

GENERAL POLICY AND PROCEDURE

DEPARTMENT OF PUBLIC SERVICE
DIVISION OF INFRASTRUCTURE MANAGEMENT
CITY OF COLUMBUS, OHIO

SUBJECT: Non-Residential Street
Pavement Design
BY: Tracie Davies

EFFECTIVE DATE: December 1, 2014
PAGES: 7 (including exhibits A & B)
EXHIBITS: A & B

I. **Applicability**

This policy shall be applicable to the design of all non-residential roadways, including the classifications of arterial, collector and industrial roadways as defined herein, in the City of Columbus, regardless of the owner, developer, or City Agency. Refer to the residential street pavement design policy for guidance on alleys and residential collectors.

II. **Effective Date**

This policy shall be effective December 1, 2014, and shall apply to all non-residential roadway engineering drawings submitted to the Public Service Department as of the effective date of this policy.

III. **Limitation on Use**

A. The use of multiple pavement types for any one class of roadway is not permitted in any segment of a given non-residential street improvement project. A street segment is defined by the limits of the proposed project.

B. The City of Columbus reserves the right to vary from this policy where it benefits the City of Columbus, in consideration of testing new products, techniques or materials.

IV. **Definitions**

A. Working Day - A working day is hereby defined as any weekday, Monday through Friday, that is not a city holiday.

B. Stabilized Subgrade - A 12-inch thick stabilized subgrade in accordance with CMSC Item 206 Chemically Stabilized Subgrade where credit of the strengthened subgrade is accounted for in the pavement design.

C. Non-Residential Street - Any street with a roadway classification as defined by Section IV (D, E, F).

D. Arterial Street - An arterial street is any street whose primary function is to move vehicles from one section of the city or county to another and which is so designated on the City of Columbus thoroughfare plan and arterial construction types adopted by city council. (Ord. 1371-81.)

E. Collector Street - A collector street is any street whose function is to provide for traffic movement within a section of the city between local and arterial streets, and to

provide direct access to abutting property. (Ord. 1371-81.) For purposes of this policy residential collectors are not included.

F. Industrial Street - An industrial street is any street, typical to Institutional, Commercial, or Manufacturing use zoning districts and, where a high percentage of the traffic is heavy single or multi axle trucks.

V. **Standard Detail Drawings**

The pavement thicknesses associated with the following City of Columbus Standard Drawings shall be designed according to the provisions within this Policy:

2105 26' Section (Non-Residential) Combination Curb & Gutter, Type Special 8"

2111 32' Section (Non-Residential) Combination Curb & Gutter, Type Special 8"

2116 36' Section (Non-Residential) Combination Curb & Gutter, Type Special 8"

2130 Widening Uncurbed Section, Side Ditch

All non-residential pavements as applicable through this policy shall be designed according to the provisions herein.

VI. **Pavement Design**

A. Through this Policy, the City of Columbus specifies that pavement designed for non-residential streets must use AASHTO equations. The methodology employed by the Ohio Department of Transportation, Office of Pavement Engineering is preferred. Other pavement design software programs may be utilized after review and approval by the Pavement Program Engineer. Except for minor roadway projects as outlined in Section VIII herein or as determined by the Long Range Program Manager, no standard pavement cross-sections will be provided in substitution for pavements designed specifically for each project; all City of Columbus non-residential pavement thickness standards are hereby revoked.

B. Pavement sections may be designed using the four basic paving materials; aggregate, roller-compacted concrete (RCC), Portland cement concrete (PCC), and asphalt concrete. The designer may vary the subgrade strength when designing roadway pavements, including the use of stabilized soils, providing the requirements of Sections VII and VIII below are met.

VII. **Additional Pavement Design Requirements**

City streets applicable under the requirements of this policy shall be designed based on Average Daily Traffic (ADT) projections for a 30 year design period. Refer to the ODOT Pavement Design and Rehabilitation Manual for guidance to determine the design period traffic loading. With the exception of projects noted in Section VI, all pavement designs shall be based upon an in-situ subgrade soils investigation performed by a qualified Geotechnical Engineering consulting firm and licensed professional engineer in the State of Ohio.

VIII. **Pavement Type Selection**

A. **Pavement Selection Committee (PSC):** The PSC shall be designated by the Public Service Director. The PSC shall consist of the Construction Section Manager, Capital Improvement Project Manager, Long Range Program Manager and Pavement Program Engineer. Three members of the committee are required for selections. The PSC

responsibility shall be to review and recommend project pavement sections to the Public Service Director for project pavement design approval. In the case of Capital Improvement Projects, the Public Service Director shall select the pavement section prior to the Stage 1 submission. The standard process to select the pavement design for a non-residential street considered a major roadway project is attached as Exhibit A.

B. Major Roadway Projects (CIP and 3P): Major roadway projects on non-residential streets which (1) involve adding through traffic lanes, (2) replace or reconstruct existing through lanes or (3) exceed the limits of a minor roadway project shall meet all of the requirements of this policy. A Geotechnical Engineer licensed in the State of Ohio shall perform a geotechnical analysis of subgrade soils on all major roadway projects. The PSC shall review and recommend pavement selections for all major roadway projects for non-residential streets based on pavement alternatives designed by the consultant. The City of Columbus reserves the right to require the use of City derived material unit prices in cost estimates when in the City's best interest. Only Ohio Registered Professional Engineers may prepare pavement designs and cost estimates. In addition to City Capital Improvement projects, all major roadway project pavements developed under a Public Private Partnership (public funds are involved) shall be selected in accordance with this policy (also noted in Exhibit A).

C. Major Roadway Projects (Private Development Process): For a fully privately funded major roadway project that is to be dedicated to the City of Columbus, the developer's engineer shall submit a pavement design based on AASHTO equations to One Stop Shop, who will coordinate with the Pavement Program Engineer as noted in Exhibit A. The limits of Major Roadway Projects associated with private development projects shall be determined at the Preliminary Site Development Review.

The consultant shall provide design year average daily traffic (ADT) volumes for each street segment in the proposed project with the pavement design package for review prior to initial submission of E-plans. The ADT volumes shall be submitted on an exhibit showing the proposed improvements to the roadway segment. ADT volumes shall represent future ADT for a 30 year pavement design. Streets connecting to proposed major roadway projects, planned and future roadways shall include full build-out traffic volumes from those adjoining roadways. The distribution of these ADT volumes shall also be indicated on the exhibit. Residential collector and higher-classification streets in the project shall include ADT for all through traffic and locally generated traffic.

D. Minor Roadway Projects (CIP, 3P and Private): In the case of proposed street improvements resulting in minor roadway projects (e.g. turn lane addition, minor lane widening, or radii improvements), geotechnical soils investigations are not required. The pavement section shall be designed assuming soil with a California Bearing Ratio (CBR) of 4, or match existing pavement section, whichever is the greater resultant pavement section. Review and acceptance of the recommended pavement section is required by the Pavement Program Engineer. In most cases the pavement section composition for such minor roadway projects shall match the existing adjacent pavement materials composition. It may be necessary to obtain pavement cores to determine the adjacent existing pavement section thickness. Exceptions to this requirement may be granted by the Pavement Program Engineer. Review by PSC is not required for minor roadway projects. For these projects the subgrade elevation of the existing pavement and the

widening should match, and drainage should be provided for the widening. See Section 504.7 of the ODOT Pavement Design Manual for guidance.

E. Underground Utility Projects: Pavement designs for isolated utility crossings are not required. However, all underground utility projects with non-residential street construction improvements that exceed the intent of Standard Drawing 1441 shall meet the pavement design standards of this policy.

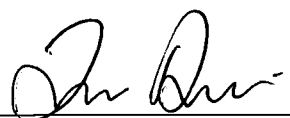
F. Pavement Selection Factors: Factors to be considered in the pavement selection process include: Initial Cost, Constructability and Maintenance of Traffic, Design Issues and Environmental. The various pavement alternatives shall be evaluated by the PSC based on the factors in these categories. The City reserves the right to consider other factors when it is in the best interest of the City, such as the composition of the adjacent existing pavement sections.

IX. Soil Stabilization

A. "Soil-Stabilized Subgrade" Pavement Design. If the CMSC Item 206 Chemically Stabilized Subgrade pavement design alternative has been chosen and approved for a project during the Design Phase, credit of the strengthened subgrade is accounted for in the pavement design. The City must approve this pavement design alternative for private development projects (fully private or Public Private Partnership).

B. If during the Construction Phase it becomes necessary for the Contractor to modify/stabilize the soil in order to aid subgrade compaction by drying out wet areas, and improve the working platform, no reduction in the pavement design shall be permitted

X. Construction and Materials Specifications-Columbus (CMSC). All pavements designed under this Policy shall be in accordance with material specifications of the current CMSC and all City Supplements and Supplemental Specifications. See Exhibit B for additional design information.

APPROVED BY:  _____
DIRECTOR

 _____
DATE

**City of Columbus Pavement Selection Steps
Major Roadway Projects**

1. Project is scoped by Division of Design and Construction (DODC) and requirement for pavement design is included as a task performed by selected consultant.
2. Consultant is selected and submits project schedule including pavement design to Division of Design and Construction Project Manager (PM).
3. Consultant schedules and performs geotechnical investigations, Dynaflect testing and coring, and research of pavement history as appropriate. Consultant coordinates with PM, who confers with Pavement Program Engineer, to establish feasible alternatives and confirm development of a major rehabilitation project. If minor rehabilitation is determined to be appropriate, pavement treatment will not require approval of Pavement Selection Committee.
4. Consultant designs pavement alternatives as specified by Pavement Program Engineer (PPE), calculates project quantities and provides primary and secondary selection factors (initial cost, constructability, design concerns, etc.). Unit prices are subject to approval of City. A Life-Cycle Cost Analysis per the ODOT Pavement Design and Rehabilitation Manual is not required.
5. Consultant submits pavement design package to PM for review by Pavement Program Engineer. PPE analyzes package for completeness and acceptability. Any comments are provided to PM.
6. Once the pavement design package has been approved by the PPE, the PM distributes the pavement design package to Pavement Selection Committee (PSC) for review.
7. PSC meets to discuss all the alternatives and selects a recommended pavement alternative. The Capital Improvement Project Manager in Design sends recommendation to Public Service Director.
8. Public Service Director approves pavement alternative selection or makes different selection.
9. PM notifies consultant and PPE of the approved alternative. PPE maintains file of selection documents.

Notes:

- A. For CIP projects all project submittals shall be in accordance with the current City of Columbus, Division of Design and Construction project drawing submittal requirements in force at the time of submittal.

- B. For private development projects the consultant will prepare a pavement design package, including appropriate plan sheets, and submit it to the Chief Plans Official, Engineering Section, Building & Zoning Services Department (One Stop Shop) for approval prior to initial submission of E-plans. The pavement design package will be forwarded by the E-plan reviewer to the Pavement Program Engineer for review of the design. All non-residential roadway engineering drawings shall have a typical section sheet with the pavement design as approved by the Pavement Program Engineer in writing.

- C. For Public Private Partnership projects the consultant procurement process differs, but the essential steps for a pavement selection as noted in Steps 3-9 above are still required.

**Non-Residential Pavement Design Policy
Materials and Design Specification Standards**

1. Item numbers refer to the latest Columbus Construction and Material Specification (CMSC) section
2. CBR of 12" thick Stabilized Subgrade Layer is 15, Resilient Modulus is 18,000 psi.
3. Elastic Modulus of Aggregate Base Material is 30,000 psi.
4. Effective Modulus of Natural Subgrade + 12" thick Stabilized Subgrade is 10,800 psi
5. Effective Modulus of Natural Subgrade + 12" thick Stabilized Subgrade + 6" thick Aggregate Base Layer is 14,000 psi
6. Use asphalt structural coefficient values and rigid pavement design parameters (Item 305, 451, 452) as recommended in the ODOT Pavement Design & Rehabilitation Manual.
7. Load transfer devices are not to be used in concrete pavement (Item 305, 451, 452) with thicknesses of 7 inches and less.
8. Roller-Compacted Concrete (RCC) design shall be in accordance with the latest version of the City of Columbus Supplemental Specification 1523 Roller Compacted Concrete Pavements (RCC).
 - a. RCC Design Parameters
 - i. Compressive Strength: 3,500 psi
 - ii. Modulus of Rupture: 650 psi
 - iii. Modulus of Elasticity: 3,400,000 psi
 - iv. Load Transfer Coefficient, Undoweled, Edge Support: 3.2
 - v. Load Transfer Coefficient, Undoweled, No Edge Support: 3.8
9. FD Asphalt = Full depth asphalt on prepared subgrade
10. Flexible = Asphalt on compacted aggregate base
11. Minimum pavement component layers:

Item 448 Surface Course:	1.00 inches (1.50 inches max)
Item 448 Intermediate Course:	1.50 inches (3.00 inches max)