

## DIVISION D – STREETS AND ALLEYS

### D 1.00 GENERAL

#### D 1.01 PURPOSE

The purpose of these Street and Alley Engineering Standards is to provide a consistent policy under which certain physical aspects of street and alley design will be implemented. Most of the elements contained in this document are Public Works oriented. The intent is that these Engineering Standards apply to both City-initiated projects as well as private development of public infrastructure.

These Engineering Standards cannot provide for all situations. They are intended to assist but not to serve as a substitute for competent work by design professionals. Engineers are expected to bring the best of skills from their respective disciplines to each project. If the Engineer anticipates challenges in meeting these Engineering Standards, they should contact the City prior to extensive design efforts.

These Engineering Standards are not intended to limit any innovative or creative effort which could result in better quality, better cost savings, or both. Any proposed departure from the Engineering Standards will be judged, however, on the likelihood that such variance will produce a long-term compensating or comparable result, in every way adequate for the user and resident.

Note that the presentation, layout, and general configuration of all engineering design drawings shall be in conformance with Millersburg's drafting design criteria as outlined in Division A of these Engineering Standards. Engineer shall prepare the project design drawings in conformance with the requirements contained therein.

These Engineering Standards have the objective of developing a street system that will:

- A. Be consistent with the Millersburg Municipal Code (MMC), Millersburg Land Use Development Code, Millersburg's Adopted Standard Construction Specifications, and all applicable state and federal regulations and requirements.
- B. Be of adequate design to safely manage the volumes of vehicles anticipated using the improvements.
- C. Provide points of connection for streets by adjacent future development.
- D. Prevent the capacity of transportation facilities from being exceeded.
- E. Provide transportation improvements that meet the long-term needs for quality streets.
- F. Maintain or improve overall transportation quality.
- G. Be designed in a manner to allow economical future maintenance.
- H. Be designed using materials to insure a minimum practical design life of 20 years.

#### D 1.02 SHORTENED DESIGNATION

These City of Millersburg Street and Alley Engineering Standards shall be cited routinely in the text as the "Engineering Standards."

#### D 1.03 APPLICABILITY

These Engineering Standards shall govern all construction and upgrading of all public street and alley improvements in the City of Millersburg and applicable work within its service areas.

Street improvements shall be provided for all property improvements within the City of Millersburg per these Engineering Standards for the following types of development:

- A. All partitions and subdivisions.
- B. Construction or reconstruction of public roadways and temporary detours.

#### D 1.04 REFERENCES

The Engineering Standards are intended to be consistent with the most currently adopted provisions of all street-related guidelines including, but not limited to:

- A. Millersburg's Transportation System Plan
- B. Oregon Statewide Planning Goals and Guidelines
- C. Millersburg Municipal Code (MMC)
- D. Millersburg Comprehensive Plan
- E. Millersburg Land Use Development Code (LUDC)
- F. Millersburg's Facility Plans

#### D 1.05 STANDARD CONSTRUCTION SPECIFICATIONS

Except where the Engineering Standards provide otherwise, design detail, workmanship and materials shall be in accordance with the current edition of the Standard Construction Specifications adopted by the City of Millersburg. The City of Millersburg has adopted the City of Albany's Standard Construction Specifications and Details.

#### D 1.06 DEFINITIONS AND TERMS

- A. Definition of Words. Wherever in these Engineering Standards the words directed, required, permitted, ordered, designated, or words of like importance are used, they shall be understood to mean the direction, requirement, permission, or order of designation of the City Engineer. Similarly, the words approved, acceptable, satisfactory, shall mean approved by, acceptable to, or satisfactory to the City Engineer.
- B. ODOT. The Oregon Department of Transportation.

- C. City. The City of Millersburg, Oregon.
- D. City Engineer. This means the City Engineer of the City of Millersburg or his/her authorized representative.
- E. Roadway: That portion of the right-of-way used, or to be used, for vehicle movement, which exists between the curbs or proposed curb lines.
- F. MUTCD: The Manual of Uniform Traffic Control Devices as published by the Federal Highway Administration.
- G. Owner. Any individual, partnership, firm, or corporation by whom the design engineer has been retained or who, as a property owner, is making arrangements with the City.
- H. Plans. Construction plans, including system site plans, storm drain plans and profiles, cross sections, detailed drawings, etc., or reproductions thereof, approved or to be approved by the City Engineer, which show the location, character, dimensions, and details for the work to be done, in which constitute a supplement to these Engineering Standards.
- I. Design Engineer. The developer's consulting engineer, including the City's engineer, licensed by the State of Oregon as a Civil Engineer under whose direction plans, profiles, and details for the work are prepared and submitted to the City for review and approval.
- J. Right-of-Way. All land or interest therein that by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the general public within which the City shall have the right to install and maintain streets and other public infrastructure.

#### D 1.07 APPROVAL OF ALTERNATE MATERIALS OR METHODS

Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in D 1.01 PURPOSE. Persons seeking such approvals shall make application in writing. Approval of any major deviation from these Engineering Standards will (normally) be in written form. Approval of minor matters will be made in writing if requested.

Any alternate must meet or exceed the minimum requirements set in these Engineering Standards.

The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, and other pertinent information.

Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the City Engineer. When requested by the City, full design calculations shall be submitted for review with the request for approval.

## **D 2.00 - NEW STREET DESIGN**

### D 2.01 GENERAL REQUIREMENTS

All designs shall conform to City of Millersburg's Transportation System Plan (TSP), Development Code, Site Plan Review Notice of Decision, Fire Department requirements, Standard Construction Specifications, Manual of Uniform Traffic Control Devices (MUTCD), and all other applicable laws and regulations.

### D 2.02 DESIGN SPEEDS

Design considerations for all street geometrics shall be based on the minimum design speeds shown below for each street classification. Variance from these design speeds may be required based upon topography or other considerations. Variance from these design speeds must be approved by the City Engineer. A consultation with the City may be beneficial before design is initiated.

Local Residential	20 mph
Local Non-Residential	25 mph
Collector	Determined by the City Engineer
Arterial	Determined by the City Engineer

### D 2.03 STREET TERMINATION

Streets that will not be extended in the future must terminate with a cul-de-sac or hammerhead. Street terminations shall meet current Development Code requirements.

- A. Cul-de-sac: The standard residential cul-de-sac shall have a minimum 48-foot radius to the face of curb.
- B. Hammerhead: For "mini subdivisions" the City Engineer may allow the use of a hammerhead turn-around as described in the Development Code. The hammerhead shall consist of two rectangular turnouts directly opposite each other and oriented perpendicular to the street centerline.

A street that will be extended in the future may be terminated with proper signing and installation of Type III barricades as required in the MUTCD. Dead-end streets over 150-feet long are required to end with a temporary cul-de-sac or hammerhead turn-around for emergency vehicles until the street extension occurs. In addition, a sign reading "THIS STREET MAY BE EXTENDED IN THE FUTURE" will be mounted at the end of the street.

### D 2.04 HORIZONTAL DESIGN

The horizontal design of streets shall produce a safe street network while also considering the need for creating livable neighborhoods. Consideration should be given to minimizing long tangent sections and other elements that might induce high speeds or other problems that might require traffic calming mitigation in the future. Traffic calming measures shall be considered in the design of new streets and should be incorporated as

required by the City Engineer.

Sharp horizontal curvature should not be introduced at or near the top of a pronounced crest vertical curve. Similarly, sharp horizontal curvature shall not be introduced at or near the low point of a pronounced sag vertical curve.

- A. Minimum Curb Radii Required at Intersections. The minimum curb radii required at intersections shall be as shown below in Table D 2.04-A.

**Table D 2.04-A Minimum Curb Radii Required at Intersections**

Intersection	Curb Radius
Residential – Residential	15 feet
Residential – Collector or Arterial	20 feet
Collector – Collector or Arterial	30 feet
Arterial – Arterial	30 feet

- B. Taper and Transition Rates: Use the criteria listed below to determine the minimum taper length to increase lane width, create a new lane, or transition traffic lanes laterally. The City Engineer may require a longer taper length. Tapers in chicanes or other traffic calming improvements may be shorter in order to meet traffic calming goals.

**Table D 2.04-B Taper Length Criteria**

Type of Taper	40 mph or less	45 mph or greater
Merging Taper	$\frac{WS^2}{60}$	WS
Shifting Taper	$\frac{WS^2}{120}$	$\frac{WS}{2}$

W = Width of offset in feet

S = Posted speed limit or anticipated speed in mph

- C. Partial Street Improvements: Designs for partial street improvements shall consider the entire future street improvement so that related facilities, grades, slopes, utility stub-outs, future curb inlets, future service lines, potential conflicts, and other issues will be identified. The partial street shall be designed so that future completion of the street and related facilities can be easily coordinated with the initial partial street improvement and minimize damage to the street structure. Construction plans shall clearly show the paving limits for the partial street and identify all items that are to be constructed by others in the future.
- D. Sidewalks and Driveways: Dimensions and spacing of sidewalks, sidewalk ramps, and driveway approaches will be within the parameters of the Land Use Development Code, the Standard Construction Specifications, and the Americans with Disabilities Act (ADA). Show sidewalk ramps on the plans at each intersection curb return and other required locations to verify adequate landing and passage area. Identify sidewalk obstructions on the plans and verify adequate clear space

for passage.

1. Setback Sidewalk: The standard configuration for new sidewalk construction is setback, with the sidewalk and landscape strip width as required in the Land Use Development Code.
  2. Curbside Sidewalk: A curbside sidewalk may be used only when the setback configuration is not feasible and is approved by the City Engineer. Curbside sidewalk located adjacent to a mountable curb shall be a minimum of 6-inches thick.
  3. Driveway Approaches: All driveway approaches to be constructed shall be shown on the plans to verify that the design meets minimum ADA requirements. Design elements to be considered are adequate clear space for passage behind the approach ramp and/or proper slope of the depressed curb transition with curbside sidewalk. Commercial driveways with a standard curb return shall not be used without prior approval of the City Engineer.
- E. Cut and Fill Slopes: Catch points for cut and fill shall be shown on the plans so that slope limits outside the right-of-way are identified. The plans shall show the direction of natural drainage and address the routing of runoff to prevent erosion of newly constructed slopes or blockage of the natural drainage.
- The plans shall show existing slope easements, along with proposed slope easements and temporary construction access agreements that must be acquired to facilitate construction. All easement dimensions shall be shown on the plans.
- F. Streetscape and Utility Appurtenances: Show all public and private items that currently exist or will be placed in the right-of-way that will impact the sidewalk and/or the landscape strip. Such items include but are not limited to fire hydrants, street lights, bus shelters, street signs, street trees, mail boxes, poles, vaults, and various utility appurtenances. Identify obstructions that would encroach into sidewalks and verify a minimum 4-foot width of clear space for passage exists or show how the impact will be mitigated.

## D 2.05 VERTICAL DESIGN

The minimum street grade is 0.5 percent, and the maximum street grade shall not exceed 6 percent on arterial streets, 10 percent on collector streets, and 12 percent on local residential streets. The minimum street grade may be reduced to as low as 0.3 percent in specific circumstances with the approval of the City Engineer. Beginning, ending, centerline-centerline intersections, and sharp grade breaks not exceeding a total of 1 percent will be identified on the profile with street stations and elevations. Grade breaks over 1 percent shall utilize a vertical curve. The maximum superelevation rate permitted shall be 4 percent on residential and collector streets, and 6 percent on arterial streets. The use of superelevation will be approved on a case-by-case basis by the City Engineer.

These requirements are for standard conditions anticipated within the city. Areas in which topography may dictate, the City Engineer will entertain variance from these Engineering Standards.

Length of Vertical Curve: Vertical curves shall be parabolic and of a minimum length computed from the formula:  $L = KA$

L = Length of vertical curve in feet

K = Design constant (rate of vertical curvature)

A = Algebraic difference in grades in percent

Selection of K values for crest vertical curves are based on sight distance requirements, and for sag vertical curves on headlight sight distance. K is a constant for each design speed and the values to be used are listed in the table below:

**Table D 2.05-A K Values for Vertical Curve**

Design Speed	K Values			
	Crest Vertical Curve		Sag Vertical Curve	
	Minimum	Desirable	Minimum	Desirable
20	10		20	
25	20		30	
30	30	30	40	40
35	40	50	50	50
40	60	80	60	70
45	80	120	70	90

- A. Curb and Gutter Grades: The minimum gutter grade, including curb returns, shall be 0.5 percent. The minimum street grade may be reduced to as low as 0.3 percent in specific circumstances with the approval of the City Engineer. All curb return data shall be summarized in a table on the plan sheet. The table shall show the total length of the return, delta angle, curb radius distance, and elevations of the beginning,  $\frac{1}{4}$  delta,  $\frac{1}{2}$  delta,  $\frac{3}{4}$  delta, and end of the return.
- B. Partial Street Improvements: If the curb and gutter on the side of the street not being constructed is anticipated to be at different grade than the curb and gutter that will be constructed, the construction plans will clearly show the future curb and identify all items that are to be constructed by others in the future.  
  
The profile view will include the bottom of the ditch or swale constructed on the side without curb and gutter, and shall show all culverts, drain pipes, drainage inlets, and drainage outlets.
- C. Cut and Fill Slopes: The catch points for cut and fill slopes shall be shown on the plan. The design shall address the collection of natural drainage and routing of runoff to prevent erosion of newly constructed slopes or blockage of the natural drainage.
- D. Utility Appurtenances: The profile will show all utility appurtenances such as manholes, curb inlets, culverts, and drainage inlets and outlets. Each item shall be labeled with the station and the finish grade elevation for the rim,

top of curb, and all inverts. Pipelines along the street shall be shown in profile as well as the cross section of pipes that cross the construction area.

### **D 3.00 – ALLEY DESIGN**

#### D 3.01 GENERAL REQUIREMENTS

All alleys shall be constructed of Portland Cement Concrete (PCC) with an inverted crown to collect drainage at centerline. The minimum pavement structure shall be 8 inches of PCC over 2 inches of base rock, placed over geotextile fabric. For alleys subject to industrial or special loading considerations, or if required by the City Engineer, a structural pavement design will be calculated to determine if additional PCC thickness is required for the anticipated loading.

Show all private improvements that will be impacted including garages or other structures, stairs, vaults, fences, walls, driveways, parking lots, walkways, or other items. Indicate existing drainage patterns and show private drainage inlets, outlets, and pipes beyond the alley right-of-way that will be impacted by the alley construction.

- A. Joint Pattern: The PCC pavement shall be placed full width in one pour, with no longitudinal joints. The alley design shall include a transverse joint pattern, shown on the plans, so that the joints are spaced to create panel lengths that are 0.75 to 1.25 times the alley width. The joint pattern will be coordinated to intersect with utility features such as poles, manholes, and catch basins.
- B. Alley Approaches: Alley approaches shall be constructed as commercial driveways in all respects, except that the structural section will be increased to 10 inches or match the alley pavement structure for which it provides access, whichever is greater. Alley approaches with a standard curb return shall not be used without approval of the City Engineer.

### **D 4.00 – STRUCTURAL PAVEMENT DESIGN**

Standard pavement structures for Asphalt Concrete (A.C.) and Portland Cement Concrete (PCC) pavements are defined in the City of Millersburg Standard Construction Specifications. It is the City's policy to only allow PCC pavements on streets on a case-by-case basis, provided all utilities have been installed or replaced prior to street construction. Design requirements and procedures are summarized in the appropriate sections below.

#### D 4.01 GENERAL REQUIREMENTS

The City has a standard structural section for residential local streets. Collector, arterial and nonresidential local streets shall undergo a full structural section design.

Design inputs shall consider soil characteristics, traffic loading data, and structural strength coefficients of the pavement materials. The PCC structural pavement design shall apply to both street and alley pavements. In any case, the City Engineer may require a structural pavement design to be generated when it is suspected that unsuitable soil conditions, high percentage of trucks, or any other condition may require



the pavement structure to be increased.

The design shall be based on a geotechnical investigation to determine soil characteristics, structural strength coefficients for the soil, and traffic loading data approved by the City. The design will be submitted for review with all supporting documentation and calculations for the structural design of the pavement. Any modification to the standard minimum pavement structure must be approved by the City Engineer.

#### D 4.02 SOIL CHARACTERISTICS

The structural characteristics of the soils underlying the proposed street will be assumed as fair, or may be specifically established by a geotechnical engineer. The classification of soil and corresponding ability to support the proposed street structure and anticipated loading is common to both A.C. and PCC pavement designs.

The structural characteristics for treated or reprocessed materials used in the pavement design shall be established by a geotechnical engineer and documented in the design calculations provided by the design engineer.

- A. Native Materials: If a geotechnical study is not undertaken, the native material classification shall be assumed to be fair. A soil classified as fair is typified as having values for the resilient modulus (MR) of 5,000 psi or other equivalent designation. For designs that assume fair soils, this value will be used.
- B. Subgrade Stabilization: Any part of the subgrade that is found to be inadequate will be stabilized to establish a new subgrade structure equivalent to the native subgrade under dry summer conditions. Rock used to replace all or a portion of the subgrade shall not be used to reduce the pavement or aggregate base thickness.
- C. Existing Street Structure: Whenever a street is to be constructed to a new grade or alignment such that the new street section is built over an existing street structure, any existing pavements shall be removed.

#### D 4.03 TRAFFIC DATA

Traffic loading data for the pavement design shall be determined for all arterial, collector, and non-residential local streets using current and 20-year future traffic volumes. The data will include a vehicle classification breakdown for passenger cars, buses, and 2, 3, 4, and 5-axle trucks. The volumes shall be provided in the form of Average Daily Traffic (ADT) so that loading factors can be determined by converting to standard 18,000 pound equivalent axle loads (EAL) for each vehicle class, and summing to determine the total traffic load.

Traffic data shall be submitted by a licensed engineer for the City's approval, or may be provided by the City if data is available. Traffic data from the City is limited to information that is readily available from existing traffic counts or based on the City of Millersburg's Transportation System Plan.

#### D 4.04 ASPHALT CONCRETE (A.C.)

Design of the A.C. pavement structural section shall follow the latest edition of Asphalt Pavement Association of Oregon (APAO) Asphalt Pavement Design Guide. All pavement structures shall be based on a 20-year design traffic-loading period with 90 percent reliability.

- A. Crushed Aggregate Base: Regardless of street classification, all streets shall be constructed with 12-inches of 100% fractured-face crushed aggregate base placed on a geotextile subgrade fabric. Geotextile fabric protects the crushed aggregate base from contamination with soil particles, preserving the structural integrity of the aggregate during the service life of the pavement. The geotextile fabric has no strength coefficient for purposes of determining the pavement structure.
- B. Minimum Pavement Structure: The following minimum pavement thicknesses have been developed with the intent of constructing a street system with long-life or "perpetual" pavement. This provides the City with a sustainable, long-term street maintenance strategy. Therefore, these minimum pavement thicknesses shall not be reduced.

**Table 4 .04-A Minimum Asphalt Pavement Criteria**

PAVEMENT CRITERIA	STREET CLASSIFICATION		
	LOCAL	COLLECTOR	ARTERIAL
Minimum A.C. Thickness	5-inches	7-inches	8-inches
Wearing Course Binder	PG 64-22	PG 70-22	PG 70-22
Base Course Binder	PG 64-22	PG 64-22	PG 64-22

Wearing course A.C. shall be 2-inches of ½-inch dense-graded hot-mix asphalt and base courses shall be ¾-inch dense graded hot-mix asphalt. Additional wearing course thickness may be required on streets with very high truck traffic. Warm mix asphalt may be used with approval of the City Engineer.

- C. Structural Strength Coefficients: When calculating the structural strength of each layer of the pavement structure, use the following values. The City Engineer must approve alternate structural materials and their strength coefficients for use.

0.42 per inch for hot mix A.C.

0.06 per inch for clean, crushed aggregate base

The above structural layer coefficients assume that construction will take place during dry summer conditions. If construction takes place outside of dry summer conditions, measures must be taken to stabilize all poor performing subgrade soils.

Arterial, collector and non-residential local streets will require pavement design calculations to check if the minimum asphalt thickness specified is sufficient for the anticipated traffic loading. For streets with more than one million EALs the pavement thickness will need to be evaluated based on a full structural design

calculation using the 1993 AASHTO Pavement Design Guide. The pavement thickness will be increased in increments of 0.5-inches if the minimum required pavement thickness above is shown to be insufficient. Increasing the thickness of the crushed aggregate base will not be allowed.

- D. Structural Overlay: A structural overlay may be considered to extend the useful life of the existing pavement structure by increasing the composite pavement Structural Number. The total structural number required for traffic loading during the design period shall be determined as described above.

Overlays shall not be feathered to match existing street pavement surfaces at paving limit lines. Taper grinding, butt grinding, or removal and reconstruction of the existing pavement will be required so the finished overlay surface will match the existing gutter or pavement grade.

1. Existing Structure: The Structural Number of the existing pavement structure may be determined by non-destructive testing, sample pits, or both. All testing methods must be approved by the City Engineer prior to performing the tests. All existing areas with soft subgrade or broken pavement shall be repaired prior to paving of the overlay.

When taper or butt grinding are employed in the design, the Structural Number of the existing pavement at those locations will be determined for the pavement thickness remaining after grinding.

2. Overlay Thickness: The required overlay thickness is determined by calculating the additional A.C. layer necessary to meet the value of the desired Structural Number. The minimum nominal overlay thickness will be 2 inches.
3. Paving Fabric: An approved paving fabric may be placed over the existing pavement immediately prior to the overlay if approved by the City Engineer, with the edge of the roll no more than 6 inches from the gutter or paving limit line. Required crack filling to support the fabric, and the fabric installation, shall be according to the manufacturer's recommendations. At no point will the pavement thickness over the fabric be less than 2 inches. The purpose of incorporating paving fabric is to create a waterproof membrane within the pavement structure to further protect the structure from water intrusion. While paving fabric may delay reflective cracking, it is not presumed to prevent it.
4. Limitations: The street must be evaluated for limiting factors that would make an overlay undesirable. The maximum cross slope after the overlay is placed must be determined and may not exceed 5 percent without approval of the City Engineer. Check driveway approach grades to verify that vehicles will not scrape and that vehicles pulling trailers will reasonably be able to access the driveways without scraping or dragging.

#### D 4.05 PORTLAND CEMENT CONCRETE (PCC)

Design of the PCC pavement structural section shall follow the Portland Cement

Association (PCA) or American Concrete Pavement Association (ACPA) design guides. The design will have a 90 percent statistical reliability of adequately supporting the design traffic loading without requiring any major maintenance or repair.

- A. Minimum Structure: The minimum slab thickness shall be 8 inches for residential streets, 9 inches for collector streets, and 10 inches for arterial streets. A leveling course of no less than 2 inches of crushed aggregate base shall be placed under all concrete street sections.
- B. Joints: A typical joint pattern shall be specified and shown on the plans so that the joints are spaced to create panel length to width ratios that are 1.00 to 1.35.
  - 1. Transverse Joints: The transverse joint pattern shall be perpendicular or slightly skewed in relation to the direction of traffic and be coordinated to match with all curb joints. The spacing of transverse joints will generally not be greater than 15 feet.
  - 2. Longitudinal Joints: A longitudinal joint shall be sawcut along the street centerline. Supplemental longitudinal joints shall be specified if the resulting half-street panel width exceeds 15 feet.

## **D 5.00 – STRIPING AND PAVEMENT MARKING PLANS**

A striping plan shall be provided for review and approval by the City Engineer prior to the application of any permanent pavement markings. All striping and pavement marking design shall comply with the standards contained in the current version of the Manual on Uniform Traffic Control Devices.

### D 5.01 STRIPING MATERIALS

Materials shall be as described in the Standard Construction Specifications. All striping shall be installed on the same day as paving of the top lift of asphalt regardless of materials specified.

- A. Extruded Thermoplastic: Extruded thermoplastic shall be used for all longitudinal lane markings. Profiled markings shall be used except for lines adjacent to a bicycle lane, where non-profiled markings shall be used.
- B. Preformed Thermoplastic Film: Preformed thermoplastic film material shall be used for all crosswalks and legends.
- C. Raised Pavement Markers: Raised pavement markers shall be reflectorized and match the color of the stripe they are complementing. Markers shall be placed every 40 feet along skip stripes (centered in each skip) and every 20 feet along solid stripes.
- D. Hot Inlay Tape: Hot inlay materials may be used for longitudinal lane lines when approved by the City Engineer.
- E. Paint: Paint shall only be used if approved by the City Engineer. Painted pavement

markings shall consist of a minimum of two coats of paint that conforms to the current Oregon State Highway Division's Standard Specifications for White and Yellow Traffic Line Bead Binder Paint.

**D 6.00 – ILLUMINATION**

D 6.01 GENERAL

- A. Improvement Plans. The Engineer shall show the proposed illumination system on the project improvement plans. All illumination systems shall be designed in accordance with this standard, accepted engineering practices, and electric utility guidelines. Street illumination shall be owned and maintained by the electric utility with a City service contract unless otherwise approved by the City Engineer. Fiberglass poles shall be specified unless otherwise approved by the City Engineer.
- B. Coordination. For all projects that include the installation of luminaires, the electric utility must be contacted early in the design process to coordinate providing service to the modified street network. The City and the electric utility shall approve luminaire and service point locations prior to approval of the improvement plans and issuance of a Construction Permit. Luminaires must be installed and operational prior to City acceptance of public improvements.

D 6.02 AVERAGE MAINTAINED HORIZONTAL ILLUMINATION

- A. Minimum Average Foot-Candle Requirements.

**Table D 6.02-A ROADWAY SEGMENTS**

STREET CLASSIFICATION	Residential	Commercial or Industrial
Local	----	0.9 fc
Collector	0.6 fc	1.2 fc
Arterial	0.9 fc	1.6 fc

Source: IES RP-8, American National Standard Practice for Roadway Lighting, Illuminating Engineering Society of North America.

Notes: Collector and arterial streets shall have a minimum weak point foot candle measurement of 0.2 fc.

**Table D 6.02-B ROADWAY INTERSECTIONS**

STREET CLASSIFICATION		Residential			Commercial or Industrial		
		Local	Collector	Arterial	Local	Collector	Arterial
Residential	Collector	1.0 fc	1.2 fc				
	Arterial	1.3 fc	1.5 fc	1.8 fc			
Commercial or Industrial	Local	1.3 fc	1.5 fc	1.8 fc	1.8 fc		
	Collector	1.6 fc	1.8 fc	2.1 fc	2.1 fc	2.4 fc	
	Arterial	2.0 fc	2.2 fc	2.5 fc	2.5 fc	2.8 fc	3.2 fc

Source: IES RP-8, American National Standard Practice for Roadway Lighting, Illuminating Engineering Society of North America.

Notes: 1. Intersection Lighting Level = Sum of Intersecting Street Lighting Levels.  
2. Collector and Arterial streets shall have a minimum weak point foot candle measurement of 0.2 fc.

**Table D 6.02-C AVERAGE/MINIMUM UNIFORMITY RATIO**

STREET CLASSIFICATION	AVERAGE/MINIMUM UNIFORMITY RATIO
Local	6:1
Collector	4:1
Arterial	3:1

Source: IES RP-8, American National Standard Practice for Roadway Lighting, Illuminating Engineering Society of North America.

**Table D 6.02-D LUMINAIRE TYPES**

BRAND	MODEL	WATTAGE	LIGHT SOURCE	LENS TYPE	DISTRIBUTION	IES FILE
American Electric Lighting (Acuity Brands, Inc.)	115	100W	HPS	Glass, Flat	TYPE II	LTL14275
		150W			TYPE III	AE3579
	125	250W	HPS	Glass, Flat	TYPE III	LTL10823-250
		400W			TYPE III	AE3874

Source: Pacific Power and Light Company. See <http://www.americanelectriclighting.com/> for IES files.

**Table D 6.02-E AVERAGE MAINTAINED LUMENS**

LUMINAIRE TYPE	INITIAL LUMEN VALUE	DEPRECIATION FACTOR	MAINTAINED LUMEN VALUE
100W HPS	9,500	0.84	7,980
150W HPS	16,000	0.84	13,440
250W HPS	27,000	0.84	22,680
400W HPS	50,000	0.84	42,000

Source: Pacific Power and Light Company.

Notes: 1. Maintained Lumen Value = Initial Lumen Value x Depreciation Factor.

### D 6.03 LOCATION

#### A. Requirements:

1. Location. Luminaire locations shall be subject to the approval of the City Engineer. Luminaires shall be located at property lines and curb returns where possible. A minimum of one luminaire shall be located at each residential local street intersection, each 3-legged intersection (all classifications), and at the end of each cul-de-sac or permanent dead-end street. Additional luminaires may be required at other street intersections. Luminaire locations shall be as follows (those not specified shall be determined by the City Engineer):

**Table D 6.03-A MAXIMUM LUMINAIRE SPACING TABLE**

MAXIMUM LUMINAIRE SPACING TABLE							
Street Width	Sidewalk Location	Pole Config.	<sup>(1)</sup> Pole Location	Pole Height	Mast Arm Length	Luminaire Type	Max. Spacing
Residential Local Streets:							
Varies	Setback	Staggered	3.0' FC	25'	6'	100W HPS	600'
Commercial or Industrial Local Streets:							
36'	Setback	Staggered	3.0' FC	30'	8'	250W HPS	200'
48'	Setback	Staggered	3.0' FC	30'	8'	250W HPS	215'
Residential Collector Streets:							
36'	Setback	Staggered	3.0' FC	30'	8'	100W HPS	150'
48'	Setback	Staggered	3.0' FC	30'	8'	150W HPS	170'
Commercial or Industrial Collector Streets:							
36'	Setback	Staggered	3.0' FC	30'	8'	250W HPS	185'
48'	Setback	Staggered	3.0' FC	30'	8'	250W HPS	200'
Residential, Commercial, or Industrial Arterial Streets:							
40'-70'	Setback	Opposite Across	3.0' FC	30'	6'-14'	City Calc.	City Calc.

Source of Calculations: Visual Roadway Lighting Tool. <http://www.3d-visual.com/Tools/Roadway/Launchpage.asp>

- Notes: 1. Distances are to the center of the pole as measured from the face of curb (FC).  
 2. Street widths that vary from those listed above can either use maximum luminaire spacing of next higher width street, or require separate City calculation.

**D 7.00 – SPECIALTY PAVEMENT TREATMENTS AND TRAFFIC CALMING**

All specialty pavement treatments proposed to alter color, surface texture, or surface material shall be submitted by the design engineer and are subject to review and approval by the City Engineer. These materials and treatments may include colored concrete, stamped patterns, inlaid materials, interlocking pavers, or any other alternative treatments or materials.

**D 8.00 – STREETScape APPURTENANCES**

Items that will be modified or placed in the right-of-way shall be identified and specified. Such items include but are not limited to street signs, bus shelters, street trees, and mail boxes. Obstructions that will encroach into sidewalk areas will be identified. Adequate clear space for passage or how the impact will be mitigated will be shown on the plans.



#### D 8.01 STREET SIGNS

Street signs shall meet MUTCD, Standard Highway Sign and City of Millersburg requirements. The type and location of the signs will be shown or described on the plans.

- A. Regulatory/Informational Signs: Street sign sizes and placement locations shall be reviewed and approved by the City Engineer. Except for street name plates or other signs as approved, all signs will utilize high intensity reflective sheeting as specified in the Standard Construction Specifications. Standard STOP and warning sign sizes are 30 inch x 30 inch, but larger sizes may be required at specific locations. Other regulatory and informational signs will follow standard size and content as described in the MUTCD or as directed by the City Engineer.
- B. Street Name Signs: Street name signs shall be as specified in the *Standard Construction Specifications*.

#### D 8.02 BUS SHELTERS

At required locations, bus shelters shall be installed as directed by the City Engineer. The shelters may be located in the landscape strip if adequate room exists or behind the sidewalk within the right-of-way or in an easement for that purpose. In no case shall the shelter be placed within the designated sidewalk area as an obstruction that would require a pedestrian to maneuver around the shelter.

#### D 8.03 STREET TREES

Current specifications for furnishing, planting, and establishing trees are available from the City. The design engineer may initially coordinate with the City for recommendations of appropriate tree species, location, and spacing. New trees will not be planted in clear vision areas or otherwise interfere with required sight distances, including intersections and railroad crossings. Final plans and specifications for street trees and related vegetation or appurtenances shall be reviewed for approval by the City Engineer.

#### D 8.04 MAILBOXES

Final locations for mailboxes shall be coordinated with the U.S. Postal Service (USPS). The engineer shall work with the USPS to ensure that mailboxes are installed according to the Standard Construction Specifications, meet ADA requirements, and shall be acceptable to the United States Postal Service.

To the extent possible, mailbox locations shall also be coordinated with streetlight locations in order to provide adequate lighting at mailbox locations. Mailbox locations shall be identified on plans for the construction of public improvements.

## **D 9.00 – PEDESTRIAN AND MULTI-USE PATHS**

Pedestrian paths providing connectivity within residential areas shall be constructed to sidewalk standards, to the width specified in the land use decision or by the City Engineer. Multi-use paths shall be assumed as shared use pedestrian/bike paths with a minimum width of 10 feet and a minimum vertical clearance of 8 feet to overhead obstructions for bicyclists. Proposed modifications due to physical constraints or other circumstances must be approved by the City Engineer.

### D 9.01 MATERIAL

All paths shall be constructed with PCC or A.C. pavement. The minimum structural PCC pavement section will be 4 inches of PCC pavement over 3 inches of crushed aggregate base. If the path is intended to support utility maintenance vehicles, the PCC thickness shall be increased to 6 inches.

The minimum structural A.C. pavement sections will be 3 inches of ½-inch dense-graded hot-mix asphalt over 6 inches of 100% fractured-face crushed aggregate base. Geotextile subgrade fabric may be required. If the path is intended to support utility maintenance vehicles, the A.C. pavement thickness shall be increased to 4 inches and the aggregate base thickness shall be increased to 8 inches. The use of pervious pavements may be allowed, but require approval by the City Engineer.

### D 9.02 DRAINAGE

Where a path is constructed on a hillside or along an unimproved hillside roadway, a ditch of suitable dimensions shall be placed on the uphill side to intercept the hillside runoff. This ditch shall be a minimum of 3 feet from the edge of pavement. There shall be a minimum 1-foot shoulder between the edge of the path and the top of ditch. Where possible, field inlets shall be installed to intercept the runoff water and carry it under the bike path. Drainage grates and manholes shall be located outside the traveled way of the bicyclists with the slits of the drainage grates placed perpendicular to the bike path. Where possible, natural ground cover should be included in the design to prevent erosion on cut and fill slopes.

## **D 10.00 – TRAFFIC SIGNALS**

A licensed traffic engineer registered in the State of Oregon shall design traffic signals. All documentation of traffic studies, field data, and recommendations will be coordinated with the City Engineer. All plans and specifications shall be in accordance with Oregon Department of Transportation (ODOT) and MUTCD requirements or as modified by the City Engineer. The final design of the traffic signal must be approved and accepted by the City Engineer.

## **D 11.00 – BRIDGES**

Bridges shall be designed by a licensed professional engineer, registered in the State of Oregon. All documentation of hydrological and soil studies, field data, and recommendations shall be

coordinated with the City Engineer. All plans and specifications will be in accordance with Oregon Department of Transportation (ODOT) and MUTCD requirements, or as modified by the professional engineer. The final bridge design must be approved and accepted by the City Engineer.