

## **SECTION 7 – ROADWAY**

### **GENERAL REQUIREMENTS**

Roadway plans shall be designed based upon the latest edition of the Ohio Department of Transportation Location and Design Manual (L&D) Volume I and III, American Association of State Highway and Transportation Officials “A Policy on Geometric Design of Highways and Streets,” the Ohio Department of Transportation Bureau of Location and Design Standard Construction Drawings, the Ohio Department of Transportation Construction and Material Specifications, the Ohio Manual of Traffic Control Devices, the City of Hudson Land Development Code and The City of Hudson Engineering Standards as noted in the following items of this section.

Horizontal and vertical design, geometric design of intersections, barrier design, pavement design and driveway design for new and reconstructed roadways shall follow the ODOT Location and Design Manual Volume I and AASHTO “A Policy on Geometric Design of Highways and Streets” or as required by the City.”

### **I. TYPICAL SECTION**

#### **7.1. LANE WIDTHS**

Roadway lane widths for all through lanes and turning lanes within the City shall be 12 feet wide or as approved by the City Engineer. Roadway lane widths do not include the gutter width, curb offset width, curb and gutter width and paved shoulder width. See Figure 7.1.(1)(2)(3). Any variations to this standard shall be documented by the designer in a written report to the City stating the reasons for the variance **and as approved by the City Engineer**. No variations shall be granted until written permission is received from the City.

#### **7.2. SHOULDER WIDTHS**

Roadway shoulder widths shall be determined by using the functional classification of the roadway and traffic data as per the latest edition of the ODOT L&D Manual Volume I or as required by the City. See Figure 7.1.1, Detail B, C and D. The type of shoulder material shall be determined by the City. A combination of materials may be required at the discretion of the City **Engineer**. Minimum curb offset from the edge of the travel lane shall be based on the functional classification of the roadway and its design speed as per the latest edition of the ODOT L&D Manual Volume I or as required by the City **Engineer**. See Figure 7.1.1, Detail A.

### 7.3. CROSS SLOPE

Cross slopes for the roadway cross section shall conform to Table 7.3.1 and Figure 7.1.1, Detail A. If the pavement has a super elevation, the cross slopes shall follow super elevation design as defined by ODOT Location & Design Manual Volume 1, latest edition, **or as approved by the City Engineer.**

TABLE 7.3.1	
Roadway Cross Slope	1/4"/FT (2.08%)
Shoulder Cross Slope	
• Asphalt	1/2"/FT (4.17%)
• Aggregate	3/4"/FT (6.25%)
• Turf	1"/FT (8.33%)
Tree lawn	1/2"/FT (4.17%)
Sidewalk	1/4"/FT (2.08%)

### 7.4. CURB AND UNDERDRAINS

Curb shall be ODOT Type 6 or match existing curb if approved by the City **Engineer.** Curb shall be placed on a minimum of 3" of ODOT Item 304, limestone aggregate. The curb shall have a sawed joint every 10 feet. The joint created between the curb face and the pavement shall be sealed with asphalt cement as per the latest edition of the ODOT Construction and Material Specifications.

Underdrains shall be 6" in diameter and underdrain inverts shall be typically 24" below the top of the roadway surface at the back of the curb. Underdrains shall be PVC plastic, smooth walled and perforated, meeting ASTM 3034 SDR35. See Figure 7.1.1, Detail A. For installation of underdrains on an existing roadway, no downspouts or sump-pumps shall be permitted to discharge onto the street, they shall be connected to existing storm sewer using material and methods as directed by the City. All underdrain outlets shall be PVC plastic and solid walled meeting ASTM 3034 SDR35. Underdrain outlets shall be 10 feet in length. There shall be a minimum of two inches of #57 limestone bedding.

In areas without curb, strip drains may be used in lieu of under drain. Strip drain shall be Contech Brand #80 or an approved equal. There shall be a minimum of 2 inches of #57 limestone bedding, then limestone to within 6 inches of the bottom of pavement or bottom of curb in curbed areas. The strip drain shall be installed 18 to 24 inches below the existing edge of pavement. Driveway aprons shall be cut back 1 foot and the slot replaced with 4 inches of 301 asphalt and 1 inch of 441 Type I Surface, limestone asphalt for residential. Commercial refer to Fig 7.1.2 Detail A.

### 7.5. SIDEWALKS AND DRIVEWAYS

Sidewalks shall be constructed of concrete as per the latest edition of the ODOT Construction and Materials Specifications and shall be a minimum of four inches thick. Sidewalks adjacent to intersections

shall include handicap access ramps constructed as per ODOT Standard Construction Drawing BP-7.1 and the latest Americans with Disabilities Act (ADA) requirements utilizing ADA Solutions “Cast in Place Replaceable Warning Surface”, brick red in color or as approved equal. Where a sidewalk traverses across the limits of a driveway, the sidewalk thickness shall be a minimum of 6 inch for residential and 8 inch for commercial. Sidewalk width shall be a minimum of five feet. Sidewalk shall meet the existing widths for replacement. A 1/2” recycled rubber (“Reflex” by J.D Russell or approved equal) expansion joint shall be used at 100 foot max. intervals. Divide replacement surfaces into equally spaced blocks of approximately five foot intervals. Where existing sidewalks are sandstone, the sidewalk will be replaced in accordance with The City of Hudson Codified Ordinances section 1012.05.

Driveway aprons shall be constructed of Type MS limestone concrete as per the latest edition of the ODOT Construction and Material Specifications and shall be six inches thick for residential driveways and eight inches thick for non-residential driveways. Residential and commercial driveway apron dimensions shall follow the latest edition of the ODOT Location and Design Manual Volume I. All driveway aprons, sidewalks and concrete roadway panels shall have a clear type of cure placed on the concrete within 3 hours after placement of the concrete has been completed unless otherwise approved by the City of Hudson Engineer.

In non-curbed areas the apron at the interface with the existing roadway shall be 1/4” lower in elevation than the elevation of the existing roadway edge of pavement. In addition, prior to placing the concrete, the existing roadway edge of pavement shall be sawn full depth resulting in a straight edge, butt joint. If the edge of the roadway is in poor condition, then the roadway edge shall be replaced in kind with the same type of roadway material.

An asphalt driveway/entrance for non-residential structures may be considered in non-curbed areas by the City of Hudson on a case by case basis. The typical section of the driveway/entrance shall conform to Figure 7.1.1, Detail A. An asphalt driveway apron for residential structures may be considered for the replacement of an existing apron. The typical section shall consist of a compacted subgrade, 4 inches of ODOT Item 304 Limestone, 4 inches of ODOT Item 301, and 1 inch of ODOT Item 441 Type I surface.

#### 7.6. DITCHES

Ditch foreslopes and backslopes shall be a maximum of 4:1. The bottom of the ditch shall be a minimum of one foot wide. The ditch size shall be based upon hydraulic calculations designed and stamped by a registered Ohio professional engineer or Professional Surveyor for elimination plans, and submitted to the City for review. The City **Engineer** may adjust the proposed ditch slopes due to right-of-way restrictions. Ditch grades shall be a minimum of 1%. Erosion control matting shall be installed from top of the bank to top of the bank and hydro seeded. The type of erosion control matting shall be based on the velocity of ditch flow. Typical ditch sections shall follow the latest edition of the ODOT Location and Design Manual, Volume 1. All excess material shall be removed from the site and not spread out on the banks.

## 7.7. PAVEMENT BUILDUP

The minimum pavement buildup for all City streets shall consist of the following courses and comply with the 2013 edition of the ODOT Construction and Material Specifications. See Figure 7.1.1, Detail A. All asphalt concrete shall be a limestone base.

Arterial Roadway Collector Roadway Local Roadway Local Residential Roadway	Roadway Widening Office Industrial Arterial Roadway Office Industrial Collector Roadway
441 Type I Surface– 1 1/2" Limestone Asphalt Concrete	441 Type I Surface– 1 1/2" Limestone Asphalt Concrete with special pavement reinforcing additive as required based on truck traffic and soils per City requirements.
Special pavement reinforcing fabric as required by the City.	441 Type II Intermediate– 1 3/4" Limestone Asphalt Concrete
441 Type II Intermediate– 1 3/4" Limestone Asphalt Concrete	301 – 9" Bituminous Aggregate Base (3-3" lifts)
301 – 6" Bituminous Aggregate Base (2-3" lifts)	304 – 4" Limestone Aggregate Base
304 – 4" Limestone Aggregate Base	Special Geogrid Tensar TX140S or approved equal
Special Geogrid Tensar TX140S or approved equal	203 – Subgrade compaction and proof rolling with zero deflection using a 30 ton or 60,000lb loaded tandem truck with ticket. Cement stabilization of the subgrade shall be required where the subgrade CBR value is less than 6.
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In all cases, the minimum pavement buildup shall be calculated based on soil conditions and truck traffic and modified as required to meet the expected loadings. The City shall receive a copy of the asphalt pavement design, including the calculations, for review and approval. The method for pavement design shall follow the latest edition of the ODOT Pavement Design and Rehabilitation Manual. For new construction, the City may require an asphalt cement construction seal as approved by the City.

For existing concrete panel roadways the minimum pavement buildup shall comply with Figure 7.1.2., Detail E, Concrete. The reinforcement shall be 6 x 6 x 4 roadway mesh installed on 3 inch chairs as per the manufacturer's recommendations and 5/8 inch epoxy coated dowels or hook bolts @ 18 inch intervals along the exposed vertical face.

#### 7.8. UTILITY TRENCH

Pavement replacement in utility trenches on asphalt streets shall consist of a minimum of four inches of ODOT 304 limestone, seven inches of Type MS concrete, with reinforcing fabric (6 x 6 x 10 wire mesh), three inches of ODOT Item 441 Type I surface asphalt concrete, limestone placed in two 1 1/2 inch compacted lifts. Concrete streets shall consist of a minimum of four inches of ODOT Item 304 limestone aggregate and seven inches of Type MS concrete, with reinforcing fabric (6 x 6 x 10 wire mesh) on 3 inch chairs, and 5/8 inch epoxy coated dowels drilled every 18 inches. The existing pavement shall be sawcut two feet wider than the width of the utility trench at the surface of the trench (one foot on each side of the trench). The thickness and depth of the concrete base and asphalt surface shall be adjusted to match the existing pavement buildup if greater than the minimum requirements. See Figure 7.1.2, Detail E. Utility trench repair shall be done within 48 hours of 50# low strength mortar placement in accordance with ODOT 614 or backfill as approved by the City. During the period between placement of the low strength mortar and the utility trench repair, the trench shall be protected with steel plating of sufficient thickness and strength to support truck traffic. The plates shall be pinned to ensure no movement and the area on either side of the plate shall be ramped with cold patch. A "steel plates in road ahead" sign shall be placed to give notification to motorcycles and other traffic. A temporary 3 inch concrete cap with a visqueen separation layer shall be applied to the trench if the weather conditions do not permit asphalt placement. Once the weather conditions are sufficient for placement of asphalt, the temporary concrete cap shall be immediately removed and asphalt shall be placed.

#### 7.9. TEMPORARY ROADWAY AND SIDEWALK

Temporary roadway buildup and temporary sidewalk shall follow Item 615 of the latest edition of the ODOT Construction and Material Specifications. Temporary roadway standards shall also apply to shoulders. Temporary roadway shall be removed after the temporary facilities are no longer needed. The Contractor shall continuously maintain all temporary roadways in good condition, as determined by the City with respect to safety and rideability.

Temporary sidewalk shall be constructed to a minimum width of four feet or wider to match the existing sidewalk width and shall consist of three inches of ODOT Item 304 limestone aggregate compacted using methods approved by the City. The Contractor shall continuously maintain temporary sidewalk in good condition, as determined by the City with respect to safety for the pedestrian. The sidewalk shall be kept free from any mud accumulation and holes.

Temporary roadway buildup and temporary sidewalk shall be placed immediately after the installation or disturbance is complete to allow for use of the roadway or sidewalk. In defining the term "complete" for temporary roadway buildup or temporary sidewalk, complete shall be when the hole, ditch or opening has been backfilled. For this instance "complete" is not related to testing of an installation or substantial completion of the installation.

#### 7.10 ROADWAY WIDENING

When it is necessary to widen an existing roadway within the City, the minimum pavement buildup for the widened portion of the roadway and the berms shall follow the table included in Section 7.7 unless otherwise approved by the City of Hudson Engineer.

The length and width of the existing pavement surface course, within the limits of the proposed widening, shall be planed to a minimum depth of 1 1/2". The planed area shall be resurfaced with a minimum of 1 1/2" of ODOT Item 441 Type I surface asphalt concrete limestone after the widening has been completed.

Existing underdrains shall be protected, left in place and connected to any modified storm drainage system. In addition, new underdrains, as shown in Figure 7.1.1 shall be installed.

#### 7.11 PAVEMENT MARKINGS

Pavement markings for new roadways shall be thermoplastic pavement markings following ODOT 644. Pavement markings for existing roadways shall be quick drying traffic paint following ODOT 642 and as approved by the City **Engineer**. Any temporary tape placed on the finished course shall be removed without damaging or scarring the roadway surface prior to the final pavement markings being placed on the finished course.

#### 7.12 MONUMENTS

**The centerline of right-of-way shall be permanently monumented per Ohio Administrative Code 4733-37 at the P.C. and P.T. of horizontal curves, angle points, center and offset of permanent cul-de-sac, all roadway intersections and at all other locations as required by the City Engineer. The monuments shall be spaced so as to be within sight distance of each other, with the sight lines being contained wholly within the roadway limits. The monuments shall be constructed as per ODOT Standard Drawing RM-1.1. All monuments shall be set and written certification sent to the City by a licensed professional surveyor, currently registered in the State of Ohio. Monument boxes shall be East Jordan 8365 Heavy Duty monument. No risers shall be used. Old, broken or non-conforming monument boxes shall be removed and replaced with the above East Jordan box.**

**External boundaries of a subdivision shall have monuments placed in the field by iron rods at least thirty inches long and one (1) inch in diameter with a fluorescent colored cap set no more than six inches above grade. These monuments shall be placed not more than 1000 feet apart in any straight line and at all corners, at each end of all curves, at the point where a curve changes its radius, at all angle points in any line, and at all angle points along the meander line of a stream, river or creek, those points to be not less than twenty feet back from the bank of any stream, river, or creek.**

#### 7.13 TEMPORARY CUL-DE-SAC

Temporary cul-de-sacs shall be built such that the center section bounded by the gutter extension of the adjacent tangent roadway section can be used with minor modifications as part of the proposed

roadway extension. Temporary cul-de-sac pavement buildup shall be the same as for permanent cul-de-sacs and roadways. The centerline crown and the edge of pavement gutters of the tangent roadway typical section shall be extended through the entire length of the temporary cul-de-sac. The cross slope of this center section shall match that of the tangent roadway typical section. The remaining outer portion of the temporary cul-de-sac shall be sloped to drain into the gutter and then to a catch basin. Curb underdrain is not required within the limits of the temporary cul-de-sac.

All storm, sanitary, water and other utilities and appurtenances shall be designed and constructed in a manner such that the castings can be adjusted to grade without reconstructing the catch basin, manhole, vault etc. Catch basins shall be designed and constructed such that the curbed inlet casting can be installed without reconstructing the catch basin.

When the tangent roadway typical section is to be extended, the temporary cul-de-sac shall be saw cut full depth along the gutter lines and the outer portion of the existing pavement removed. Curb shall then be placed along the saw cut and tied into the existing tangent roadway curb. The remaining area disturbed by the pavement removal shall be graded to properly drain into the roadway, seeded and mulched.

#### 7.14 NEW PUBLIC ROADWAYS AND WIDENING

Where new public roadways are to be built, or existing roads are to be widened, soil borings shall be required at 100 foot intervals along the proposed roadway or 300 foot along the existing roadway centerline. The California Bearing Ratio (CBR) value of the existing soil shall be determined and made available in a report to the City Engineer. If the soil exhibits a CBR value less than 6.0, the subgrade shall be stabilized with cement such that there is zero deflection when proof rolled, see Figure 7.1.2.

The soil cement stabilization shall be portland cement or portland cement kiln dust of sufficient percentage by dry weight to achieve 200 psi at seven (7) days on an unconfined compressive strength. Construction of the soil cement stabilization shall be in accordance with ODOT 804, with a minimum depth of 12 inches. The subgrade shall be proof rolled by a 60,000 pound (30 ton) gross weight dump truck that will achieve a zero (0) deflection as a final result **as approved by the City Engineer**. A certified weight slip must accompany the proof roll unit.

#### 7.15 TRAFFIC IMPACT STUDIES

**A traffic impact study is required for any site development or subdivision plat which involves a use (or reuse) of a property which is determined to generate or has the potential to generate 100 or more vehicle trips (total of entering and exiting vehicles for the proposed development at full 20-year build out and occupancy) during the highest peak hour of the development or for a site development or subdivision plat which proposes a direct access to any collector or arterial roadway. The City may require a traffic impact study, if in the opinion of the City Engineer, the site has a potential to require significant transportation improvements, is a sensitive environmental area or an area with a safety condition. The content of the study and the preparation of the traffic impact study, shall be in conformance with the accepted transportation**

engineering procedures & guidelines in the Institute of Transportation Engineer's (ITE) "Transportation Impact Analysis for Site Development", latest edition.

For all site development projects and subdivision plats that do not generate 100 or more vehicle trips in the peak hour, a trip generation report and a turn-lane warrant analysis shall be required, unless otherwise approved by the City Engineer. The turn lane analysis shall be in conformance with the current Ohio Dept. of Transportation, State Highway Access Management Manual.

**Study Area:** The proposed site or subdivision access shall be evaluated to the next major intersection(s), as defined by the City Engineer, & in all directions from each proposed access point(s). The City Engineer may require additional areas at the developer's expense, if the proposed access(s) is within a high crash area, if there is a traffic operations concern, or as directed by the City Engineer.

7.16 **STREET DESIGN STANDARDS**

In addition to the pavement and right-of-way widths standards in the Hudson Land Development Code, streets must adhere to the current Ohio L&D - Roadway Design Manual and the following design standards.

(A) Minimum Centerline Radius:

<u>Road Classification</u>	<u>Radii in Feet</u>
<b>Arterial</b>	<b>600</b>
<b>Collector</b>	<b>360</b>
<b>Local</b>	<b>200</b>

(B) Stopping Site Distance

Horizontal and vertical alignments shall be designed according to the following Stopping Site Distance:

<u>Design Speed</u>	<u>Minimum Stopping</u>	<u>Preferred Stopping</u>
<u>Site Distance</u>	<u>Site Distance</u>	
<b>25 mph</b>	<b>150</b>	<b>175</b>
<b>30 mph</b>	<b>200</b>	<b>225</b>
<b>35 mph</b>	<b>250</b>	<b>275</b>
<b>40 mph</b>	<b>305</b>	<b>350</b>
<b>45 mph</b>	<b>360</b>	<b>400</b>
<b>50 mph</b>	<b>425</b>	<b>475</b>
<b>60 mph</b>	<b>570</b>	<b>650</b>

7.17 **CURBED AND UNCURBED MINIMUM RADII RETURNS**

The turn radius for any commercial or industrial development must be based on the classification of vehicle projected for the development. Compound curves, tapers with curb radii or curb radii shall



dictate the layout of the proposed curb based upon the vehicle classification. The turn radius for residential areas shall be in accordance with the curb radius.

The curb radius for a residential subdivision with two local streets shall be a minimum of **25** feet. The curb radius between a local street and a collector shall be a minimum of **35** feet. The right of way lines shall follow the curb-radius/turn radius.

#### 7.18 MAXIMUM/MINIMUM GRADES

The maximum grade for residential streets shall be 6%, **or as approved by the City Engineer.** The maximum grade for commercial and industrial streets shall be 5% **or as approved by the City Engineer.** The minimum grade for all streets is 1%, **or as approved by the City Engineer.**

All reasonable attempts shall be made to minimize the impact to the surrounding contours of the existing topography of the proposed development site. The **City Engineer** reserves the right to require proposed grades designed to minimize the impact to the surrounding area.

#### 7.19 INTERSECTION PROFILE GRADE APPROACH LIMITS

Intersections shall be designed to match cross slopes and shall be designed with a flat grade wherever possible. In areas not allowing flat grades, a leveling area shall be provided having no greater than a 2% grade for a distance of a minimum of 60 feet as measured from the nearest right-of-way line of the intersecting street.

#### 7.20 REVERSE CURVES AND TANGENTS

Tangents of at least 100 feet long shall be provided between reverse curves on residential and collector streets and at least 250 feet long on arterial streets. A transitional spiral is a suitable alternative.

All required fire access roads, including public streets, shall be installed and serviceable before commencement of aboveground construction.

#### 7.21 SIGNS

A reflective distance marker shall be required for fire access roads greater than 900 feet in length. A marker supplied and installed by the Hudson Fire Department shall be located every 900 feet of length from the main entrance of the structure to the street.

#### 7.22 PATHWAYS

See Section 7 - FIG. 7.1.1 & 7.1.5.