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## Policy for Applying Level of Service and Volume-to-Capacity Ratio in the Transportation Development Process

### Purpose

This policy will provide the progression in applying Level of Service (LOS) and Volume-to-Capacity Ratio (V/C) in the transportation planning and project design processes. The goal of this policy is to provide direction for appropriate planning agencies in the development of Transportation Plans, Major Investment Studies, Interchange Feasibility Studies, Interchange Justification Studies, Traffic Design Studies, and Corridor Studies as they advance to project development. It is important to make this determination as early as possible in the transportation planning process since it will affect all other aspects of a proposed project.

### Authority

Sections 5501.03 and 5501.31 of the Ohio Revised Code. These sections confer upon the Department and Director the power and duty for supervision of all roads comprising the state highway system.

### References

Highway Capacity Manual, Special Report 209 Third Edition, 1994, Transportation Research Board, National Research Council, Washington D. C.

A Policy on Geometric Design of Highways and Streets, 1994, American Association of State Highway and Transportation Officials (Green Book)

Fred J. Hempel's April 26, 1991 letter on FHWA Ohio Division's LOS Design Policy  
Location and Design Manual, Volume One, Roadway Design, December, 1990, Ohio Department of Transportation  
Location and Design Manual, Volume Three, Roadway Design, May, 1993, Ohio Department of Transportation

## Scope

All Districts, Divisions, and Offices of the Ohio Department of Transportation  
All Metropolitan Planning Organizations within Ohio

## Background

There is currently no comprehensive direction coordinating the use of Level of Service and Volume-to-Capacity Ratio in the transportation planning and project design processes. Current practice is for the planning process to use LOS criteria as a screening tool to identify transportation system deficiencies while the design process defines the scope of the project that will address the deficiency. For example, many urban areas are identifying transportation deficiencies as worse than LOS D. As a result, MPOs recommend improvements to be designed to a LOS D. However, when a project is designed to address the deficiency, the project may be designed to meet a LOS C standard. The lack of coordination between planning and design processes can result in misperceptions in expectations and results in the final design of projects recommended by an MPO when compared to the final project design advanced by ODOT. The example of this is planning for one lane while it may be determined during design that two lanes are needed to achieve the appropriate LOS. Further, the air quality conformity and major investment study requirements of ISTEA legislation are mandating that project design concept and scope decisions be finalized through the planning process.

This disparity has created confusion and misinterpretation of various studies, projects, and access

requests during the last couple of years as to what is the Federal Highway Administration's (FHWA's) and ODOT's policy/position on the issue of LOS D versus LOS C design criteria. In many of the State's urbanized areas it is noted that the projected traffic volumes are becoming so large that achieving a LOS C is perhaps simply not feasible within specific corridors due to environmental, right-of-way, and prohibitively high construction cost constraints. As a result, a few MPOs are recommending that a LOS D operating level be established as the "bench mark" for reconstructed facilities and new access point requests.

FHWA Agency Policy does not directly require a design LOS for projects. The current practice of FHWA Ohio Division, Regional, and Washington Offices is to reference the design LOS criteria on Page 90 of the 1994 AASHTO Green Book.

## Definitions

**Deficiencies** - A location within the transportation system that experiences congestion, safety, or other operational problems.

**Level of Service (LOS)** - A qualitative measure from A (best) to F (worst) describing operational conditions within a traffic stream, generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS is measured by degree of volume to capacity ratio.

**MPO Area** - The geographic area of at least 50,000 population including the central city or cities as defined by the latest decennial Census in which the metropolitan planning process required by 23 U.S.C. 134 and 49 U.S.C. 1607 is carried out.

**Metropolitan Planning Organizations (MPO)** - a forum for cooperative transportation decision making comprised of state and local officials by agreement among the Governor and units of general purpose local government which together represent at least 75 percent of the affected population (including the central city or cities as defined by the Bureau of the Census) or in accordance with procedures established by applicable State or local law.

**New Access** - the addition of a point of access where none previously existed. This may include the construction of an entirely new interchange or the reconfiguration of an existing interchange such that it will result in additional points of access.

**Revised Access** - the revision of existing ramps or crossroads within the limited access area such that the number of access points will remain the same but the traffic on the interstate/freeway may be affected.

**Non-MPO Area** - A rural area located outside an MPO boundary as defined by agreement among the Governor and units of general purpose local government.

**Transportation Management Area (TMA)** - an urbanized area with a population over 200,000 (as determined by the latest decennial census) or other area when TMA designation is requested by the Governor or MPO (or affected local officials), and officially designated by the Administrators of the FHWA and the FTA.

**Traffic Impact Study** - an analysis that addresses the current and design year (twenty years from opening day) traffic with and without the project. The analysis shows what improvements are required concurrently with the opening of the project and when others are needed if stage construction is contemplated.

**Volume to Capacity Ratio (V/C)** - the ratio of demand flow rate to capacity for a traffic facility.

## Policy and Procedures

### **I. Identifying Urbanized Area Deficiencies using LOS criteria**

When the responsible transportation planning agency is conducting a transportation plan analysis or a freeway system wide analysis, they are conducting a gross level analysis for the purposes of assessing their system needs. These studies, together with a congestion management system in TMAs, are the tools that provide the agencies with information on the system deficiencies. LOS information at this stage is used to understand the operational characteristics of the system or network as it currently exists. Each agency may set their own LOS criteria for identifying these deficiencies and determining when to add a project. If an improvement project is scheduled for this identified deficiency, the design of the improvement must conform to the design criteria. Because LOS C is the recommended LOS for interstate and freeway facilities, the LOS criteria for identifying deficiencies should be at least LOS D or worse.

### **II. New Interstate and Freeway Capacity Addition Projects Design Criteria**

The recommended design LOS for interstate and freeway facilities, as consistent with Table

301-1 of Volume One of the ODOT Location and Design Manual, is LOS C in MPO areas and B in non-MPO areas. A traffic impact study for these projects should document the design that would be necessary to achieve these recommended LOSs. LOS C in urbanized areas and LOS B in rural areas, however, is not required for improvements. The Department recognizes that designing projects to achieve these Levels Of Service may require so many lanes that the project will result in undesirable environmental or social impacts on an affected area or become prohibitively expensive. At a minimum, the V/C ratio for new interstate and freeway capacity addition projects shall improve by at least .01 better than the facility's twenty year V/C ratio with existing capacity.

### **III. New and Revised Interstate and Freeway Interchanges**

As identified in Section 1500 of Volume Three of ODOT's Location and Design Manual, in MPO areas, when an existing interchange is revised or a new interchange is proposed, the design year LOS of the freeway and ramps with the proposed improvement should be determined. If the LOS is C or better, the improvement or new interchange can be approved without any additional modifications. If the LOS is worse than C, the improvement may still be possible if it can be shown the LOS on the Interstate or Freeway is not degraded as a result of the proposed improvement. This can be accomplished by showing that the LOS of the proposed geometrics does not become worse than the LOS of the existing geometrics in the design year. Where this is not possible, the study should identify what improvements are necessary to restore the LOS with the proposed geometrics to the same LOS which would have existed with the existing geometrics in the design year. Where the existing geometrics provide a LOS F in the design year, the v/c ratio for the proposed geometrics cannot be worse than the v/c ratio for the existing geometrics in the design year. The limits of the study area are at a minimum of one interchange upstream and downstream of the proposed improvement. The study area should include all bottleneck areas or critical segments that will be significantly impacted by the new or revised interchange. Where the LOS of the freeway with the proposed interchange in the design year is worse than LOS C, the limits of the study may have to be extended until the LOS on the mainline is restored to the LOS which would have existed with the existing geometrics in the design year.

In non-MPO areas, new interchanges must meet LOS C and restoration must be made to the geometrics up and down the Interstate or Freeway to the point where the LOS on the mainline is C. The limits of the study area are a minimum of one interchange upstream and downstream of the proposed improvement. The study area may have to be extended to include several interchanges on each side of the improvement to reach a point where the LOS requirement is achieved. Components of the interchange, including ramps, ramp/crossroad intersections and

the crossroads within the limited access right-of-way shall be designed for LOS C. The criteria for revised interchanges in Non-MPO areas is identical to the criteria for revised interchanges in MPO areas as noted above.

The following chart demonstrates the Planning and Design LOS criteria for new capacity addition projects and new or revised interchanges in urbanized and rural areas. These criteria will be used in identifying the scope and cost of an improvement.

<b>Planning and Design LOS Criteria</b>		
	<b>Planning</b>	<b>Design</b>
<b>New Capacity Addition Project (MPO and Non-MPO area)</b>	<ul style="list-style-type: none"> <li>- When identified as a deficiency</li> <li>- LOS deficiency determined by MPO in MPO area, by ODOT in Non-MPO area</li> </ul>	<ul style="list-style-type: none"> <li>- LOS C recommended in MPO areas and LOS B in Non-MPO areas</li> <li>- At a minimum, .01 V/C ratio better than the facility's design year V/C ratio with existing geometrics</li> </ul>
<b>New or Revised Interchange (MPO Area)</b>	<ul style="list-style-type: none"> <li>- When identified as a deficiency</li> <li>- LOS deficiency determined by MPO</li> </ul>	<ul style="list-style-type: none"> <li>- LOS C or better with interchange for twenty year design - improvements approved without additional modifications</li> <li>- LOS worse than LOS C with interchange for twenty year design</li> <li>- improvements must not degrade LOS on mainline worse than the existing geometric's design year LOS</li> <li>- LOS F with interchange for twenty year design - improvements must maintain the existing geometric's design year V/C ratio on mainline</li> </ul>
<b>New Interchange (Non-MPO Area)</b>	<ul style="list-style-type: none"> <li>- When identified as a deficiency</li> <li>- LOS deficiency determined by ODOT</li> </ul>	<ul style="list-style-type: none"> <li>- LOS C with interchange for a twenty-year design</li> </ul>

<p><b>Revised Interchange (Non-MPO Area)</b></p>	<ul style="list-style-type: none"> <li>- When identified as a deficiency</li> <li>- LOS deficiency determined by ODOT</li> </ul>	<ul style="list-style-type: none"> <li>- LOS C or better with interchange for twenty year design - improvements approved without additional modifications</li> <li>- LOS worse than LOS C with interchange for twenty year design</li> <li>- improvements must not degrade LOS on mainline worse than the existing geometric's design year LOS</li> <li>- LOS F with interchange for twenty year design - improvements must maintain the existing geometric's design year V/C ratio on mainline</li> </ul>
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## Training

Minimal training for Districts and MPOs will be required and will be completed with in-house staff.

## Fiscal Analysis

Implementation of these guidelines may result in a significant savings for the Department. Requiring a facility to operate with a V/C ratio of at least .01 ratio better with an improvement project should decrease the construction costs as compared to requiring it to operate at a certain LOS. Its activities shall be carried out with existing staff.