a newly constructed local residential street will generally not be permitted to be installed during the initial paving of the street. The top lift shall be placed within one year of the conditional acceptance of the roadway and no later than when 90 percent of the structures in the new development are completed. Class "C" asphalt concrete, as defined by APWA Standard Specifications, not less than 1-1/2" in thickness shall be applied. NOTE: The City may require the full thickness of the asphalt concrete section to be placed immediately.

14. Private Streets

The structural roadway sections for private streets shall be constructed to local street standards.

15. Street Lighting

The City minimum streetlight illumination levels are to be in conformance with the "An Informational Guide for Roadway Lighting," American Association of State Highway and Transportation Officials, 1984. Standard luminaries for public streetlighting must be of the type, spacing, and height as acceptable by PGE for operation and maintenance purposes.

16. Barricades and Guardrails

Guardrail installation shall be based on information found in AASHTO publication "Guide for Selecting, Locating and Designing Traffic Barriers."

Guardrails shall be designed and constructed per ODOT's "Standard Drawings for Design and Construction."

Barricade installation shall be based on the MUTCD (Manual of Uniform Traffic Control Devices). Basically red and white reflectorized Type III barricades shall be used at the end of a street. White and black reflectorized Type III barricades shall be used at the end of a street widening which does not taper back to the existing pavement width. White and black reflectorized Type II barricades shall be used at the end of the sidewalk or pedestrian/bike path.

17. Street Striping

The design engineer shall submit a street striping plan for projects involving street improvements. The striping plan and striping materials shall be in conformance with the MUTCD and the manufacturer's specifications. Striping material shall match either existing striping material on the roadway, or, in a case where no striping exists, conform to one of the following:

For roadway improvements constructed to ultimate width, alignment and grade, durable permanent pavement striping shall be used. The material shall be equal to or better than Dura-Stripe (90 mils thick for longitudinal lines and 120 mils thick for legends, arrows, crosswalks and stop bars), or inlaid 3M Stamark Pavement Marking Tape (A420 for stop bars and crosswalks and A380 for lane lines, legends and arrows). Inlaid tape shall be applied during the final rolling of asphalt with a finish roller.

For roadway improvements not constructed to ultimate width, alignment and grade, or where the City Engineer determines durable permanent pavement striping should not be used, painted permanent pavement striping shall be used. The materials shall either be bead binder paint conforming to ODOT Specifications, thermoplastic conforming to ODOT Specifications (for legends, arrows, crosswalks and stop bars only), or PREMARK brand conforming to manufacturers specifications (for legends, arrows, crosswalks and stop bars only).

All lane striping shall include reflector markers spaced 40 feet apart, except for turn lanes and transition areas where the reflector spacing shall be 20 feet apart.

Crosswalk stripes shall be 12 inches wide, spaced 10 feet apart, and shall extend across the entire width of the street.

Any striping, buttons or reflector markers damaged or tracked with asphalt outside the limits of the project work area shall be restored to its original condition or replaced as directed by the City Engineer at the permittee's expense.

E. EROSION CONTROL

Erosion control plans shall conform to "Erosion Prevention and Sediment Control Plans - Technical Guidance Handbook, February 1994." Unified Sewerage Agency of Washington County.

F. PUBLIC SANITARY SEWER AND STORM SYSTEM DESIGN

1. Standard Design Specifications

All public sanitary sewers and storm systems shall be designed in accordance with USA (Unified Sewerage Agency) Design and Construction Standards Resolution and Order No. as well as Washington County Uniform Road Improvement Design Standards subsections 220.3 "Hydrology" and 220.4 "Hydraulics."

2. Sewers in Easements

Sewers within easements will be permitted only upon a showing of the infeasibility of providing services from a line within a right-of-way. These sewers, where permitted, will require a 12-foot wide access sufficient to provide adequate access for maintenance vehicles.

3. Additional Storm Drain Requirements

Curved sewers are not permitted.

Where tee connections from catch basins to a main line are permitted by USA Design and Construction Standards R&O No. 96-44, any existing or anticipated upstream storm drains shall be without open culverts or other inlets not protected with a grate.

4. Additional Sanitary Sewer Requirements

4.1 Capacity

Design flows shall be determined by consideration of the following factors:

(1) Drainage basin to be served.

(2) Population within the area to be served, at the future time of full development, based upon the Tigard Comprehensive Plan.

(3) Land use within the area to be served.

(4) Per capita sewage flow.

(5) Commercial, industrial, or institutional users to be served.

(6) Infiltration allowance.

In the absence of flow data or other reliable information, the design factors from TABLE F-1 may be assumed. Appropriate peaking ratios should be applied to determine flows

.

TABLE F-1

Wastewater Flow Design Criteria

Residential	70	gpcd
Commercial	1,000	gpad
Industrial	3,000	gpad
Institutional	500	gpad
Peak Annual I/I	1,000	gpad

Ref.: USA Master Plan Update, June 1985, Table 3.2

It is recommended that design calculations include estimates of average, maximum and minimum daily flows. The submission of design calculations will not ordinarily be required, but engineers should be prepared to substantiate pipe sizes, layout, population estimates, land uses or other design assumptions as may be requested.

4.2 Work on Existing Sewers

(1) Insert-a-Tee type couplings are required to connect side sewers to existing concrete lines.

(2) A detail drawing showing the steps, bench, and proposed connection is required for connections to existing manholes.

4.3 Side Sewer Connection

(1) Channels shall be provided for each side sewer connected to a manhole.

(2) Side sewer connections at a cleanout are not permitted.

G. WATER DISTRIBUTION

1. General

These standards and Division 4 of the APWA Standard Specifications set forth the requirements for the installation of water distributions facilities within the City's service area. The Tualatin Valley Water District as shown on Map G serves a portion of the City.

Dead-end mains normally will not be allowed, but when permitted, a blowoff assembly will be required. Water mains shall extend just outside the edge of pavement to facilitate future extensions. City policy is to provide water service at a minimum of 50 psi. Available pressure may fall outside of this range depending on geographic features within a particular pressure zone. Developers will be responsible for construction of a facility (i.e. vault to house pressure reducing valves (values to be provided by City) to reduce design pressure when pressure exceeds 110 psi.

All work shall be in accordance with American Water Works Association standards.

2. Design

2.1 System Design

The City will provide required line sizes and connection points. Other required lines shall be designed to supply the required fire flow, associated demands and future development.

2.2 Component Location

Main Lines: South or East Side of street to the extent practical without crossing centerline. Minimum cover over the pipe is 36 inches. The project engineer is responsible for the design of the pipe to insure maximum pipe joint defection is not exceeded.

Valves: Beginning and endings of curb returns at intervals that provide for the isolation and purging of air from lines, in lengths not exceeding 500 feet, by operating not more than three valves. Also install on line ends intended for future extension.

Fire Hydrants: Generally at beginning or ending of curb returns and as required so that no part of any single-family building is greater than 500 feet from a hydrant and no part of any commercial, industrial or multiple-family building is greater than 250 feet from a hydrant, both as measured along the most practical accessible route as determined by the Fire Marshall.

3. Materials

General: All material shall be new and manufactured in USA (No rebuilt, reconditioned or used material will be allowed) 10” and 14” pipe are not permitted.

Pipe: Ductile iron, Class 52, with Tyton joints. As manufactured by US Pipe andFoundry, Pacific States Pipe.

Approved Alternate: American Darling Pipe, class 52 with push on type joints.

Valves: Resilient seat gate valves for 8” or smaller pipe and butterfly valves for larger pipe.

Fittings: Cement lined ductile iron with mechanical joints to comply with AWWA unless otherwise specified hereinafter, or approved by the City Engineer.

Fire Hydrants: Modern Mueller Centurion, # A-442; Mueller Centurion A423; Waterous Pacer # WB67 or Clow Medallion # 2646-5B, with:

6" MO; 5¼ " MVO; 3 Port (2 – 2½" NST hose connection and 1, 4-½ " NST pumper connection); 1½ Pentagon operating nut; open left; color yellow.
Fire Hydrant Assembly tee: MJ x 6" flg
gate valve: 6" flg x MJ
holding spool: 6" MJ x MJ or 6" Class 52 ductile iron with MJ restraints (Megalugs by Ebba Iron Foundries)

Air and Vacuum Release Valves: APCO heavy-duty combination air release valve as manufactured by Valve and Primer Corporation, Chicago, Illinois or equal. Model No. 143C and 145C for 1” and 2” sizes respectively.

Sampling Stations: Eclipse No. 88 Sampling Station manufactured by Kupferle Foundry, St. Louis, MO 63102. The sampling station shall be 2’-0” bury with a 3/4” FIPT inlet, and a 3/4” unthreaded hose nozzle. All stations shall be enclosed in a locatable, non-removable, aluminum-cast housing. When opened, the station shall require no key for operation, and the water will flow in an all-brass waterway. All working parts will also be of brass and be removable from above ground with no digging. A copper vent tube (standard) will enable the station to be pumped free of standing water to prevent freezing, and to minimize bacteria growth. The exterior piping will be brass, and a 1/4” ball valve shall be provided in place of the 1/4” petcock on the vent pipe.

4. Installation

All curbs shall be in place before beginning any work unless bedrock is encountered.

The City will install services 2 inch or less. Provide installation location by marking property corner with a hub and guard stake. The owner shall install larger services.

City will install all copper services and sampling stations before utility work and placement of the final lift of asphalt. The City upon individual request and payment will install water meters by others (owners). All water meters connected to an

irrigation system must have the proper Oregon State Approved backflow prevention device (minimum of a Double Check Value Assembly) installed on the property side of the meter. The backflow prevention device shall be installed and tested by owner, with the results forwarded to Public Works, before water service can begin.

Upon completion of installation of the water system, advise the City of the total construction costs to which will be added ten percent for City inspections, water loss, overhead, administration, sampling, etc. and two percent for engineering review, including "as-built" drawings, updating master map, intersection maps, etc.

Operation of valves is by Public Works only.

5. Cross Connection Control and Backflow Assemblies

All commercial, multi-family, industrial, and institutional services, regardless of size shall have the proper Oregon State approved backfill prevention device (min. double check valve assembly installed on the property side of the meter.

Backflow prevention in accordance with Appendix I and OAR 333-61-070 shall be installed and approved before service will be provided.

The backflow prevention device shall be installed and tested by owner, with the results forwarded to Public Works, before water service can begin.

6. Disinfection

Upon satisfactory completion of testing, the new mains and connections to existing mains shall be cleaned and flushed with potable water prior to disinfection. Flushing velocities shall be at least 2.5 feet per second. Disinfection shall be in accordance with AWWA Standard C65-92, the State Health Division and City requirements. The continuous feed method of disinfection shall be used. Disinfecting mixture shall be a chlorine-water solution having a free chlorine residual of 40-50 ppm. The disinfection mixture will be prepared by injecting a calcium sodium hypochlorite and water solution in to the pipeline at a measured rate while fresh (potable) water is allowed to flow through the pipeline so that the chlorine-water solution is of the specified strength. Treated water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. Typical retention period is 24 hours. At the end of the 24-hour period, the pipeline is to have a chlorine level of at least 10 ppm. After chlorination, flush the water from the line until the water throughout the pipeline is equal chemically and bacteriological to the permanent source of supply.

Dispose of the disinfection water in an approved manner. Do not allow disinfection water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine residuals to a safe level as mandated by DEQ. After disposal and flushing of the disinfection solution, there will be another 24-hour retention period prior to the taking of water samples for bacteriological testing. Bacteriological tests will be taken by the City.

7. Easements

When it is not possible or practical to install the main within a dedicated public street, an easement shall be provided. In general, a 15-foot wide easement will be adequate where vehicular access is not necessary and 20-foot wide easement will

be required if vehicular access is necessary. The easement will state that any damage resulting from a mainline break in the easement will not result in liability to the City.

8. Repair of any Damage to the City's Facilities

Repair of any damage to the City's facilities (including buried water lines, valve boxes, meter boxes, combination air and vacuum release valves, etc.) shall be made at contractor's expense. The City, at its option, may make the repair to facilitate maintaining service. In this instance, the contractor will be billed for repairs on a time and materials basis.

9. Relocation Design Work

Any relocation work within existing right-of-way that is a requirement of the development, will be performed by the developer at the developer's expense.

10. Pressure Testing

Testing Pressure: 150 psi or 1.5 times the static pressure, whichever is greater.

Permitted Pressure Loss: 5 psi in one hour.

Insert Tigard Water District Area MAP G

H. SURVEYING

1. General

This document, Section 105 of the APWA specifications and ORS 209.140-150, define the requirements for protection of existing survey monuments during any construction and setting new survey monuments following construction.

2. Existing Survey Monuments

Any person or public agency that finds it necessary to interfere with or place over any established public land survey corner or accessories for any reason shall notify the County Surveyor prior to the interference. The County Surveyor shall reference the monument prior to construction and replace it following construction. The County Surveyor shall be reimbursed for all expenses from said replacement by the party responsible for the construction.

In accordance with ORS 209.150, any person or public agency removing, disturbing or destroying any survey monument of record in the office of the County Surveyor shall cause a registered Professional Land Surveyor to file a reference with the County Surveyor and replace the monument with 90 days of the removal, disturbance, or destruction. Failure to comply with this provision is subject to penalty according to ORS 209.990.

3. New Survey Monuments

Street Centerline Monumentation shall be in accordance with ORS 92.060 Subsection (2) and/or 209.15 Section 2. The centerlines of all street right-of-way shall be monumented before the City shall accept a street improvement. Monuments shall be set under the direction of a registered Professional Land Surveyor. A record of survey must then be filed in compliance with ORS 209.250 and any additional requirements set forth by the City.

All centerline monuments shall be placed in a monument box conforming to City standards and the top of the box shall be set at design finished grade. Monument boxes shall be of a type approved by the City before installation. See City standard drawings.

The following centerline monuments shall be set:

(a.) At centerline intersections created with existing streets, when the centerline alignment of the existing street has been established by or for the City.

(b.) The centers of all cul-de-sacs.

(c.) Curve points in accordance with *ORS 92.06 and 209.15*. P.I.'s may be monumented in lieu of P.C.'s and P.T.'s when the P.I. falls in the pavement.

All sanitary and storm sewers shall be placed in positions that do not interfere with centerline monumentation.

I. STRUCTURAL DESIGN

Structures not included in the Standard Drawings of this document shall be designed and constructed in accordance with the requirements of the Structural Design Section of ODOT. These Standards are referenced in ODOT's *Bridge Design Manual and Accompanying Standard Drawing, Standard Specifications for Highway Construction, and Standard Drawings for Design and Construction.*

The project special provisions shall specify the APWA or ODOT requirements for bridges and other structures that apply to the specific project.

J. DESIGN MODIFICATIONS

1. General - Request to Modify Specifications/Standards

Modifications to specifications or standards may be requested as follows. It is to be noted that if the requested modification involves public safety, the City will rule in the direction of safety.

2. Modification Process

2.1 Submittal

Requests to modify shall be submitted in writing to the City Engineer. This written request shall state the desired modification, the reason for the request and a comparison between the specification/standard and the modification as far as performance, and maintenance requirements.

Any modification or variance of these Standards should be documented and reference nationally accepted specifications/standards. The use thereof shall not compromise public safety or intent of the City's standards.

2.2 City's Review

The request to modify shall be reviewed by the City Engineer who shall make one of the following decisions:

Approve as is, approve with changes, or deny with an explanation.

Approval of a request shall not constitute a precedent.

2.3 Appeal

Applicant may appeal the City Engineer's decision to the Council as provided in the Community Development Code.

2.4 Criteria for Modification of Specification Standards

The City Engineer may grant a modification to the adopted specifications or standards when any one of the following conditions are met:

(a) The specification or standard does not apply in the particular application.

(b) Topography, right-of-way or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative that can accomplish the same design is available. Variances to self-imposed hardships shall not be allowed. The variance requested shall be the minimum variance that alleviates the hardship.

(c) A minor change to a specification or standard is required to address a specific design or construction problem which, if not enacted, will result in an undue hardship.

(d) An alternative design is proposed which will provide a plan equal or superior to these standards. In considering the alternative, the City Engineer shall consider appearance, durability, cost of maintenance, public safety, and other appropriate factors.

K. CONSTRUCTION INSPECTION

1. General

All public construction shall be inspected by an Oregon registered engineer or a qualified individual under his supervision as required in the Developer - Engineer Agreement (Appendix. B).

An engineer whose firm, or any member of the firm, has a corporate, partnership or any form of real property interest in the development for which the improvements are required cannot be designated inspecting engineer. The inspecting engineer's relationship to the project must be solely that of a professional service nature.

It shall be the policy of the City not to provide full inspection services for non-public funded public improvements. However, the City may perform limited inspection services upon request if the project scale is such that the retention of a private inspecting engineer is not warranted. These inspection requirements are not applicable to individual sidewalk, driveway or utility permits.

2. City Activities

Inspecting services provided by the City include:

- Liaison between the inspection engineer and the City
- Monitoring of work progress and performance testing as deemed desirable
- The performance of administrative and coordinate activities as required to support the processing and completion of the project
- The issuance of stop work orders upon notifying the inspection engineer of the City's intention to do so
- Primary inspection of public water lines

3. Inspecting Engineer's Activities

The following minimum activities are required of the designated inspecting engineer:

a. *Execute a form accepting responsibility. (Appendix B)

b. Maintain a project log book which contains at least the following information:

(1) Job number and name of engineer and designees
(2) Date and time of site visits
(3) Weather conditions, including temperature
(4) A description of construction activities
(5) Statements of directions to change plans, specifications, stop work, reject materials or other work quality actions
(6) Public agency contacts which result in plan changes or other significant actions
(7) Perceived problems and action taken
(8) General remarks
(9) Final and staged inspections
(10) Record all material, soil and compaction tests

c. The inspecting engineer shall obtain and use a copy of City-approved construction plans and specifications.

d. Review and approve all pipe, aggregate, concrete, AC and other materials to ensure their compliance with City standards.

e. *Approve all plan or specification changes in writing and obtain City approval.

f. Monitor and concur in construction activities to ensure end products meet City specifications.

g. *Perform or have performed material, composition and other tests required to ensure City specifications are met.

h. Periodically check that curb, storm sewer work and pavement grades are in accordance with approved plans.

(1) For pavement construction, perform the following stage inspections and record date of each:
(2) Curbs are built to line and grade
(3) Subgrade meets grade and compaction specifications
(4) Base rock meets grade and compaction specifications
(5) Leveling course meets grade and compaction specifications
(6) Wearing course meets grade and compaction specifications

i. For sewer construction, perform the following stage inspections and record the date of each:

(1) Sewers are installed to proper line and grade
(2) Trenches are properly backfilled and compacted
(3) Construction staking is adequate to ensure that the sewer is properly installed with respect to easement, right-of-way, and property lines
(4) Air testing and video inspections are performed according to standard procedures

j. For grading, ensure that the grading plan, as staked, will result in acceptable slopes along exterior property lines, proper on and offsite drainage; and erosion control.

k. *Periodically certify to the City the amount of work completed to enable release of moneys or a reduction of assurance amount.

l. File a completion report which contains:

(1) The original of the project completion certification
(2) A complete copy of the log book initialed by the inspecting engineer
(3) A complete set of as-built mylar plans, including diskette in "DWG" or "DXF" format if plans were prepared with the use of CAD
(4) The results of material tests, compaction tests and soil analysis as detailed in the log book

m. Call to the City's attention within two working days all plan changes, material changes, stop work orders or errors or omissions in the approved plans or specifications.

n. Notify the City 24 hours before the start of construction or resumption of work after shutdowns, except for normal resumption of work following Sundays or holidays.

* The inspecting engineer of record must be registered to practice engineering in the State of Oregon. The engineer must personally perform all activities marked by an (*) and must supervise all individuals performing delegated activities. Material testing not performed by the inspection engineer must be accomplished by a recognized testing firm or another registered engineer.

APPENDIX A - Maps Available

CITY OF TIGARD DEPARTMENT OF COMMUNITY DEVELOPMENT

Revised: May 1, 1991

VARIABLE SCALE	PRICE	SHEET SIZE
As-Built construction Drawings	$2.00	24 X 36
Assessor's 'Tax' Maps (photocopy of a portion of map	.25	8-1/2 X 11
Assessor's 'Tax' Maps (copy of full map)	$2.25	18 X 24
Subdivision Plat Maps	$2.00	18 X 24
SERIES 1" = 100' (quarter section map)		
Orthophotographs (94 Sheets)	$5.00	30 X 42
Topographic Maps (94 Sheets)	$5.00	30 X 42
SERIES 1" = 200' (section maps)		
Address/City Limits Maps (17 Sheets)	$3.50	30 X 42
Annexation and Road Jurisdiction/	$3.50	30 X 42
Acceptance (17 Sheets)	$3.50	30 X 42
Parcel Base (23 Sheets)	$3.50	30 X 42
SERIES 1" = 400' (4 sheets)		
City Limits	$3.50	36 X 40
Parcel Base	$3.50	36 X 40
Sanitary Sewer As-Built Index	$3.50	36 X 40
Sanitary Sewer Mainline System	$3.50	36 X 40
SERIES 1" = 800'		
City Limits	$4.00	36 X 48
Inventory: Buildable Lands -		
(Commercial/Industrial Lands)	$4.00	36 X 48
Land Use (Comprehensive Plan Map)	$4.00	36 X 48
SERIES 1" = 800' (continued)		
Voting Precincts	$4.00	36 X 48
Wetlands and Floodplains (Comprehensive Plan Map)	$4.00	36 X 48
Zoning Districts (Comprehensive Plan Map)	$4.00	36 X 48
SERIES 1" = 1600'		
Bike Path Plan	No Cost	17 X 22
Street Index	$4.00	24 X 36
Vertical Network Bench Mark Control	$2.00	24 X 36
Transportation Plan (Comprehensive Plan Map)	$2.00	24 X 36
Voting Precincts	$2.00	24 X 36

Note: Maps are priced by page size or cost of acquiring from Washington County.

APPENDIX B - Developer - Engineer Agreement

City Engineer
13125 SW Hall Blvd.
Tigard, OR 97223

RE:

Dear City Engineer:

We hereby certify that _____ has been retained by _____ to perform or coordinate the following work pertinent to the above project.

1. Perform or coordinate the surveying or verify the existing surveying information as necessary for the design.

2. If necessary, provide for the expertise of other engineers such as soils or structural engineers.

3. Prepare construction drawings in accordance with the City standards and obtain the City, and if applicable, DEQ, County, or State approval of such drawings.

4. Supply construction staking.

5. Provide adequate inspection to assure compliance with City Specifications, and keep accurate field notes in order to prepare "as-built" drawings. The following <u>minimum</u> activities are required of the designated inspecting engineer:

   A. *Execute a form (this form) accepting responsibility.

   B. Maintain a project logbook that contains at least the following information.

      (1) Job number and name of engineer and designees;

      (2) Date and time of site visits;

      (3) Weather conditions, including temperature;

      (4) A description of construction activities;

      (5) Statements of directions to change plans, specifications, stop work, reject materials or other work quality actions;

      (6) Public agency contracts which result in plan changes or other significant actions;

      (7) Perceived problems and action taken;

      (8) General remarks;

      (9) Final and staged inspections;

      (10) Record all material, soil, and compaction tests.

C. The inspection engineer shall obtain and use a copy of City-approved construction plans and specifications.

D. Review and approve all pipe, aggregate, concrete, AC and other materials to ensure their compliance with City standards.

E. *Approve all plan or specification changes in writing and obtain City approval.

F. Monitor and concur in construction activities to ensure end products meet City specifications.

G. *Perform or have performed material, composition, and other tests required to ensure City specifications are met.

H. Periodically check that curb, storm sewer work and pavement grades are in accordance with approved plans.

I. For pavement construction, perform the following stage inspections and record date of each:

(1) Curbs are built to line and grade;

(2) Subgrade meets grade and compaction specifications;

(3) Base rock meets grade and compaction specifications;

(4) Leveling course meets grade and compaction specifications;

(5) Wearing course meets grade and compaction specifications.

J. For sewer construction, perform the following stage inspections and record the date of each:

(1) Sewers are installed to proper line and grade;

(2) Trenches are properly backfilled and compacted;

(3) Construction staking is adequate to ensure that the sewer is properly installed with respect to easement, right-of-way, and property lines;

(4) Air testing and video inspections are performed according to standard procedures.

K. For grading, ensure that the grading plan, as staked, will result in acceptable slopes along exterior property lines, proper on and offsite drainage; and erosion control.

L. Certify to the City the value of and amount of all work remaining to be completed to enable release of moneys or a reduction of assurance amount.

M. File a completion report which contains:

(1) The original of the project completion certification;

(2) A complete copy of the log book initialed by the inspecting engineer;

(3) A complete set of as-built mylar plans, including a diskette in "DWG" or "DXF" format if the plans were prepared with the use of CAD;

(4) The results of material tests, compaction tests, and soil analysis as detailed in the logbook.

N. Call to the City's attention within two working days all plan changes, material changes, stop work order or errors or omissions in the approved plans or specifications.

O. Notify the City 24 hours before the start of construction or resumption of work after shutdowns, except for normal resumption of work following Sundays or holidays.

*The inspecting engineer of record must be registered to practice engineering in the State of Oregon. The engineer must personally perform all activities marked by an (*) and must supervise all individuals performing delegated activities. Material testing not performed by the inspection engineer must be accomplished by a recognized testing firm or another registered engineer.

6. Upon completion of construction, provide written certification that all improvements are complete in accord with the approved plans and specifications.

7. Obtain City approval prior to any substantial deviation from the approved plans.

8. Resolve engineering and construction related problems as may arise.

We agree to notify the City immediately if the above agreement is terminated or if the engineer for any reason is unable to perform the above duties.

By: _____ By: _____

(Developer) (Engineer)

_____ _____

(Date) (Date)

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APPENDIX C - Plan Submittal Check List

CITY OF TIGARD

A. GENERAL REQUIREMENTS

- Approved Application Completed
- Notice of Decision Conditions Met
- Soils Report/Subgrade Evaluation
- Hydraulic Report Calculations and Hydrology
- Erosion Control Plan
- Traffic Report
- Proof of Utility Coordination
- Quantities/Cost Estimate
- Design Plans
  - Cover-Site, Vicinity, Abbreviation, Legend
  - Street (Plan and Profile)
  - Water, Storm and Sanitary (Plan and Profile), Water Quality Facilities
  - Electricity, Phone, Gas crossings on storm and sanitary plans and profiles
  - Grading
  - Landscaping
  - Structures
  - Composite Utility Plan
  - Details
  - Traffic Control
  - Signing and Striping
  - General Notes
- Format
  - 24" x 36" Sheet Size
  - Scale
  - North Arrow
  - Bench Mark
  - Title Block (Engineer., Owner, Project, Sheet)
  - PE Stamp
  - Revisions
  - Dated

PLAN VIEW

- R/W, Property Lines Survey Monuments (Existing & Proposed)
- Easements (Slope, Utility, Access)
- Subdivision Name, Lot #, Tract Lines, Street Names
- Centerline with stationing (Existing & Proposed)
- Curb & Sidewalk (including. Ramps & Drawings & Elevations)
- Horizontal Curve Data (including curve radius, length and delta with elevations at ¼ deltas)
- Match Lines (with Reference Number Sheet)
- Survey (Existing & Proposed)
- Toe & Top of Slope
- Pedestrian/Bicycle Path

- Cross Section Locations
- Mailboxes
- Drainage Arrows
- Crown lines (except centerline)
- Intersection centerline stationing
- Existing Features (Adjusted, Removed, Relocated, Remain)
- Utilities (Existing & Proposed)
  - W, SS, SD, G, T, E, TV
  - Vaults & Conduit Type
  - Streetlights, Junction Boxes
  - Connections, meters, MH, CB, etc.

- Traffic Control
  - Signing & Striping (Construction. & Permanent)
  - Phased Construction Plan
  - Signal Details
  - Barricades

- Grading Plan
  - Contours (Existing/proposed)
  - Sedimentation Control
  - Cross Sections
  - Erosion Control (Structures & Planting)
  - Trees & Shrubs (Existing & to be removed))
  - Roof Drainage
  - Building Pad and finish floor Elevations

C. PROFILE VIEW

- Street name (Utility Type)
- Station Grade and Elevation (PC, PT, PI, INTX, high point, low point, grade break)
- Vertical Curve Data (K, grade change, elevation., BVC, PIVC, EVClength)
- Ground at centerline and R/W (Existing & proposed)
- Extend Profile 300' (Street, Utility)
- Utility Profile (Storm, Water, and Sanitary) invert and rim elevation
- Utility Crossing, (SS, SD, W, G, E, T, TV)
- Curb Return Profile
- Grade breaks
- Backfill class, lengths
- Pipe class, lengths
- Scale (Horizontal & Vertical)

D. GENERAL NOTES

- Typical Specifications, Standard Details (City, County, State)
- Applicable utility standards
- Special site conditions
- Compaction requirements
- Erosion control methods, time limits
- Tree cutting allowed
- Construction methods (limits, time and physical)

- Utility coordination
- Testing and inspection requirements (soil, pipe, waterline)
- Offsite roads clean and dust control
- Existing utility location verification
- Material specifications (e.g. concrete, pipe)
- Cut and fill requirements
- Benchmark
- Demolition
- Restoration of site
- Contractor securement of permits

E. CALCULATIONS

- Storm drainage
- Drainage basin contour map
- Offsite drainage
- Inlet capacity vs. actual flow
- Floodplain location
- Under drain requirements
- Traffic study/impact (ADT, Speed, Classification)
- Pavement section
- Quantity/Cost Estimate

F. TYPICAL DETAILS

- Typical road section, right-of-way to right-of-way, and slope to original ground, including typical utility locations
- Utility details (W, SS, SD, E, G, T, TV)
- Manhole, catch basin, trench, inlet/outlet structures
- Fire hydrant, trench intersection
- Landscaping
- Sidewalk, Driveway, Curb
- Special details, structures
- Survey monument box

APPENDIX D - General Conditions

RE: _____

✓ 1. The City's standard specification for traffic control is "Manual on Uniform Traffic Control Devices For Streets and Highways", U.S. Dept. of Transportation, FHWA, 1988 Ed.

✓ 2. Traffic control shall be provided for by the contractor in accordance with the City's standard specification and, also, in accordance with a City (job specific) approved traffic control plan. A copy of the approved traffic control plan shall be available at the work area.

✓ 3. Public roadway shall not be closed to traffic, at any time, without having first obtained written approval from the City Engineer. The permit holder is responsible for provision of timely notification of traffic flow disruptions to area wide Emergency Services (Tigard Police Dept., Tualatin Fire & Rescue) and to Tri-Met and Tigard and Beaverton School District.

✓ 4. Advance warning of imminent traffic disruption shall be provided to the general motoring public by placement of an advance notification sign at each end of the construction area 72 hours (min.) before initiation of construction work.

✓ 5. Access to existing properties shall be maintained at all times, including normal delivery service and mail service and if not, shall be cause for work stoppage until effective access is established.

✓ 6. Traffic control devices, flagpersons, etc., shall be in place prior to initiation of construction work and shall be effectively maintained.

✓ 7. No work will be permitted during the hours of darkness, nor between 9:00 p.m. to 7:00 a.m., Monday through Friday nor between 9:00 p.m. to 8:00 a.m. Saturday, nor between 9:00 p.m. to 9:00 a.m. Sunday.

✓ 8. Minimum travel lane width shall be twelve (12) feet; pedestrian travel shall also be provided for.

✓ 9. The City reserves the right to add to or modify traffic control requirements as may be necessary to effectively control traffic and to assure public safety.

✓ 10. Before initiating any construction activity, the permit holder shall contact the City's private Development Review Engineer, (#639-4171) to establish a place, time, and date for a pre-construction meeting.

✓ 11. The permit holder or his contractor shall notify the City's Inspector at 639-4171 twenty-four (24) hours prior to commencing work, twenty-four (24) hours prior to any staged inspection (see attached listing) and after completing work covered by the permit.

✓ 12. A copy of the permit and all attachments, and a copy of the approved construction plan and all amendments shall be available at the work area. All work shall conform to the permit terms, conditions and provisions and to the City approved permit plans, and approved plan amendments and to the City's standards and

specifications and to these General Conditions. Changes to any of the aforesaid must be approved by the City, in advance of work performance.

✓ 13. Maintenance of the work area and approach roads is the responsibility of the permit holder. The work area and approach roads shall be maintained in a clean condition, free from obstructions and hazards. A copy of the permit holders Certificate of Insurance shall be available at the work area.

✓ 14. The spreading of mud or debris or storage of materials or equipment of any kind upon any public roadway is strictly prohibited and violation shall be cause for immediate cancellation of the permit. The City may at any time order immediate clean up and stoppage of work to accomplish clean up.

✓ 15. Effective erosion control is required. Erosion control devices must be installed and maintained meeting the D.E.Q. requirements. The City may at any time order corrective action and stoppage of work to accomplish effective erosion control.

✓ 16. Property disturbed by construction activity shall be seeded with a standard grass mix; shrubs, flowers, barkdust, existing signs, pavement markings, mailboxes, etc. shall be reestablished, reinstalled or replaced, with like kind and material.

✓ 17. Effective drainage control is required. Drainage shall be controlled within the work site and shall be so routed that adjacent private property, public property and the receiving system is not adversely impacted. The City may at any time order corrective action and stoppage of work to accomplish effective drainage control.

✓ 18. Excavator(s) must comply with O.R.S.757.541 through 757.571; excavator(s) shall notify all utility companies for line locations 72 hours (min.) prior to start of work. Damage to utilities shall be corrected at the permit holders' expense.

✓ 19. Contractor must verify all existing utilities for both vertical elevation and horizontal location prior to start of work (pothole before digging if necessary). Should conflicts arise and redesign or relocation of facilities be necessary, it shall be done at the permit holders expense. Changes must be approved by the City in advance of work performance. Contractor shall coordinate the work with affected utility agencies.

✓ 20. A temporary hard-surface patch (Cold mix AC or Hot Mix base paving) shall be placed on trenches within roadways at the end of each days work. No trench, on site or off-site, shall be left at any time in an unsafe condition. The permit holder is responsible for and is liable for hazards or damage resulting from the prosecution of the work.

✓ 21. Work provided for under the permit shall include repair of existing facilities (roads, ditches, etc.) as may be necessary, in the City Inspectors opinion, to overcome deterioration or damage which occurred in conjunction with the work authorized by the permit. Corrective work shall be done at the permit holders' expense.

✓ 22. One as-built mylar drawing showing all new public improvements, including any revision made to the previously approved construction plans and, also, any improvement which may impact an existing public system or facility, shall be provided to the City by a registered civil engineer along with an engineers certification of installation compliance (form attached).

✓ 23. A sewer system air-test and (V.H.S.) TV test report and one set of blueline "As-Builts" (of either or both the storm and sanitary sewer systems) may be required by the City for review and approval prior to connection of any buildings to the sewer system.

✓ 24. The permit holders Engineer/Inspector shall submit daily inspection reports, on a weekly basis, to the City's Inspector. (see Developer - Engineer Agreement Note # 5.)

✓ 25. The City's Inspectors may, at their discretion, require provision of tests and or reports from the permit holder, permit holders engineer or contractor to validate claims of material or construction adequacy/compliance. Such tests/reports shall be provided at the permit holders' expense.

✓ 26. The permit holder shall provide a copy of a properly executed Release and Waiver document to the City for each ownership disturbed by construction activity, as evidence of disturbance resolution and owner satisfaction.

✓ 27. Existing monuments, property corners, and survey markers shall be protected. Replacement shall be at the permit holders' expense.

✓ 28. The Engineer shall notify the Washington County Surveyor when the initial and final lift of asphalt has been placed.

✓ 29. The permit holder shall provide to the City inspector, in writing, the names and 24 hour emergency telephone number of two (2) persons who have authority to resolve problems, take corrective action and, in general, will be responsible in case of any emergency. The permit holder shall notify the City Inspector, in writing, of any/all assignment changes.

✓ 30. The permit holder shall cause his contractor to provide to the City Inspector, in writing, the name and 24 hour emergency telephone number of a designated "Competent Person" responsible for construction safety as per OR-OSHA, Chap. 437, Div. 3 Construction, Sub-division P - Excavations. The contractor shall notify the City Inspector of any/all assignment changes.

✓ 31. It is the sole responsibility of the permit holder to provide for proper right-of-entry and/or easements prior to starting work. Proof of right-of-entry or properly executed easements, shall be provided to the City. The City shall in no way be construed to be liable for the permit holders failure to obtain or provide for proof of right-of-entry or easements.

✓ 32. Before placement of the final lift of asphalt, the permit holder shall clean and have the City complete a pre-acceptance video inspection of all new sewer lines. The permit holder shall provide the City with 30 days of notice for the video inspection. Any deficiencies shall be repaired before placement of final lift.

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APPENDIX E - Water Construction Notes

1. An estimated 12 percent of the water system cost must be on deposit prior to beginning construction on water lines, and to receive a TPW (City of Tigard Public Works, Water Division) stamped approval on construction plans.

2. The contractor shall maintain one set of TPW stamped approved plans on the construction site at all times.

3. Curbs must be in place prior to installation of water mains within new subdivisions.

4. Notify TPW, Water Division, 48 hours prior to commencing construction to schedule a pre-construction meeting. Telephone 639-4171.

5. All work shall be in accordance with AWWA (American Water Works Association) standards.

6. All work will be inspected and approved by TPW, Water Division.

7. All pipe and fittings shall be ductile iron, cement-lined, of new manufacture and made in the USA. Pipe shall be "Tyton" Joint Ductile Iron, Class 52. All fittings shall be MJ (mechanical joint) unless otherwise specified.

8. Cover for all water mains in street and rights-of-way shall be 36". Backfill shall be ¾"-0" gravel.

9. All valve-operating nuts shall be within 36" of finished grade, otherwise valve operating nut extensions will be required.

10. Poured concrete thrust blocks of at least eight square feet of bearing surface are required at each tee, cross, and bend locations (see details for minimum bearing areas).

11. A 4" x 4" x 8'-0", painted blue, shall be installed in front of every 2-inch water service location, and remain there until the water meter is installed. All 2-inch water services shall consist of a MJ x 2" IPT tee and 2" IPT x 110 compression fitting as manufactured by Mueller Company.

12. Fir hydrant assembly consists of a MJ x 6" Flg. (Flange) tee, 6" Flg. x MJ gate valve, 6" MJ x MJ holding spool, and a Modern Mueller Centurion fire hydrant, A-442, 6" MJ, 5-1/4" MVO, 3-port (2-2½" NST hose connection, 1-4½" NST pumper), 1½" pentagon operating nut, opening left, color: yellow; Approved Equal: Mueller Centurion A-423, Waterious Pacer 6790, Clow Medallion

13. Each fire hydrant shall be installed upon a pre-formed concrete block with 1½ cubic yards of crushed 2" – ¾" drain rock. Tarpaper will be laid on top of the drain rock to separate the rock from earth cover.

14. All sanitary sewer lines within 10 feet laterally or 3 feet vertically of a water main shall be encased in a reinforced concrete jacket 6" thick for a distance of 10 feet on both side of the crossing. Where crossings are necessary, they must be made at approximately 90 degrees with at least 18" of separation below the water line.

15. All mains with a static pressure up to 100 psi (pounds per square inch) shall be tested at 150 psi for 1 hour with a maximum loss of 5 psi. Water mains with a static pressure

greater than 100 psi shall be pressure tested at 1.5 times the static pressure for 1 hour with a maximum loss of 5 psi.

16. Upon satisfactory completion of testing, the new mains and connections to existing mains shall be cleaned and flushed with potable water prior to disinfection. Flushing velocities shall be at least 2.5 feet per second. Disinfection shall be in accordance with AWWA Standard C651-92, the State Health Division and City requirements. The continuous feed method of disinfection shall be used. Disinfecting mixture shall be a chlorine-water solution having a free chlorine residual of 40-50 mg/l (milligrams per liter). The disinfection mixture will be prepared by injecting a calcium/sodium hypochlorite and water solution into the pipeline at a measured rate while fresh (potable) water is allowed to flow through the pipeline so that the chlorine-water solution is of the specified strength. Treated (chlorinated) water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. Typical retention period is 24 hours. At the end of the 24-hour period, the pipeline is to have a free chlorine residual of a least 10 mg/l. After satisfactory chlorination, flush the water from the line until the water throughout the pipeline is equal chemically and bacteriologically to the permanent source of supply.

    Dispose of the disinfection water in an approved manner. Do not allow disinfection water to flow into a waterway without adequate dilution or other satisfactory methods of reducing chlorine residuals to a safe level as mandated by DEQ. After disposal and flushing of the disinfection solution, there will be another 24-hour retention period prior to bacteriological testing. Bacteriological tests will be taken by TPW.

17. Provide an Eclipse No. 88 Sampling Station manufactured by Kupferte Foundry, St. Louis, MO 63102. The sampling station shall be 2'-0" bury, with a ¾" FIPT(Female Iron Pipe Thread) inlet, and a ¾" unthreaded hose nozzle. All sampling stations shall be enclosed in a lockable, non-removable, aluminum-cast housing. When opened, the sampling station shall require no key for operation, and the water will flow in an all-brass waterway. All working parts will be of brass and be removable from above ground with no digging. A copper vent tube (standard) will enable the sampling station to be pumped free of standing water to prevent freezing, and to minimize bacteria growth. The exterior piping will be brass, and a ¼" ball valve shall be provided in place of the ¼" pet cock on the vent pipe.

18. TPW will install all copper services and sampling stations prior to surfacing of streets. Water meters will be installed by TPW upon individual request and payment by others (owners). All water meters connected to an irrigation system must have the proper Oregon State approved backflow prevention device , minimum of a DCVA (Double Check Valve Assembly) installed on the property side of the water meter. In addition, every meter for commercial, multi-family, industrial, and institutional service, regardless of size, shall have the proper Oregon State approved backflow prevention device minimum of a DCVA installed on the property side of the meter. The backflow prevention device shall be installed and tested by the owner, with the results forwarded to TPW Water Division, before water services can begin.

19. Upon completion of installation of the water system, the contractor or owner shall advise TPW of the total construction costs to which will be added 10% for TPW inspections, water loss, overhead, administration, sampling, etc. and 2% for engineering review, including "as-builts" drawings, updating master map, intersection maps, etc.

OPERATION OF VALVES IN THE TIGARD WATER SERVICE AREA IS PROHIBITED

APPENDIX F - General Notes - Grading Plan Permits

1. This grading permit is not to be construed as final approval of site grading, embankment or structural fill work; it merely provides for initiation of work and is subject to change pending City approval of the entire construction-development plan set.

2. Spreading of mud or debris upon any public road is prohibited. The City may order stoppage of work to effect corrective action, at any time.

3. Effective erosion control, dust control, and drainage control is required at all times. The City may order stoppage of work to effect corrective action, at any time.

4. Embankments or structural fills for roadway construction or fills to be constructed on buildable lots shall be constructed from excavated materials acceptable to the soils engineer and shall be brought to grade in lifts not to exceed 8" loose measure. Each lift shall be compacted to 90 percent of maximum density as obtained by AASTHO T-180 compaction test.

5. Structural fills shall comply with Appendix Chapter 33 of the Uniform Building Code. Construction on existing slopes greater than 5:1 shall be achieved by benching into the existing bank a minimum of ten feet. If the bench exposes sand soil an underdrain must be provided. The underdrain, if required, will be constructed by installing nonwoven filter fabric, equivalent to Exxon GTF 12500, along the bottom of the starting bench, then placing a six inch layer of 1½" – 3/4" drain rock, and finally covering the drain rock with the nonwoven filter fabric. Successive benches will be constructed with vertical fill between two to five feet and be compacted in layers not to exceed 8 inches. Each 8-inch layer shall be compacted to a minimum of 90 percent AASHTO T-180 density. The fill slopes shall not exceed 2:1 at finish grade. No rock or similar material exceeding a 12-inch diameter shall be allowed in the structural fill.

6. The geotechnical engineer for structural fill shall be notified 24 hours in advance, by the contractor, of starting benchwork to determine the need for an underdrain layer and to verify existing conditions.

7. The City shall be provided with a copy of the geotechnical engineer's report/recommendation changes.

8. If springs or ground water are encountered during construction, the contractor shall notify the soils and civil engineers of the conditions found and coordinate his activities in a manner that will allow the engineers time to review the situation and prepare a plan to properly mitigate the water encountered.

9. The contractor shall have the soils engineer take compaction tests. A minimum of three tests will be required for each 2 feet of fill.

10. Excavator must comply with *ORS 757.541 through 757.571* (Utility pre-notification, etc.).

APPENDIX G - Compaction Requirements

STRUCTURAL LOT FILL:

Minimum percent compaction required	90%
Test method required to determine maximum density	T-180
Frequency of density testing in lots	8" lifts 3 test for each 2 feet of fill

ROAD SECTION – EMBANKMENT:

Minimum percent compaction required	90% below 3' of subgrade 95% within 3' of subgrade
Test method required to determine maximum density	T-99 or T-180
Frequency of density testing of embankment	8" lifts 3 tests for each 2' of embankment

ROAD SECTION – SUBGRADE:

Minimum percent compaction required	95%
Percent compaction required to what dept below subgrade	1 foot
Test method required to determine maximum density	AASHTO T-99
Frequency of density testing of subgrade	As needed

ROAD SECTION – AGGREGATE BASE:

Minimum percent compaction required	95%
Test methods required to determine maximum density	OSHD TM 106 or T-99
Frequency of density testing of aggregate base	As needed

ROAD SECTION – ASPHALT PAVEMENT:

Minimum percent compaction required	92%
Test method required to determine maximum density	OSHD TM 306
Frequency of density testing of aggregate base	5 tests minimum* average density
Full time inspection or spot checking of compaction	Spot

UTILITY TRENCH BACKFILL: (Beneath pavement or sidewalk)

Minimum percent compaction required for bedding	90%
Minimum percent compaction required for pipe zone	90%
Minimum percent compaction required above pipe zone	95%
Test method required to determine maximum density	T-99
Different Requirement for PVC	No
In landscape area	85%

ADDITIONAL INFORMATION/COMMENTS:

*When using nuclear gauge, two readings at each site, the second at right angles to the first. The two reading will be averaged to obtain test density.

APPENDIX H - Public Improvement Drawing Circulation List

____ PGE Company
14655 SW Old Scholls Ferry Rd.
Beaverton, OR 97005
Attn.: Jim Johnston and
Brian Moore

____ General Telephone Co.
8840 SW Burnham - 2nd Floor
Tigard, OR 97223
Attn.: Sue Sartin

____ Tualatin Valley Water District
1850 SW 170th Ave.
Aloha, OR 97006
Attn.: Jesse Loman

____ TCI Cable of Tualatin Valley
14200 SW Brigadoon CT
Beaverton, OR 97005
Attn.: Craig Eyestone

____ U.S. Post Office
12210 SW Main Street
Tigard, OR 97223
Attn.: Creiton Willis/Jim Stewart

____ State of Oregon
Division of State Lands
1600 State St.
Salem, OR 97310
Attn.: Bill Parks

____ Electric Lightwave, Inc.
8100 NE Parkway Drive # 200
Vancouver, WA 98662
Attn.: Susan McAdams

____ Northwest Natural Co.
220 NW Second Ave.
Portland, OR 97209
Attn.: Scott Palmer

____ Tualatin Valley Fire & Rescue
Beaverton City Hall, 3rd Fl.
4755 SW Griffith Dr.
Beaverton, OR 97005
Attn.: Mr. Gene Birchill

____ US West Communications
421 SW Oak, Rm. #5-N-15
Portland, OR 97204
Attn.: Jackie Lollar

____ State Highway Division
2131 SW Scholls Ferry Rd
Beaverton, OR 97005
Attn.: Jane Estes

____ Washington County LUT
Public Services Bldg.
155 N. First Ave.
Hillsboro, OR 97124
Attn.: Ron Aase

____ USA Corps of Engineers
Portland District
Permit Evaluation Section
319 SW Pine
Portland, OR 97204
Attn.: Richard Johnson

APPENDIX I - Inspection Requirements

Public Improvement Project Work
City of Tigard

- General: Contact your assigned Public Improvement Inspector (Matt Harrell or Mike White at 639-4171), a minimum of 24 hours before beginning any public improvement construction work within the City limits. Also remember inspection is required before 'covering' or 'pouring' anything.

- Required Inspections: At a minimum, inspection by the City inspector is required at the start and end of each of the following work phases;

Grading

Cut & Fill Staking
Fill Placement/Compaction
Temporary Drainage Work
Dust/Erosion Control

Sanitary & Storm Sewers

MH & CB Staking
Pipe Installation/Backfill
Trench Compaction Testing
Air & TV Testing
Repairs/Resurfacing
Traffic & Pedestrian Control
Outfalls/Rip-Rap

Streets

Horizontal/Vertical. Staking
Subgrade Cut/Fill
Curb Staking
Proof Roll Curb Line
Curb Forms/Pouring
Baserock Installation
Leveling Course Installation
Base Compaction/Proof Roll
Wearing Course Installation
Wearing Course Compaction
Power Trenching/Utilities
Street Light Installation
Monumentation
Traffic & Pedestrian Control
Sidewalk/Wheelchair Ramp Installation
Overlay Installation **

Traffic Control

Water Line

Water line installation shall occur after curbs and temporary lot corners are installed. Contact City Water Works Inspector for inspection.

WHEN IN DOUBT CALL FOR INSPECTION!

NOTE FOR SEWER ACCEPTANCE: The developer is required to have all sanitary and storm lines within the scope of their project cleaned a minimum of one week prior to a request for a pre-acceptance inspection (at end of one-year maintenance period). The ball and flushing or jet rodding methods are considered acceptable. A 30-day minimum request for pre-acceptance TV inspection is required prior to scheduling placement of the asphalt overlay. Any problems noted in these inspections are subject to repair prior to the placement of the overlay.

APPENDIX J - Subdivision Compliance Agreement

THIS AGREEMENT dated the _____ day of _____, 19____ between the CITY OF TIGARD, a municipality of the State of Oregon, hereinafter termed the "CITY", _____ _____ hereinafter termed "Petitioner".

W I T N E S S E T H :

WHEREAS, Petitioner has applied to the City for approval for filing in Washington County, a subdivision plat known as _____ Willamette Meridian, Washington County, Oregon; and

WHEREAS, the City has adopted the Standard Specifications for Public Works Construction by Oregon Chapter APWA, for street, structure and related work, and Unified Sewerage Agency Standards and Specifications, for sanitary and storm sewer construction, prepared by professional engineers, for subdivision public improvement development; and

WHEREAS, the public improvements to be constructed in Petitioner's development are incomplete, and Petitioner has nonetheless requested the City to permit progressive use of property in the subdivision, and the parties desire hereby to protect the public interest generally and prospective purchasers of lots in said subdivision by legally enforceable assurances that public improvements will be installed as required and completed within the time hereinafter set forth.

NOW, THEREFORE, in consideration of the foregoing premises and the covenants and agreements to be kept and performed by the Petitioner and its sureties, IT IS HEREBY AGREED AS FOLLOWS: (1) Petitioner shall proceed with development, with the intent and purpose to complete all public improvements except sidewalks and street trees of said subdivision not later than two (2) years from the date of this agreement, and Petitioner agrees to comply with all subdivision standards as set forth in the Tigard Municipal Code and the standard specifications of the City of Tigard, to comply with all terms and provisions specified therein this improvement by the Council and Planning Commission of the City of Tigard, Oregon, or as may be specified by the Engineering Department and to use only such material and to follow such designs as may be required by or approved by said Department. Petitioner shall provide certification of installation conformance and one as-built mylar, both stamped by a registered civil engineer, to the City prior to City inspection of petitioners' improvement work for City conditional and final acceptance consideration. Petitioner's contractor shall be licensed, bonded, and insured.

(2) **(OPTIONAL)** To assure compliance with the City's requirements and the provisions herein, Petitioner tenders to the City a surety bond in form approved by the City, with liability in the amount of $_____ a copy of which is attached and by this reference made a part hereof.

(2) **(OPTIONAL)** If the petitioner desires to proceed to record the development plat prior to completion of installation of all required public improvements, Petitioner agrees to tender to the City a surety bond in form approved by the City in the amount of $_____ (or in an amount equal to the value of all incomplete public improvement work plus the one year guarantee amount). THE PLAT SHALL NOT BE RECORDED UNTIL ALL PUBLIC IMPROVEMENTS ARE COMPLETE OR ARE ASSURED.

(3) In the event that Petitioner shall fail, neglect or refuse to proceed with the work in an orderly and progressive manner to assure completion within the time limits, upon ten (10) days notice by the City to Petitioner and Petitioner's sureties, and such default and failure to proceed continuing thereafter, the City may at its option proceed to have the work completed and charge the costs hereof against Petitioner and Petitioner's Sureties and in the event same be not paid, to bring an action on the said bond to recover the amount thereof. In the event such action be brought, Petitioner and Petitioner's Sureties promise and agree to pay, in addition to the amounts accruing and allowable, such sum as the court shall adjudge reasonable as attorney's fees and costs incurred by the City, both in the Trial Court and Appellate Court, if any, or the City may, at its option, bring proceedings to enforce against the Petitioner and/or Petitioner's Sureties specific performance of the contract and compliance with the subdivision standards and ordinances of the City of Tigard, and in such event, in like manner, the City shall be entitled to recover such sum as the court shall adjudge reasonable as and for the City attorney's fees and costs, both in the Trial Court and Appellate Court, if any.

(4) Petitioner, concurrent with the execution hereof, shall deposit with the City an amount estimated to equal pole and luminary maintenance fees, for street lighting facilities within the subdivision, according to Portland General Electric Schedule #91, Option "B", together with a further sum equal to the estimated cost of providing electrical energy to energize the street lighting facilities for a period of two (2) years from the date of initial energizing of said lights. Said amount being $_____.

(5) The City agrees to make and provide periodic and final inspections which in the City's interest are desirable to assure compliance herewith, in consideration whereof the Petitioner shall pay prescribed inspection fees:*

*Project Fee $_____
Sewer Fee $_____

(6) The City agrees to install street identification and traffic signs within said subdivision, in consideration of payment in the amount of $_____.

(7) At such time as all public improvements except sidewalks, street trees and asphalt overlay of local streets within the subdivision have been completed in accordance with the City's requirements, Petitioner shall submit a "certificate of installation conformance" to the City to notify the City of readiness for conditional acceptance inspection and, then, upon notification by the Engineering Department, that the requirements of the City have been met, the Petitioner will submit to the City a good and sufficient guarantee bond, if not already provided with the performance bond, form approved by the City to provide for correction of any incomplete work or any defective work or maintenance becoming apparent or arising within one (1) year after conditional acceptance of the public improvements by the City.

(8) Upon receipt of certification from the Engineering Department that all requirements have been met, and a One Year Guarantee Bond, the City agrees to conditionally accept the public improvement subject to the requirement of completion of all work and correction of deficiencies and maintenance for a period of one year as set forth above.

(9) That in addition to or supplementary of the requirements of Tigard Municipal Code and the provisions hereof, Petitioner binds itself to conform to the following requirements, scheduling limitations:

(a) No building permits, or permits to connect to City utility services shall be issued for lots within Petitioner's subdivision as described until: 1) the City Engineer has determined that the corresponding public improvements are substantially complete to assure that the health and safety of the citizens will not be endangered from inadequate public facilities, and 2) Petitioner has provided to the City Engineer one check print of the as-built drawings, prepared by a registered civil engineer, for review and approval, along with certification of substantial completion, signed and stamped by Petitioner's engineer.

(b) Upon a determination by the City Engineer that the public improvements are substantially complete and a check print of the as-built drawings has been reviewed and approved, the Petitioner or individual lot owners within the subdivision may receive building permits or utility service for not more than 50-percent of the platted lots within the subdivision.

(c) No building permits shall be issued or utility service approved for any lot which, together with previously approved lots, would exceed 50-percent of the platted lots within the subdivision until: 1) all required public improvements have been completed in accordance with the approved plans, except for those improvements listed in Section 7 above, 2) Petitioner has provided one as-built mylar stamped by a registered civil engineer, 3) the Petitioner has submitted a "certificate of installation conformance" as described in Section 7 above, 4) a One Year Guarantee Bond, as described in Section 8 above, has been submitted by Petitioner, and 5) the remaining, incomplete improvements listed in Section 7 are assured by a performance assurance.

(d) None of the lots of Petitioner's subdivision as described may be occupied for residential purposes until an Occupancy Permit is issued under authority of the City an no Occupancy Permit shall be issued prior to conditional acceptance of the subdivision and to the time that the sidewalk paralleling the street for each developed lot proposed to be occupied, is installed as a part of the development; provided that all sidewalks as required by the plans and Tigard Municipal Code shall be installed throughout said subdivision not later than three (3) years from the date of this Subdivision Compliance Agreement.

(e) All landscaping trees on that portion of each lot between the public sidewalks and the curb (parking area), if required, shall be planted in place prior to final inspection and issuance of Occupancy Permit for each such lot in the subdivision. Provided that final inspection and application for Occupancy Permit occurs within any calendar month from October to April of any year, such plantings may be deferred until the next following growing season. In any event, all required landscaping and trees in all areas shall be planted and in place within the entire subdivision within three (3) years from the date of this subdivision improvement contract.

(f) After conditional City acceptance of the public improvements, the Petitioner agrees to place an asphalt concrete overlay on all streets within the development; placement scheduling to be approved by the City.

(g) Compliance with all terms and provisions specified for said subdivision development by the Council and the Planning Commission of the City of Tigard, Oregon, in regard to variances allowed from the Tigard Municipal Code**,** conditions specified by the zone use classification and, also on the approved plat(s) and plan(s).

(h) Petitioner agrees to correct any defective work and to perform any maintenance, upon notification by the City, arising during the guarantee period as set forth above.

(10) At such time as all public improvements have been completed in accordance with the City's requirements, Petitioner shall notify the City of readiness for final inspection and upon certification by the Engineering Department that all requirements of the City have been met, the City agrees to accept said improvements for operation and maintenance responsibility, and release the Petitioner's Guarantee Bond.

(11) **(OPTIONAL)** The parties hereby adopt the form of performance bond, copy is attached and by reference made a part hereof, and Petitioner agrees to cause to have said bond executed and filed with the City concurrently with the execution of this agreement at or prior to the time this agreement is executed on behalf of the City. Petitioner further agrees to maintain said bond in full force and effect until otherwise authorized by the City in writing.

(11) **(OPTIONAL)** Petitioner agrees to cause to have said bond executed and filed with the City concurrently with the execution of this agreement or as may otherwise be described herein. Petitioner further agrees to maintain said bond in full force and effect until otherwise authorized by the City in writing.

(12) The specific requirements of Paragraph 9 hereof shall for all purposes be included as a part of the obligation secured by the performance bond mentioned above, and the City shall be entitled to recourse in the event of default on the part of the Petitioner with respect to any requirement thereof.

IN WITNESS WHEREOF, Petitioner acting by and through its duly authorized undersigned officers pursuant to resolution of its Board of Directors has caused this agreement to be executed, and the City acting pursuant to resolution of its Council adopted at a regularly scheduled meeting on the 13th day of October, 19 86 , has caused this agreement to be executed by the City Engineer.

PETITIONER:

By:_____
(Title)

THE CITY OF TIGARD

By:_____
City Engineer

(Attached Notary Acknowledgment hereto)
Return signed copy to:

_____

_____

_____

Revised April, 1997
c:\my documents\design standards.doc

APPENDIX K - Subdivision Public Improvements - Performance Bond

Bond No. _____

KNOW ALL MEN BY THESE PRESENCE, that we _____ as Principal, and _____, a corporation duly authorized to conduct a general surety business in the State of Oregon, as Surety, are jointly and severally held bound unto the City of Tigard, Oregon, a municipality of the State of Oregon, hereinafter called obligee, in the sum of $_____, lawful money of the United States of America, for the payment of which we, as Principal, and as Surety, jointly and severally bind ourselves, our successors and assigns firmly by these present.

THE CONDITIONS OF THIS BOND AND OBLIGATION IS SUCH, that the Principals are _____, located in the City of Tigard, Oregon, and have entered into a Compliance Agreement with respect to timely development and improvement, a copy of said Agreement is attached, and by reference made a part hereof; and

NOW, THEREFORE, if the Principal herein shall faithfully and truly observe and comply with all terms of the Agreement and shall well and truly perform all matters and things undertaken to be performed under said Agreement and under all ordinances, regulations and conditions of the Obligee applicable to said development and improvement, and shall promptly make payments to all persons supplying labor or material for any of the work provided by said agreement, and shall not permit any lien or claim to be filed or prosecuted against the Obligee, then this obligation shall be void, otherwise to remain in full force and effect.

In the event of suit or action be filed by the Obligee hereunder to enforce said contract or to recover under the terms of this bond, in addition to all other rights and remedies, the City, in the event it shall prevail, shall be entitled to recover such sums as the Court may adjudge reasonable as and for attorney's fees.

IN WITNESS WHEREOF, the parties hereto have caused this bond to be executed this _____ day of _____, 19____.

_____
Principal

By: _____

(A true copy of the Power of Attorney
must be attached to the original of this bond).

_____
Surety

_____
Attorney in Fact

_____
Address

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APPENDIX L - Project Completion Requirements For Maintenance Status

PROJECT_____

The following items shall be complete prior to placing a project onto the one-year maintenance period, and prior to issuance of 50% of the building permits:

_____ 1. Sanitary sewer installed, air, mandrill, and TV inspections complete and approved.

_____ 2. Storm sewer installed, mandrill and TV inspections complete and approved.

_____ 3. Water mains installed, tests complete and passed, and services installed.

_____ 4. Curbs installed with 2 weep holes per lot.

_____ 5. Streets complete through first lift of asphalt.

_____ 6. Site grading and compaction complete per plan.

_____ 7. Power trench and franchise utility installation complete (power, gas, telephone, cable TV), backfilled and compacted.

_____ 8. Bike paths and maintenance access roads installed per plan.

_____ 9. General clean up, post construction erosion control installed as necessary.

_____ 10. Sidewalks, wheel chair ramps, and mailbox bubble outs installed per plan.

_____ 11. Streetlights installed per plan and ready to be energized..

_____ 12. All easements and dedications recorded, including plat at Washington County.

_____ 13. Check print of as-builts submitted for review and approval.

_____ 14. Water quality/detention facility installed and complete per plan.

_____ 15. Final report from Geotechnical Engineer submitted for review and approval, in accordance with UBC Appendix Chapter 33.

_____ 16. A completion report from the private Engineer, including a Certificate of Compliance (City form), in accordance with the Developer-Engineer Agreement.

Prior to placing the project onto the one-year maintenance period and release of the remaining 50% of building permits:

_____ 17. Mailboxes installed per plan.

_____ 18. Street signs and barricades installed per plan.

_____ 19. Mylar as-builts submitted.

_____ 20. Maintenance bond submitted (City form).

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APPENDIX M - Abbreviations

A

AB	Aggregate Base
AC	Asphalt Concrete
ACB	Asphalt Concrete Base
Approx	Approximate
AS	Aggregate Subbase
@	At
Ave	Avenue

B

BC	Beginning of Horizontal Curve
BCR	Begin
Bldg	Building
Blvd	Boulevard
BM	Bench Mark
BVC	Begin Vertical Curve

C

CAP	Corrugated Aluminum Pipe
CB	Catch Basin
CDF	Controlled Density Fill
CE	Construction Easement
CF	Cubic Fee
CIP	Cast Iron Pipe
CL	Centerline
CO	Cleanout
Conc	Concrete
Const	Construct
CTB	Concrete Treated Base
Culv	Culvert
cy	Cubic Yard

D

Demo	Demolish
Det	Detail
DI	Ditch Inlet
Dia	Diameter
DIP	Ductile Iron Pipe
DR	Drive
Dwg	Drawing
Dw	Driveway

E

E	East
Ea	Each
Ease	Easement
EC	End Horizontal Curve
ECR	End Curb Return
Elec	Electric
Elev	Elevation
EP	Edge of Pavement
Exc	Excavate
Exist	Existing
Esp Jt	Expansion Joint/

F

FC	Face of Curb
FG	Finish Grade
FH	Fire Hydrant
FL	Flow Line
ft.	Feet or Foot

G

Galv	Galvanized
GB	Grade Break
GP	Guar Post

H

H	Height
HDPE	High Density Polyethylene
Horiz	Horizontal
H x W	Height x Width
Hwy	Highway

I

ID	Inside Diameter
IE	Invert Elevation
"	Inch
Inst	Install
Irrig	Irrigation

J

Jt	Joint

L

L	Length
LB	Pound
LF	Linear Foot
Ln	Lane
Loc	Location
LS	Lump Sum
Lt	Left

M

Max	Maximum
MH	Manhole
Med	Median
Min	Minimum
Mon	Monument

N

N	North
NIC	Not In Contract
NO	Number
NTS	Not To Scale

O

OC	On Center
OD	Outside Diameter
OG	Original Ground

P

PC	Portland Cement
PCC	Portland Cement Concrete
PCF	Pounds Per Cubic Foot
PI	Point of Intersection
PL	Property Line
POC	Point on Curve
PP	Power Pole
PRC	Point of Reverse Curve
PRV	Pressure Reducing Valve
PRVC	Point of Reverse Vertical Curve
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PT	Point of Tagency
PVC	Polyvinylchloride
PVI	Point of Vertical Intersection
Pvmt	Pavement

R

R	Radius
RBO	Remove by Others
RCP	Reinforced Concrete Pipe
Rd	Road
Rel	Relocate
Req'd	Required
Rev	Revise or Revised
RR	Railroad
Rt	Right
RW	Retaining Wall
R/W	Right of Way

S

S	South
Sec	Section
SD	Storm Drain
Sht	Sheet
Specs	Specifications
SS	Sanitary Sewer
Sta	Station
Std	Standard
St	Street
SW	Sidewalk

T

TC	Top of Curb
Temp	Temporary
TG	Top of Grate
TOP	Top of Pipe
Type	Typical

V

VC	Vertical Curve
Vert	Vertical

W

W	West
WV	Water Valve

X

X-ing	Crossing
X-Sec	Cross Section

APPENDIX N - Standard Details

Street

☐	120	Concrete Sidewalk	July 15, 1998
☐	125	Standard Curb	July 15, 1998
☐	126	Curb and Gutter	July 15, 1998
☐	128	Corner Wheelchair Ramp w/Curbside Sidewalk	March 10, 2003
☐	140	Driveway Approach Location	July 15, 1998
☐	142	Standard Driveway	March 10, 2003
☐	143	Modified Driveway	March 10, 2003
☐	145	Curb Knockout for Driveways	July 15, 1998
☐	148	Driveway Culvert Streets w/o Curbs	July 15, 1998
☐	162	Alternate Commercial Driveway	July 15, 1998
☐	165	Fire Truck Turnaround	July 15, 1998
☐	166	Maintenance Access or Pedestrian/ Bike Path	July 15, 1998
☐	170	Monument Box	July 15, 1998
☐	172	Mailbox Alternative	July 15, 1998
☐	180	Trench Backfill	July 15, 1998
☐	182	Pavement Dig-Out and Repair	July 15, 1998
☐	190	Typical Traffic Control Plan	July 15, 1998
☐	192	Street Barricade	July 15, 1998

Water

☐	503	Typical Gate Valve	July 15, 1998
☐	504	Typical Butterfly Valve	July 15, 1998
☐	505	Operating Nut Extension	July 15, 1998
☐	520	3/4”-1” Water Service	December 17, 2004
☐	521	2” & 1 1/2” Water Service	July 15, 1998
☐	523	3” & 4” Meter	July 15, 1998
☐	525	Large Meter w/Fire Bypass	July 15, 1998
☐	530	Double Check Assembly	July 15, 1998
☐	531	Irrigation Double Check Assembly	July 15, 1998
☐	532	Double Check Valve Assembly	July 15, 1998
☐	533	Double Check Detector Valve Assembly	July 15, 1998
☐	542	Fire Hydrant Assembly	July 15, 1998
☐	550	RP Detector Backflow Assembly 2 1/2” - 10” (Below Ground)	July 15, 1998
☐	553	RP Backflow Assembly 2 1/2”+ (Above Ground)	July 15, 1998
☐	554	Reduced Pressure Detector Backflow (Above Ground)	July 15, 1998
☐	555	Reduced Pressure Backflow Assembly	July 15, 1998
☐	557	Reduced Pressure Backflow Assembly Discharge Rates	July 15, 1998
☐	558	Pressure Reducing Station	July 15, 1998
☐	560	Standard Thrust Block	July 15, 1998
☐	561	Straddle Block	July 15, 1998
☐	563	Vertical Bend Restraint	July 15, 1998
☐	570	2” Standard Blowoff	July 15, 1998
☐	571	6” Blowoff	July 15, 1998
☐	572	Sampling station	July 15, 1998
☐	573	Minimum Protection For Filling Tanker Trucks	July 15, 1998
☐	575	Typical Valve And Hydrant Location	July 15, 1998
☐	580	Pipe Casing	December 17, 2004
☐	590	1” Combination Air & Vacuum Valve	July 15, 1998
☐	591	2” Combination Air & Vacuum Valve	July 15, 1998