**Interchange Justification Studies/Interchange Modification Studies (IJS/IMS)**

**What is an Interchange?**

An interchange is a grade-separated intersection (one road passes over another) with ramps to connect them. For busy roads this is a necessity to keep traffic moving. Traffic signals are sometimes needed to help traffic move through and between the two facilities.

Within these pages, we are going to depict and describe some of the various interchanges used to date. There might be some not used in Ohio. All interchanges are designed for the projected traffic for the region. This will make some designs more beneficial than others with respect to operation, right-way impacts, etc.

**Purpose of an IJS/IMS**

Control of access on the Interstate and other freeway systems is considered critical to providing the highest quality of service in terms of safety and mobility. Sometimes referred to as an Access Point Request, these studies are needed on Interstate and other freeway systems in accordance to Federal Code 23 U.S.C. 111 and FHWA Policy - Additional Interchanges to the Interstate System (Federal Register: February 11, 1998, Volume 63, Number 28).

The documentation required depends on the type of change requested - new or revised. New Access is the addition of a point of access where none previously existed. This includes the construction of an entirely new interchange such that it will result in additional points of access or additional ramps to existing interchanges. As an example, the reconstruction of an existing diamond interchange to a full cloverleaf interchange would add four new points of access.

Revised Access is 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 operation and/or safety of the Interstate/freeway system may be affected. The changing of a cloverleaf interchange to a fully directional interchange, the adding of turn lanes at crossroad-ramp intersections, the adding of through lanes on the crossroad through an interchange, or the widening of a single lane entrance ramp to two lanes are considered examples of revised points of access.

New or revised access point requests require the preparation and processing of an Access Point Request Document. Generally, a new access requires an Interchange Justification Study (IJS), and a revised access requires an Interchange Modification Study (IMS).

Ultimately, the study is going to demonstrate that the modification to the Interstate will not degrade its capacity or safety.
Common Interchange Types

The most commonly used types of interchanges are the diamond, cloverleaf and directional. The diamond interchange is the most common type where a major facility intersects a minor highway. The design allows free-flow operation on the major highway but creates at-grade intersections on the minor highway with the ramps. The capacity is limited by the at-grade intersections on the minor highway. Variations of the diamond interchange include the Tight Urban Diamond Interchange (TUDI) and the Single Point Urban Interchange (SPUI). The characteristics of the TUDI include closely spaced ramp intersections, typically within 250 ft [76 m] to 400 ft [122 m] of each other, with side-by-side left turn lanes on the minor highway that extend beyond the first ramp intersection. Special signal phasing allows queuing of vehicles outside the ramp intersections and minimizes queuing of vehicles between the ramp intersections. The SPUI aligns the left turn movements of the exit ramps opposite one another to form a single intersection at the center of the grade separation structure. Both SPUIs and TUDIs are more compact than a standard diamond, but are significantly more costly to construct.

Cloverleaf or partial cloverleaf designs may be used in lieu of a diamond when development or other physical conditions prohibit construction in a quadrant, or where heavy left turns are involved. A continuous flow design is required where two major facilities intersect. In this case, a full cloverleaf interchange is the minimum design that can be used. The designer should consider collector-distributor roads in conjunction with cloverleaf interchanges to minimize weaving. However, full cloverleaves have deficiencies which need to be addressed before being chosen as the interchange type. Principle disadvantages are:

- The inherent weaving maneuver generated and the short weaving length available.
- Large trucks may not be able to operate efficiently on the smaller curve radii on the associated loop ramps.
- Loop ramps are limited in capacity.

When Collector-Distributor roads are not used, a further disadvantage includes weaving on the main line, the double exit on the main line and problems associated with signing for the second exit. The full cloverleaf weaving maneuver is not objectionable when the left-turning movements are relatively light, but when the sum of traffic volumes on two adjoining loops approaches about 1,000 vehicles per hour, interference occurs, which results in a reduction in the speed of the mainline traffic. For these reasons, full cloverleaves are discouraged.

Directional interchanges are the highest type and most expensive. They permit vehicles to move from one major freeway to another major freeway at relatively fast and safe speeds.
Definitions

A complete interchange has to provide access to and from any direction from each facility. Full freeway to street access with a conventional interchange requires a minimum of four ramps, to get on and off in each direction. In Ohio, full interchanges are required for a future design. Partial interchanges are not allowed unless special needs are displayed (park and ride, by-pass routes, etc.)

An exit ramp, or off ramp, leaves the main roadway for another road; an entrance ramp, or on ramp, enters the roadway. These terms make the most sense when one freeway intersects a surface street; entrance and exit are from the point of view of the freeway.

An interchange is a simple solution to a capacity problem. Safety, cost, environment, development and politics can vary at each site. Many interchanges are slight variations of a few basic types.