FDM 11-30-1 Design Elements

November 15, 2022

1.1 Warranting Guidelines

Justifying an interchange differs at each location due to varying site conditions, traffic volumes, highway types, interchange layouts, economic development, safety, and potential for signals in the near future. Consider the following conditions when determining if an interchange is warranted:

1. Design designation
2. Reduction of bottlenecks or spot congestion
3. Reduction of crash frequency and severity
4. Site topography
5. Road-user benefits
6. Traffic Volume warrant

See Section 10.2, Page 10-3, 2018 GDHS for further discussion, as well as additional warrants for grade separations found on page 10-5, 2018 GDHS. (GDHS hyperlink is only available to WisDOT staff.)

This guidance may apply to four-lane divided expressways or current two-lane facilities where it may be appropriate to reconstruct a short section to four lane divided design criteria.

Rural highway interstate interchanges follow FDM 11-30-15 Interstate Access Points - Additional or Revised Access to the Interstate Highway System.

1.2 General Design

The rest of this procedure deals primarily with interchange ramps, ramp terminals, and crossroad details. For information relating to the structures, refer to FDM 11-35-1.

Guidance concerning sight triangles, exit and entrance ramp tapers, ramp curvatures, and other elements of interchange design are included within this section. For additional information, refer to Chapter 10, page 10-1, 2018 GDHS.

Preliminary studies should be made for each highway to establish category of treatment, grade relationship (crossroad over or under), and layout of interchange where required. Layouts of interchanges should include turning diagrams showing design hour volumes.

1.3 Interchange Type and Selection

There are several basic interchange configurations to accommodate turning movements at a grade separation. Refer to pages 10-1 to 10-11 2018 GDHS for general interchange and grade separation warranting criteria.

The configuration used at a particular site is determined by several factors.

- The number or intersection legs,
- Capacity,
- Route continuity,
- Topography,
- Design controls,
- Uniformity of exit patterns,
- Single exits in advance of the separation structure,
- With or without weaving,
- Right-of-way availability
- Potential for stage construction,
- Compatibility with the environment
- Proper signing and intersection treatment at the crossroad.

Interchange configurations are covered in two categories, “system interchanges” and “service interchanges.”

The term “system interchange” is used to identify interchanges that connect two or more freeways, whereas the term “service interchange” applies to interchanges that connect a freeway to lesser facilities. System interchange connections should be high speed and free-flow to provide all directional movements. Connections between freeways and other controlled access facilities are analyzed and, where practical, provide all movements unstopped. Refer to pages 10-76 thru 10-102, 2018 GDHS for general design considerations and specifically Figure 10-45 for interchanges that are adaptable on freeways as related to classifications of intersecting facilities in rural, suburban, and urban environments.

At service interchanges the crossroad should pass over the freeway or access-controlled highway. There are many reasons for this; the exit ramp is constructed as an upgrade that assists vehicles to decelerate as they approach the intersection, the entrance is constructed on a downgrade that assists vehicles to accelerate as they enter the freeway.

In most cases building the crossroad over the mainline offers these added benefits:

- Less earthwork required,
- Lower structure costs
- Lower maintenance costs
- Lower delay costs when the crossroad structure is rehabilitated

The side road intersection is typically controlled by stop signs, roundabouts, or signals and will sometimes determine the type of interchange. Signal and roundabout control should be analyzed as equal alternatives until such time when the analysis of capacity, user delay, crashes, and available space dictates which treatment is more appropriate for the location. For more information on at-grade intersections refer to FDM 11-25-1.

While interchanges are custom designed to fit specific site conditions, it is desirable that the overall pattern of exits along the freeway have some degree of uniformity. Furthermore, from the standpoint of driver expectancy, it is desirable that all interchanges have one point of exit located in advance of the crossroad wherever practical. Urban freeway design is more challenging than rural and should:

1. Maintain a basic number of continuous lanes,
2. Provide lane balance at ramp exits and entrances,
3. Provide appropriate ramp spacing, one mile or greater between the gore areas,
4. Maintain route continuity,
5. Use auxiliary lanes as appropriate

Route continuity and system configuration may also drive the interchange type. Typical urban freeway operational problems that result in high crash locations include weave sections, limiting geometry (horizontal and vertical), and left-side ramps. Left-side entrance and exits should rarely be used. A FHWA publication[1] suggests that crashes may be reduced 25-70 percent with the use of right-off, right-on ramps as compared to left side ramps.

Signing and operations are major considerations in the design of the interchanges. The need to simplify interchange design from the standpoint of signing and driver understanding is critical.

To prevent wrong-way movements, confusion, driver frustration and misdirection, all freeway interchanges with non-access-controlled highways should provide ramps to serve all basic directions. When drivers exit the freeway system, they should be able to enter again at the same interchange or within a short distance on a frontage road. Do not design at-grade braided ramps[2] at any interchanges. Remove existing at-grade braided ramps on reconstruction projects and relocate the frontage road separate from the ramp.

Provide direct entrance and exit ramps without driveway, side road or other access to ramps. Access within interchange ramps or access within proximity to ramps on expressways is counter to driver expectancy. See FDM 11-5 Attachment 5.2 for additional information on nearest access from ramp entrance and exit as well as nearest crossroad access outside the ramp/crossroad termini.

The accommodation of pedestrians and bicyclists also should be considered in the selection of an interchange configuration.

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[1] US Department of Transportation, Federal Highway Administration. Safety Effectiveness of Highway Design Features, Volumes 1 to VI. Washington DC, 1992. Volume IV specifically discusses interchanges.

[2] Braided ramps are entrance or exit ramps that connect a controlled access highway to a nearby parallel frontage road.

The most favored interchange type for Department applications is the conventional diamond interchange. The more common interchange configurations are addressed in the following text. For additional information on interchanges see Section 10.9 on pages 10-30 thru 10-102, 2018 GDHS.

For further assistance, contact your BPD project development engineer.

1.3.1 Four-leg Designs

Besides the following, there are other four-leg interchange designs that are covered further in the pages 10-39 thru 10-71, 2018 GDHS.

1.3.1.1 Diamond Interchanges

Diamond interchanges are the simplest, generally the least expensive and the most common type of interchange. The conventional and the tight diamond are the preferred WisDOT interchange type for most situations. The more common types of diamond interchanges are:

1. Conventional diamond: used in rural conditions or urban conditions where space allows; See Figure 10-17A, Page 10-43, 2018 GDHS.
2. Tight diamond[3]: primarily used in urban areas where space is limited.
3. Split diamond: used where local conditions justify separating the ramps by using one-way frontage road pairs; See Figure 10-18A, Page 10-44, 2018 GDHS.
4. Single-point diamond (SPDI): used where all four turning movements are controlled by a single traffic signal and opposing left turns operate to the left of each other, and again where space is limited; See Figure 10-24, Page 10-49, 2018 GDHS. The SPDI is quite costly to construct. Single-point diamond interchanges should be designed such that the mainline passes under the at-grade-intersection. There are two primary reasons for this:
    a. By constructing the mainline at the lower-level columns may be located in the center of the structure thus reducing the clear span of the structure and substantially reducing girder depth, earth work and the cost,
    b. The at-grade-intersection should be located on the top level where it is exposed to an even lighted surface, thus not requiring the driver to go from sunlight into shade and back into sunlight. The eye needs time to adjust to changing light conditions. Turning on a curved path through the intersection with a changing light condition may be unsafe and problematic particularly for older drivers.
5. Roundabout: Diamond Interchange with roundabouts at each crossroad ramp terminal (See Section 10.9.3.3, Page 10-47, 2018 GDHS and FDM 11-26-17.5).
6. Diverging Diamond (DDI): Also known as a Double Crossover Diamond (DCD) uses directional crossover intersections to shift traffic on the cross street to the left-side between the ramp terminals within the interchange (see Section 10.9.3.5, Pages 10-53 thru 10-57, 2018 GDHS).

The capacity of a diamond interchange is limited by the capacity of the at-grade terminals of the ramps at the crossroad. The entrance ramp capacity may be limited by the traffic volume on the mainline. Traffic operations may be improved, and interchange life expectancy extended by using a roundabout at the ramp/crossroad termini. The approximate limit of left turning traffic to any intersection approach is with double left turn lanes and that is limited to approximately 600 left turning vehicles for the DHV. Left turn demand greater than 600 DHV should consider a roundabout or directional ramp design to reduce user delay and crashes. A roundabout will usually break up traffic platoons and allow ramp entrance traffic to enter the system in a dispersed manner which may preclude the need for ramp metering. Proper analysis and evaluation of the projected intersection traffic volumes and turning movements will guide the designer to the correct intersection treatment (i.e. stop, roundabout, or signal control).

1.3.1.2 Cloverleaf Interchanges

Interchanges with loops in all four quadrants are referred to as “full cloverleafs” and all others with loops in one or more quadrants are referred to as “partial cloverleafs” or “par-clo.” The common types of cloverleafs are:

1. Full cloverleaf without collector-distributor (C-D) road, requires substantial space, may reduce capacity on high volume highways when collector-distributor roads are not used (See Figure 10-17, Page 10-

[3] A tight diamond is a diamond interchange whose ramps are pulled in closer by using retaining walls.

43, 2018 GDHS).

2. Full cloverleaf with C-D road requires substantial space. The C-D road should be considered when the sum of the traffic on two adjoining cloverleaf loops approaches 1,000 vph. C-D roads allow weaving and slower moving loop ramp traffic to adjust and select the appropriate lane while still separated from the mainline traffic (See Figure 10-29, Page 10-59, 2018 GDHS).

3. Par-clo is commonly used where the right-of-way is restricted (e.g., with loops on one side of the mainline because of a stream or railroad). For other par-clo configurations see Pages 10-60 to 10-63, and Figure 10-30, 2018 GDHS).

The volume on a tight loop ramp (25-30 mph design speed) is limited to approximately 12,000 ADT or about 1,200 DHV. A loop ramp should be restricted to one lane unless there is ramp metering or other extenuating circumstances. The entrance to loop ramps should be designed with consistent radii, without compound curves entering the loop from a high-speed condition. Compound curve design is acceptable when leaving the loop and entering the acceleration lane. Two-lane tight loop ramps are difficult to design without encountering potential operational issues and should only be utilized when absolutely necessary. In lieu of designing a loop ramp with design year volume greater than 12,000 ADT, consider a directional ramp or roundabout at the termini.

1.3.1.3 Directional Interchanges

There are many configurations for directional interchanges[4] that use various combinations of direct and semidirect connections, and loop ramps:

1. Semi-directional interchange: with loops and ramp to accommodate high-volume left turn traffic in one direction.

2. Directional interchange: allows for all high-speed direct movements from one facility to another.

1.3.2 Three-Leg Interchanges

An interchange with three legs consists of one or more highway grade separations and one-way roadways for all traffic movements. They are sometimes referred to as “T” and “Y” interchanges. The more common types of three-leg interchanges are:

1. Trumpet - A. (Figure 10-9A, page 10-33, 2018 GDHS)

2. Trumpet - B. The more direct alignment favoring the heavier volume of the left turn movements and the tight loop favoring the lesser volume. (Figure 10-9B, page 10-33, 2018 GDHS)

3. Directional-Y and Directional-T (Figure 10-10, page 10-35, 2018 GDHS). Direct alignment is provided to both left turn movements where volume is anticipated to be high. A review of capacity of tight loop ramps is presented in the Four-Leg Design section.

There are other three-leg interchange designs that are covered further in pages 10-31 thru 10-38, 2018 GDHS.

1.4 Ramps

The relationship of speed to curvature for ramps is shown or derived from Table 10-4, page 10-132, and Table 10-6, page 10-138, 2018 GDHS, and are adequate for main line design speeds through 80 mph.

Details for cross road designs, assuming a stopped condition, are shown in Attachment 1.1, Attachment 1.2, and Attachment 1.3.

The lengths of the exit ramps on diamond-type interchanges are typically in the range of 900 to 1,200 feet from the crossroad terminal to the gore. The length will vary depending on needed crossroad terminal storage, deceleration length, type of exit (taper or parallel), grade and profile.

Entrance ramp design lengths depend on grade and acceleration length. A long vertical curve is needed if the ramp profile is opposite in direction to that of the through highway, because of the large algebraic difference in grade. Additional length may also be needed to warp the ramp profile to attain superelevation, or to provide drainage.

The distance between ramp terminals as measured along the crossroad will vary depending on site-specific conditions. The spacing for a conventional diamond is 800 feet or more; for a compressed diamond, typically about 400 to 800 feet; and for a tight diamond, typically about 250 to 400 feet. Urban designs will generally have closer spacing than rural designs because of higher right-of-way costs. Using greater spacing will provide more

[4] A Policy on Geometric Design of Highways and Streets, 7th edition, AASHTO, 2018, pages 10-63 thru 10-71

flexibility for future interchange upgrades. The ramp description information is from ITE 2005, Freeway and Interchange Geometric Design Handbook. Some of the values have been adjusted to eliminate gaps in the description.

Design the ramp terminal intersections to accommodate safe and efficient operations. Provide enough separation between the ramp terminal intersection and the interchange structure (at least 100 feet) and design the crossroad profile, so that the structure does not obstruct intersection sight distance. See FDM 11-10-5 and FDM 11-30-5 for additional guidance.

Stop signs on the exit ramp terminals at the crossroad are the minimum control for diamond type interchanges and are generally used for rural or lower volume intersections. If additional control is warranted, evaluate roundabouts, signals and, where appropriate, 4-way stop control as alternatives. A proper evaluation will determine the appropriate and desired intersection control. Roundabouts at interchange ramp terminals with the crossroad will generally provide a longer useful life without the use of loop ramps or fly-over directional ramps, improve intersection safety, and decrease intersection delay.

It may be appropriate to extend a left turn bay back through the previous ramp terminal intersection at signalized ramp terminal intersections. This extended turn bay will provide greater storage for queued traffic to reduce the possibility of the turning traffic queue extending into the through traffic lanes, or the opportunity for vehicles to enter the turn bay when the through traffic queues are long. The extended left turn bay may result in undesirable operations and safety concerns when aggressive drivers anticipate “jumping” in front of other vehicles in the queue. The desired option is to provide adequate storage between the ramp terminals; however, it may not be cost effective to provide a wide distance between ramp terminals in an urban area. Extending the left turn bay in urbanized areas where signals exist or where signals may be proposed in the future may be preferred to using valuable right-of-way to accommodate wide ramp terminals.

Traffic signal progression must be considered if two or more intersections are signalized along the corridor. Contact the Region Traffic Unit for further guidance.

1.4.1 Speed Change Lanes

Speed change lanes (acceleration and deceleration) are needed at both entrance and exit terminals to the main line roadways of interchanges. These lanes should be of sufficient length to allow a driver to make the necessary change between the speed on the highway and the lower speed on the turning roadway or ramp.

Parallel-type entrance ramps are recommended for new interchange construction or for the reconstruction or reconfiguring of existing interchanges. Merge tapers at the downstream end of parallel-type entrance ramps are to have a minimum taper rate of 25:1.

Parallel-type ramps are not to be confused with the auxiliary lanes, which serve a different function than parallel-type ramps. Refer to FDM 11-25-35 and pages 10-90 thru 10-93, 2018 GDHS.

For special situations, refer to pages 10-143 thru 10-150, 2018 GDHS. Special situations include, but are not limited to, multi-lane entrance or exit ramps, and overlapping entrance and exit tapers (as in a full cloverleaf interchange).

1.4.2 Right-Side Ramps vs. Left-Side Ramps

Use right-side entrance and exit ramps in the design of new interchanges. Left-side entrance and exit ramps are contrary to driver expectation (refer to page 10-123, 2018 GDHS). An FHWA publication[5] suggests that crashes may be reduced as much as 25-70 percent with the use of right-off, right-on ramps as compared to left-side ramps.

If possible, replace existing left-side entrance/exit ramps with right-side ramps when reconstructing an interchange. If this is impracticable because of unacceptable economic, agricultural, wetland or historical impacts then document and justify this in the Design Study Report. This justification shall include a crash data analysis showing that the existing left-side ramp is not a safety hazard.

Major forks or major freeway splits are not considered ramps and therefore may diverge left or right. Examples of major splits/forks that enter or exit on the left-side are IH 94 EB/IH 90 EB near Tomah, and IH 894 WB/IH 43 in Milwaukee.

[5] US Department of Transportation, Federal Highway Administration. Safety Effectiveness of Highway Design Features, Volumes 1 to VI. Washington DC, 1992. Volume IV specifically discusses interchanges.

1.4.3 Parallel-Type Ramps vs. Taper-Type Ramps

1.4.3.1 Entrance Ramps

Parallel-type entrance ramps are preferred. Taper-type entrance ramps have been used predominantly for interchange design in the past. However, studies have shown that parallel entrance ramps are generally safer than tapered[6]. With tapered entrance the driver has less time and poorer angles in which to use side/rear-view mirrors to monitor surrounding traffic prior to merging. Taper-type entrance ramps can also cause confusion in mainline horizontal curve situations when the driver cannot identify mainline alignment. See Figure 10-72, Table 10-4, and Table 10-5, pages 10-129 thru 10-134, 2018 GDHS for parallel-type entrance ramp design.

A curve with a radius of 1000 ft or more and a length of 200 ft should be provided in advance of the parallel ramp. If the approach curve is short drivers tend to drive directly onto the mainline without using the acceleration lane, which is undesirable.

As the parallel ramp becomes longer the driver's perception is that they are in a continuing lane. When the parallel entrance ramp design exceeds 800 ft, pavement marking, arrows, may be necessary to reinforce the lane drop. Consult the Region Traffic Section for the need, placement and spacing of the Type 5 arrows.

If it is necessary to provide an acceleration lane longer than computed by applying the adjustment factors in Table 10-5, Page 10-133, 2018 GDHS, then consult with the Region Traffic Section about the use of auxiliary lanes or lane additions.

The length (L_g) of the parallel entrance ramp is measured from the point where the left edge of the traveled way of the ramp pavement is between 2' and 10' from the right edge of the traveled way of the mainline, refer to Figure 10-72, page 10-129, 2018 GDHS, to the point where the downstream taper begins. The length (L_g) is given in Table 10-4 and Table 10-5, page 10-132 and 10-133, respectively, 2018 GDHS for the ramp according to the entering speed (design speed of ramp), and the design speed of the mainline. Provide a downstream merge taper of 300 ft in all applications of parallel entrance ramps.

Review the DHV traffic on the mainline. If it is anticipated that the freeway will frequently approach capacity or the percent of trucks on the ramp exceeds 10%, then a minimum length (L_g) of 1200 ft plus the 300 ft merge taper is typical.

The grade of the mainline parallel ramp area will influence the length of the acceleration lane needed to achieve merging speed. Table 10-5, page 10-133, 2018 GDHS gives multipliers to be used where the grades are +3% to +4%.

Consider the following factors when designing parallel entrance ramp terminals.

1. The entering speed of the vehicle - directly related to the radius and design speed of the last curve on the ramp.
2. Type of mainline roadway (freeway, expressway, interstate)
3. Design speed of the main line.
4. Percent trucks using the ramp.
5. The grade of the main line.

[6] Transportation Research Record 1385, Ramp Exit/Entrance Design

Example 1

Given: A freeway with a design speed of 65 mph, and 45 MPH design speed at the gore
A parallel on-ramp with approach curve R=1095 ft
Mainline grade is 0.5%,
No capacity problems on either the ramp or the mainline.

Find: The length (L_g) of the parallel entrance ramp.
From Table 10-4, page 110-132, 2018 GDHS, this mainline design speed will permit a merge design speed of 50 mph. (GDHS Hyperlink only available to WisDOT staff.)
From Table 10-4, 2018 GDHS, this combination of mainline and controlling feature design speeds requires a ramp length of 600 ft. To this must be added the 300 ft merge taper.

Example 2

Given: Same situation as Example 1 except now the mainline grade is +3%.
Find: The length (L) of the parallel entrance ramp.
Start with the same basic length as determined in Example 1 but now apply the adjustment factor found in Table 10-5, page 10-133, 2018 GDHS for mainline upgrades from +3% to +4%. In this case the factor is 1.65.
600 x 1.65 = 990 ft. To this must be added the 300 ft merge taper.
With a length of 990 ft, consult with the Region Traffic Section about the need, placement and number of any Type 5 arrows needed to reinforce the lane drop.

1.4.3.2 Exit Ramps

Parallel-type exit ramps are preferred. Taper-type exit ramps have been used predominantly for interchange design in the past. With tapered exits the driver has less time in which to diverge from the main lane of traffic. See Figure 10-73, Table 10-5 and Table 10-6, pages 10-133 thru 10-139, 2018 GDHS for single lane exit ramp design.

A curve with a radius of 1000 ft or more should be provided beyond the parallel ramp.

If it is necessary to provide an deceleration lane longer than computed by applying the adjustment factors in Table 10-5, Page 10-133, 2018 GDHS, then consult with the Region Traffic Section about the use of auxiliary lanes or lane additions.

The length (L_a) of the parallel exit ramp is measured from the point where the leading taper section reaches 12-foot wide, measured from the right edge of the mainline, to the point controlling the speed of the ramp (refer to Figure 10-73, page 10-137, 2018 GDHS). The length (L_a) is given in Table 10-5 and Table 10-6, page 10-133 and 10-138, 2018 GDHS, respectively, for the ramp according to the exiting speed (design speed of ramp), and the design speed of the mainline. Provide an upstream taper of 300 ft in all applications of parallel exit ramps.

Review the DHV traffic on the mainline. If it is anticipated that the freeway will frequently approach capacity or the percent of trucks on the ramp exceeds 10%, then a minimum length (L_a) of 800 ft plus the 300 ft merge taper is typical.

The grade of the mainline parallel ramp area will influence the length of the deceleration lane needed to achieve diverging speed. Table 10-5, page 10-133, 2018 GDHS gives multipliers to be used where the grades are 3% to 6%.

Consider the following factors when designing parallel exit ramp terminals.

1. The exiting speed of the vehicle - directly related to the radius and design speed of the last curve on the ramp.
2. Type of mainline roadway (freeway, expressway, interstate)
3. Design speed of the main line.
4. Percent trucks using the ramp.
5. The grade of the main line.

1.4.4 Ramp Speeds

Ramp design speed will vary by type of interchange design. This section also addresses a freeway split which by definition is not a ramp. The various scenarios are provided as follows:

1. Freeway Splits
2. Freeway-to-Freeway directional ramp
3. Freeway-to-Service Road off and on ramps

Provide the highest practicable design speed for the ramps as well as attempt to reach the 2018 GDHS upper ranges for the given situation.

Table 10-1, page 10-105, 2018 GDHS provides guide values for ramp design speed as related to various mainline highway design speeds (i.e. those in the upper range (85%) of the mainline ramp terminal should be designed to be within 85% of the mainline design speed, middle range within 70%, and lower range within 50%). Guidance is provided for each scenario, including the freeway split.

1. Freeway Splits – Each freeway shall have the same design speed. Freeway split example: Tomah Interchange where I-90 continues westward, and I-94 diverges northward.
2. Freeway to Freeway directional ramps – Design directional ramps to be in the upper range, or within 85% of the mainline design speed (within 10mph of mainline highway design speed for 60mph and greater). Freeway to freeway directional ramp example: Portage Interchange where I-39 South connects to I-94 Westbound.
3. Freeway to Service Road off and on ramps – Design diamond interchanges to be in the upper range, or within 85% of the mainline design speed (within 10 mph of mainline highway design speed for 60mph and greater). Design Tight loop ramps (cloverleaf or partial cloverleaf) in the lower range, or within 50% of the mainline design speed. The minimum design speed on ramps or turning roadways associated with interchanges is normally 30 mph. A minimum design speed of 25 mph may be used on loop ramps when the mainline design speed is 50 mph or less. Because of the increased lengths and large areas required, the maximum design speed on loop ramps should be limited to 30 mph. Provide proper deceleration distance to transition from the mainline design speed to the ramp design speed while maintaining proper stopping sight distance.

The design speed of ramps approaching their junction with crossroads should be adjusted to fit the conditions existing or desired at these terminals. The details for a stop condition at a crossroad are shown in Attachment 1.2 and Attachment 1.3. For crossroad terminal treatments that merge with an arterial, such as at a cloverleaf where the design speed on the arterial is less than 65 mph, the length of the taper should be provided in accordance with Table 10-4, page 10-132, and Table 10-6, page 10-138, 2018 GDHS.

1.4.5 Ramp Alignment

Ramp alignment details on entrance and exit terminals are shown in Section 10, 2018 GDHS. Exit ramp tapers should be located along tangent sections of the main line. Ramp tapers that are located adjacent to a main line section that is on a curve are undesirable because of the confusion created as to which alignment is the main line. Ramp terminals on a curve are addressed on pages 10-139 thru 10-143, 2018 GDHS. Transition curvature of turning roadways on ramps should be designed with adequate length to facilitate any speed change to the design speed of the succeeding curve. Lengths of transition are also shown in Table 3-22, page 3-89, 2018 GDHS.

1.4.6 Ramp Sight Distance

For minimum stopping sight distance along ramps or the turning roadway, refer to Table 3-1, page 3-4, 2018 GDHS. Entrance ramps and merging areas should be visible to approaching main line traffic for a minimum distance equivalent to the design stopping sight distance. The design of the ramp and merging area should take into account the effect of grades, especially where there is a substantial volume of heavy truck traffic (see Table 10-5, page 10-133, 2018 GDHS). Exit ramp tapers should diverge from the main line roadway in such a way that the vertical curvature will not restrict visibility along the ramp to a value less than the stopping sight distance for the ramp design speed. Ramps that "drop out of sight" create a definite problem in driver recognition of queuing and should be avoided. At least 200 feet (60 m) of ramp pavement beyond the gore should be visible from the main line at the point where the exit taper begins.

1.5 Intersection Sight Distance

The sight distance at a ramp terminal must be adequate to allow safe turning movements. For ramp terminals that merge with a crossroad, such as at a cloverleaf, the sight distance requirements for the main line apply except that the design speed may be lower (refer to "Ramp Speeds" in this procedure).

1.6 Grades and Profile

The effect of grades on the length of speed change lanes is shown in Table 10-5, page 10-133, 2018 GDHS. Grades on ramps should not exceed five percent. The maximum acceptable grade is eight percent provided the length of such grade is relatively short.

Profiles for ramps usually consist of a combination of crest and sag vertical curves. The vertical curves should be designed simultaneously with the horizontal alignment to avoid hidden curves for a driver leaving the through highway and turning onto a ramp.

1.7 Superelevation and Cross Slope

The maximum superelevation rate for ramps and ramp terminals is 6 percent. The one exception is existing ramp roadways with cross slopes based on an 8 percent maximum superelevation. In these cases, the existing 8 percent rate may be retained when such roadways are perpetuated or rehabilitated. Guidance on development of superelevation at turning roadways and terminals is included in 2018 GDHS, Section 9.6.4.3, Intersections, Development of Superelevation at Turning Roadway Terminals on page 9-84 and Section 10.9.6, Grade Separations and Interchanges, Ramps on page 10-102.

The maximum algebraic difference in pavement cross slope at turning roadways should not exceed 5 percent. Where necessary, the divergence angle between the ramp and through lanes should be increased to limit the rollover rate to 5 percent.

LIST OF ATTACHMENTS

Attachment 1.1	Typical Details of Ramp - Mainline Intersections
Attachment 1.2	Details of Ramp - Mainline Intersections with Special Turn Lanes
Attachment 1.3	Layout for Turning Volumes

FDM 11-30-5 Cross Section, Ramp and Crossroad — *November 15, 2022*

5.1 Interchange Ramp Roadway Widths

Ramp widths for single-lane, one-way operation follow Table 3-27, Page 3-109, 2018 GDHS when the ramp is not curbed, plus shoulders (see FDM 11-15 Attachment 1.5 for typical section), and follow Table 3-27 and Table 3-28, Page 3-109 thru 3-110, 2018 GDHS for face to face of curb width, when the ramp is curbed on both sides. (GDHS hyperlink is only available to WisDOT staff.) The width of ramps designed for two-lane operation or for truck volumes in excess of 12% shall be in accordance with Table 3-27 and Table 3-28, Page 3-109 thru 3-110, 2018 GDHS. Single-lane ramps should be designed with a uni-directional slope (straight line without crown) over the entire width. Two-lane ramps on tangent should have a normal center line crown. Ramp pavement widths at crossroad terminals shall be as shown in FDM 11-30 Attachment 1.1, FDM 11-30 Attachment 1.2, and FDM 11-30 Attachment 1.3. Multi-lane exit and entrance ramps are discussed on pages 10-143 thru 10-150, 2018 GDHS.

Where the radius of the turning roadway is less than 430 feet, a barrier curb with a 5 foot turf shoulder should be provided on the low side or inside of the curve and an 8 foot shoulder, on the high side or outside of the curve. The turf shoulder should be sloped at the rate of 4 percent and normally away from the curb.

5.2 Interchange Ramp Median (Two-Way Operations)

Two-way ramps on which one or both lanes are designed for 50 mph or greater should be provided with a median barrier when the median width is 30 feet or less. Two-way ramps on which both lanes are designed for less than 50 mph may be designed with a flush or curbed median. The minimum width of median should be 6 feet between curb faces to permit room for signing.

5.3 Intersecting Road

A crossroad should normally be divided through an interchange area to help safeguard against wrong-way entry onto ramps and to accommodate left-turning lanes when stop or signal control are used. The typical section shown in FDM 11-30 Attachment 1.1, is the minimum design for two lane crossroads when the intersection treatment is stop or signal controlled. When roundabouts are provided at the ramp/crossroad termini, additional width for turn lanes or storage for turning vehicles is not part of the design. Therefore, when roundabouts are used at the termini, it is not important to divide the highway other than to provide the splitter island at the approach to the roundabout.

Another consideration at the crossroad termini is sight distance. The sight distance for a roundabout design is approximately half the sight distance required for a stop or signal controlled condition. For more information on roundabout design refer to FDM 11-25-3.

FDM 11-30-10 Collector Distributor Roads May 19, 1997

10.1 Collector-Distributor Roads

If the spacing between successive interchanges or between successive ramps of high-volume cloverleaf or directional interchanges is less than about one-half mile (800 m), it may be necessary to provide collector-distributor (C-D) roads for weaving vehicles. The C-D road should be separated from the freeway so weaving maneuvers are not made in the through lanes of the main line roadway. C-D roads are particularly adaptable to cloverleaf type interchanges where vehicles are entering and leaving simultaneously on adjacent loop ramps. The auxiliary lane has the dual function of operating as a deceleration/acceleration lane and as a weaving area. The need for C-D roads (capacity, weaving analysis, speeds, etc.) should be analyzed as part of interchange selection (see FDM 11-30-1).

If traffic volumes are high, the ramp to the C-D road should be preceded by an adjacent lane parallel to the main line, through roadway, similar to a parallel type off-ramp. Leaving vehicles can decelerate on a lane away from the through traffic lanes.

Where two high-volume entrance ramps are connected via a C-D road, an added lane downstream from the entrance may also be necessary.

In addition to handling high volumes of weaving and merging traffic, collector-distributor road systems enable cloverleaf type interchanges to be compressed in size, thus saving right-of-way. This is accomplished by providing speed changes on the C-D roadways, which permits the use of shorter radius ramp loops.

FDM 11-30-15 Interstate Access Points - Additional or Revised Access to the Interstate Highway System May 17, 2022

15.1 Introduction

Changes in access to the Interstate Highway System are governed by a FHWA policy for evaluating requests for additional and revised access to the Interstate System. This policy is contained in the FHWA Policy Statement on Access to the Interstate System published August 27, 2009 in the Federal Register Volume 74, Number 165, Page 43743 to Page 43746 and as updated by the memorandum titled “Changes to FHWA’s Policy on Access to the Interstate System” dated May 22, 2017. There is also a FHWA-Wisconsin Division Standard Operating Procedure titled “New or Revised Interstate Access Points” that provides additional guidance on the procedure for submitting a request. In addition, a Programmatic Agreement between the FHWA Wisconsin Division Office and WisDOT allows for changes in the review and approval of specific types of changes in Interstate-System Access (Attachment 15.9).

This policy is applicable to new or revised access points to existing Interstate facilities regardless of the funding of the original construction or regardless of the funding for the new access points. Routes approved as a future part of the Interstate System under 23 U.S.C. 103(c)(4)(B) represent a special case because they are not yet a part of the Interstate System. Since the intention to add the route to the Interstate System has been formalized by agreement, any proposed new or significant changes in access beyond those covered in these agreements, regardless of funding, must be approved by FHWA.

The primary emphasis of the policy is protection for the safety, operations and engineering of the Interstate System. Proposals for added or revised access to the Interstate must be based on serving regional traffic needs. The intent is to limit additional access to essential needs and not merely to serve the convenience of adjacent property interests or to solve local traffic problems by moving them onto the Interstate facility.

The following is a list of the most common needs that are addressed by a change in access:

- Systems linkage or connectivity
- Road user benefits
- Access to areas currently not served
- Address an existing safety, operational or engineering problem
- Prevention of future safety, operational or engineering problems

It is important to note that congressionally directed funding for a change in access has no bearing on consideration of an Interstate System Access Change Request. The approval of funding for a project does not change the requirements for consideration of a proposed change in access or acceptance by FHWA.

An Interstate Access Justification Report (IAJR) must be prepared and submitted as part of the Interstate System Access Change Request for all new points of access or significant revisions which involve interchange configuration. (Attachment 15.1 details some of the information required for this evaluation.) These requirements apply regardless of the funding of the original construction or regardless of the funding for the new access points.

A change in access is considered by FHWA as any modification to the control of access right of way on the Interstate System. Each entrance or exit point is considered an access point. Any additional access where there previously was none would be considered new access. Generally, revised access is considered to be a change in the interchange configuration that affects the safety, operational and engineering characteristics of the Interstate System even though the actual number of points of access may not change.

Ramps providing access to rest areas, information centers, and weigh stations within the Interstate controlled access are not considered access points for the purpose of applying this policy. These facilities shall be accessible to vehicles only to and from the Interstate System. Access to and from these facilities and local roads or adjoining property is prohibited. The only allowed exception is for access to adjacent publicly owned conservation and recreation areas if access to these areas is only available through the rest area, as allowed under 23 CFR 752.5(d).

If there is any question whether an Interstate System Access Change Request is required, contact the DTSD BPD Region Design Oversight Engineer or FHWA Wisconsin Division Office to determine the type of review and process to be considered.

All requests for new or revised access points on completed Interstate highways must closely adhere to the planning and environmental review processes as required in 23 CFR parts 450 and 771. The FHWA approval constitutes a Federal action and, as such, requires that the transportation planning, conformity, congestion management process, and the National Environmental Policy Act procedures be followed, and their requirements satisfied. This means the final FHWA approval of requests for new or revised access cannot precede the completion of these processes or necessary actions.

There are three (3) types of IAJR approvals:

1. Access Changes That Do Not Require FHWA Review and Action Unless Specifically Requested;
2. WisDOT Review and Determination of Safety, Operational and Engineering (SO&E) Acceptability with Expedited FHWA Review and Concurrence of IAJR and
3. FHWA Final Review and Determination of Safety, Operational and Engineering (SO&E) IAJR Acceptability.

See Attachment 15.2 Prompt List for Reviewing Access Requests Table labeled “Delegation of Authority for Access Approval” on page 8 of 8. These approval types consist of the following:

1. Access Changes That Do Not Require FHWA Review and Action Unless Specifically Requested

WisDOT has review and approval authority for changes to I-System interchange ramp approach and departure auxiliary lanes and gore, ramp lane and ramp intersection and crossroad Interchange configurations as follows:

1. Adding Turn Lane(s) or Through Lane(s) on Cross Roads at Ramp Termini
2. Widening of Existing Ramps to Add Lane(s)
3. Relocating Ramp Termini Along Cross Roads
4. Adding Auxiliary Lane(s) Between Two Adjacent Interchange Ramps
5. Signal or Channelization Improvements of Ramp Terminal Intersections with Cross Roads

The access changes listed above are not included in the Programmatic Agreement and are not required to be documented in the annual report (see FDM 11-30-15.2).

WisDOT also has review and approval authority for changes to locked gated access and access to ramps or collector-distributor roadways or other facilities that are functionally part of the Interstate System. These access changes are not included in the Programmatic Agreement and are also not required to be documented in the annual report (see FDM 11-30-15.2).

2. WisDOT Review and Determination of Safety, Operational and Engineering (SO&E) Acceptability with Expedited FHWA Review and Concurrence of IAJR

WisDOT conducts the necessary review and assessment of the justification and documentation substantiating certain proposed changes in I-System access; makes the determination on the safety, operational and engineering (SO&E) acceptability of proposed changes; and requests expedited FHWA approval after completion of required NEPA actions. FHWA’s lack of objections to the WisDOT’s determination within an established time-period of 10 business days after completion of required NEPA actions constitutes FHWA's concurrence and approval required under 23 U.S.C. 111(a). These I-System Access Changes consist of:

1. New and Modifications of Existing Freeway-to-Crossroad (Service) Interchanges such as:
   a. Adding New Ramp(s) to an Existing Interchange(s)
   b. Relocating Ramp(s) within an Existing Interchange(s) without creating a Partial Interchange
   c. Changing Service Interchange Configuration(s)
2. Completion of Basic Movements at an existing Partial Interchange(s)

The access changes listed above are included in the Programmatic Agreement and are required to be documented in the annual report (see FDM 11-30-15.2).

3. FHWA Final Review and Determination of IAJR Safety, Operational and Engineering (SO&E) Acceptability

WisDOT develops the justification and documentation substantiating certain proposed changes in I-System access and submits to FHWA; FHWA reviews and assesses the justification and documentation; makes the determination of the SO&E acceptability of the proposed changes; and final determination of approval required under 23 U.S.C. 111(a). These I-System Access Changes consist of:

1. New or Modified Freeway-to-Freeway (System) Interchanges
2. New Interchanges or Ramps to Provide Intermittent Access During Special Events
3. New Partial Interchanges
4. Closure of Individual Access Points that Result in Partial Interchanges or Closure of Entire Interchanges
5. Any Other Project as Set Forth in the Programmatic Agreement not on the 1-Year List or any Others FHWA Requires

The access changes listed above are included in the Programmatic Agreement and are required to be documented in the annual report (see FDM 11-30-15.2).

To offer maximum flexibility for those IAJR requests requiring FHWA concurrence or approval, required information may be submitted by WisDOT to the FHWA Wisconsin Division Office for a determination of SO&E acceptability prior to Final IAJR concurrence/approval. This flexibility allows agencies the option of obtaining this acceptability determination prior to making the required modifications to the Transportation Plan, performing any required conformity analysis, and completing the environmental review and approval process. In this manner, WisDOT can determine if a proposal is acceptable for inclusion as an alternative in the environmental process. This policy in no way alters the planning, conformity or environmental review and approval procedures as contained in 23 CFR parts 450 and 771, and 40 CFR parts 51 and 93.

An affirmative determination by FHWA of SO&E acceptability for proposals for new or revised access points to the Interstate System should be reevaluated whenever a significant change in conditions occurs (e.g., land use, traffic volumes, roadway configuration or design, environmental commitments). Proposals shall be reevaluated if the project has not progressed to construction within 3 years of receiving an affirmative determination of SO&E acceptability (23 CFR 625.2(a)). If the project is not constructed within this time period, an updated justification report based on current and projected future conditions must be submitted to FHWA to receive either an affirmative determination of SO&E acceptability, or final approval if all other requirements have been satisfied (23 U.S.C. 111, 23 CFR 625.2(a), and 23 CFR 771.129). Refer to Interstate System Access Information Guide.

WisDOT is required to submit requests for certain proposed changes in access to the FHWA Wisconsin Division Office for review and action under 23 U.S.C. 106 and 111, and 23 CFR 625.2(a). The FHWA Division Office will ensure that all requests for changes in access contain sufficient information, as required in this policy, to allow FHWA to independently evaluate and act on the request. Guidance to assist with the implementation and consistent application of this policy can be accessed electronically through the FHWA Office of Infrastructure.

WisDOT is responsible for ensuring that the collection of all data, performance of all required analysis, and development of the required documentation is complete, correct and appropriate for the proposed change in access as agreed to in the coordination process.

See Attachment 15.3 for a simplified flowchart of the Interstate System Access Change Request and Approval Process. See Attachments 15.4 to 15.7 for more detailed flowcharts of the IAJR and IAJR SO&E process with recommended coordination meetings.

15.2 Annual Reporting per Programmatic Agreement

The Programmatic Agreement (PA) between the FHWA Wisconsin Division Office and WisDOT requires WisDOT to submit to FHWA a report summarizing its performance under this agreement annually from the effective date. The report will:

- Summarize results of all changes to the I-System that were processed and approved under PA;
- Summarize the changes in access WisDOT plans to process in the coming year;
- Assess the effectiveness and verify all changes to I-System processed through PA were evaluated and processed consistent with terms of PA; and
- Identify any areas where improvement is needed and what measures WisDOT is taking to implement those measures

BPD will coordinate the process for preparing the annual report each year.

- In January, BPD will:
    - Initiate process by posting the IAJR annual report template in Box folder (See Attachment 15.8)
    - Alert designated individual from each Region responsible for providing input into template and provide deadline for doing so *
    - Alert bureau individual(s) responsible for reviewing template (typically BPD – Design Standards & Oversight Section; possibly, BTS – Environmental Process & Documentation Section, BTO – Traffic Analysis & Safety, BTS – Utility & Access Unit) and provide deadline for doing so
- Designated Region individual compiles data for Region projects and inputs data into template in Region's Box folder (between mid-January and March 1)
- Bureau staff identified above review data that region staff have provided in Box folders (between March 1 and March 15)
- BPD compiles all data into a single file, reviews input, resolves any questions with contributors, and forwards to AO (between March 15 and April 15)
- AO reviews and approves (between April 15 and May 1)
- BPD forwards to FHWA (May 1)

* Each Region will identify an individual who is responsible for collecting information relating to IAJR activity and providing input for the IAJR annual report template. The Region will be responsible for notifying BPD should a different individual assume this role.

15.3 Coordination and Approval Procedures

A. Access Changes That Do Not Require FHWA Review and Action Unless Specifically Requested - Acceptability Determination Review and Approval Procedure

Follow the Standard Project IAJR Process as described in this chapter and as shown in Attachment 15.5 Flowchart. Complete the Intersection Control Evaluation(s) (ICE) with appropriate Traffic Analyses (Micro-simulation if needed) and Environmental (NEPA) and Public Involvement Processes as required. Documentation related to this IAJR Determination Approval Type is to be provided with the Design Study Report (DSR) as added documentation either in or attached to the Report. WisDOT Regions coordinate with WisDOT BPD to decide on the best method of documentation. Approval of the DSR will constitute IAJR approval.

B. WisDOT Review and Determination of Safety, Operations and Engineering - Acceptability of IAJR with Expedited FHWA Division Office Concurrence Procedure

Follow the appropriate IAJR Process (Standard, Complex or High-Risk Complex) as agreed to between the WisDOT Region and BPD along with the appropriate coordination meeting steps as outlined in Attachment 15.4 "Interstate Access Justification Report (IAJR) Process – Common Beginning Steps" flowchart. Documentation related to this IAJR Approval Type is to be provided in a full Interstate Access Justification Report(s) completed by way of either one of the agreed to Procedures (Two (2) Step or One (1) Step) as described later in this FDM Chapter.

C. WisDOT BPD Review and Request for FHWA Approval on the Determination of IAJR Safety, Operations and Engineering - Acceptability

Follow the appropriate IAJR Process (Standard, Complex or High-Risk Complex) as agreed to between the WisDOT Region and BPD and FHWA. Follow the coordination meeting steps as outlined in Attachment 15.4 "Interstate Access Justification Report (IAJR) Process – Common Beginning Steps" flowchart. Documentation related to this IAJR Approval Type is to be documented in a full Interstate Access Justification Report(s) completed by way of either one of the agreed to Procedures (Two (2) Step or One (1) Step) as described next in this FDM Chapter.

IAJR Process to follow when FHWA Concurrence or Approval is Required (Section B. and C. Above)

There are Two IAJR Processes that WisDOT may choose to follow when FHWA Concurrence or Approval is required. The FHWA recommended Two (2) Step Process and the One (1) Step Process which are as follows:

15.3.1 The Two (2) Step IAJR Approval Process

The Two (2) Step process includes an initial Determination of Safety, Operational and Engineering (SO&E) Acceptability and then a final approval given after the completion of NEPA. Step One (1) in the concurrence/approval process is to obtain FHWA concurrence or approval in the determination of safety, operational and engineering acceptability. The "Interstate System Access Change Request" must come from WisDOT with a recommendation for approval. This request, with recommendation for approval must come from the WisDOT Division of Transportation System Development Administrator. Requests submitted directly from the Regions will not be accepted. Supporting documentation in the form of an "Interstate Access Justification Report" (IAJR) must accompany the request. FHWA's decision to approve new or revised access points to the Interstate System must be supported by substantial information justifying and documenting that decision. A safety, operational and engineering analysis must demonstrate that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility. If the FHWA determines the project is acceptable, project development may occur.

Step Two (2) is the final FHWA concurrence/approval which constitutes a Federal Action, and as such, requires that NEPA procedures are followed. Compliance with the NEPA procedures need not precede the determination of safety, operational and engineering acceptability. However, final approval of access cannot precede the completion of the NEPA process and FHWA approval of the Record of Decision (ROD), Finding of No Significant Impact (FONSI) or Categorial Exclusion (CE) as appropriate. Once NEPA has been completed, final approval of access may be granted as long as the alternative covered by the favorable SO&E determination is of the same scope and design as the alternative selected and approved in the NEPA decision. The "Interstate System Access Change Request" is submitted for approval with whatever changes have occurred since the first submittal as a result of design refinements or the environmental review process.

15.3.2 The One (1) Step IAJR Approval Process

The initial separate Determination of Safety, Operational and Engineering (SO&E) Acceptability report and review may be eliminated if agreed to between the WisDOT Region and BPD. The Final IAJR can be submitted after completion of the Environmental (NEPA) process and approval of the Record of Decision (ROD), Finding of No Significant Impact (FONSI) or Categorial Exclusion (CE) as applicable and must contain all the information required to justify concurrence/approval of the access request including the safety, operational and engineering aspects of the change. This One (1) Step process, though potentially allowing for a shorter IAJR process approval timeframe, may add more risk to the approval process as FHWA will have not yet made an SO&E determination and thus may not be in approval of the final chosen preferred alternative. The WisDOT Region and BPD must determine if this risk is acceptable.

Under either FHWA concurrence/approval process, early coordination between WisDOT and the FHWA Wisconsin Division Office is recommended to refine the scope of the analysis and to make an initial determination if the project is reasonable. This coordination will allow for the project analysis to be performed in a cost-effective manner and provide for a more effective review of the request.

Issues to be addressed at the early coordination meetings:

- Need for FHWA review and action.
- Study area or area of influence for analysis.
- Defining the goal and objective of the access request.
- Preliminary alternatives to be considered.
- Performance objectives and measures.
- Technical analysis requirements for the planning, environment, design, safety, and operations issues.
- Documentation requirements. Refer also to Attachment 15.1.

Regardless of the funding source, since approval is considered a Federal Action, the project's final approval is contingent on the successful completion of the same process as used in the planning, engineering, and environmental phases for any federally funded project. The Interstate System Access Change Request also must be adopted as part of a conforming transportation plan and STIP or TIP to receive final approval. Review of the plans, specifications, and estimate is also performed by WisDOT BPD and FHWA prior to construction. This is the final opportunity to review and approve proposed changes in access. The final design is the recommended construction plan and should be consistent with the engineering concepts approved in the earlier submittals. If the final design is not consistent with the earlier approvals, a re-evaluation is necessary.

Any proposed Interstate access changes requiring FHWA concurrence/approval should be discussed in the early stage of development with the FHWA Field Operations Engineer and the design oversight engineer in the Design Standards and Oversight Section of the Bureau of Project Development (BPD). They will provide the necessary guidance for evaluating and documenting the proposal. If the request originates within the department, the Region's role is to perform the necessary analyses and prepare the justification report. If the request originates with a local unit of government, the Region should provide guidance to ensure the necessary studies and analyses are performed.

See Attachments 15.4 to 15.7 for IAJR SO&E Process Flowcharts. Attachment 15.4 shows the beginning steps of the IAJR process. These steps are common to all types of projects.

Attachment 15.5 shows the remaining steps for a standard project IAJR process. A standard project is any project that is not complex or high-risk complex (see definitions below). The A. Access Changes That May Not Require FHWA Review and Action IAJRs will follow this flowchart.

Attachment 15.6 shows the remaining steps for a complex project IAJR SO&E process. A complex project is a project where it is critical to ensure that the preferred alternative would be acceptable from a safety, operational and engineering standpoint prior to final environmental approval (i.e. the risk is not being able to obtain IAJR approval of the preferred alternative, or the need to make adjustments after completion of the NEPA would adversely impact the development of the project). These projects usually involve any combination of the following: complex or controversial environmental issues, an accelerated project schedule, or relatively complex interchange design issues. An affirmative determination of SO&E acceptability should normally be completed on complex projects.

Attachment 15.7 shows the remaining steps for a high-risk complex project IAJR SO&E process. A high-risk complex project is a project where it is crucial to ensure that each of the proposed alternatives to be carried forward for detailed study in the environmental document would be acceptable from a safety, operational and engineering standpoint. The risk of not being able to obtain IAJR approval of any of the proposed alternatives would adversely impact the development and delivery of the project. These projects usually involve any combination of the following: extensive or controversial environmental issues, a critical or politically sensitive project schedule, or complex or unique interchange design issues. An affirmative determination of SO&E acceptability should normally be completed for these projects.

Consult the Interstate System Access Informational Guide by the FHWA Office of Infrastructure, August 2010 and subsequent revisions, for detailed guidance on preparing an IAJR.

Also, consult the "FHWA Prompt List for Reviewing Interstate Access Requests" in Attachment 15.2. All IAJR proposals shall include a conceptual signing plan.

All studies and analyses should be complete so the proposal can be properly evaluated. The request is required to be a standalone document. Referencing information that is needed to support decision making in other documents (Feasibility Study, Preliminary Engineering Report or similar document) is not acceptable. Relevant information from these documents should be provided in the appropriate section of the access request. Excerpts may be included as appendices. The document needs to be clearly written for someone who is not familiar with the project, the area, or the State.

If the Region believes the proposal is sufficiently justified and supported, submit the documentation, along with a formal request and recommendation, to the Bureau of Project Development for approval by the Administrator of the Division of Transportation System Development. The Bureau of Project Development will circulate the IAJR for comment to the Bureau of Traffic Operations, the Bureau of Structures, the Bureau of Technical Services Acquisition and Services Section, and the Division of Transportation Investment Management Bureau of Planning and Economic Development as needed. When any DTSD & DTIM Bureau concerns have been sufficiently addressed, the BPD Design Standards and Oversight Section will submit to the DTSD Administrator for signature and then submit the request to FHWA when required.

Coordinate new or revised access proposals within urbanized areas with the appropriate Metropolitan Planning Organization.

All new or revised access proposals requiring FHWA approval/concurrence will be processed through the FHWA Division Office. The responsible FHWA Field Operations Engineer should be brought into the process when the Region determines a viable proposal is being pursued.

FHWA Headquarters retains final approval for those IAJRs listed on page 8 of Attachment 15.2.

There is a detailed process in WisDOT's Highway Maintenance Manual Chapter 9, Section 10 State Trunk Highway Connections, that outlines how non-interchange gated access is handled. Locked gates for WisDOT use do not need to be permitted, but there is an approval process that involves FHWA. A permit is required for locked gates for non-WisDOT use. For gated interchanges, the regular process, with completion of an IAJR, would be required.

For temporary access modification that fall under FHWA concurrence/approval requirements, FHWA formal documented approval is needed, even for temporary access in, or to, construction zones. Exceptions can be made when there is a very short-term emergency/incident response need.

15.4 Content

Interstate System Access Change Requests need to discuss the appropriate issues and provide the information necessary to allow WisDOT BPD or FHWA to make an informed decision considering the potential consequences of a change in access. The type of analysis necessary will vary on a request-by-request basis. At a minimum, the system analysis will include upstream and downstream interchanges, as well as the local road system feeding into the affected interchanges.

The FHWA policy specifies two (2) criteria for the evaluation of new or revised access to the Interstate. Proposals must comply with all that are pertinent (refer to Attachment 15.2 for additional discussion on the criteria and Attachment 15.3 for a simplified typical interstate access change request and approval process flowchart). Refer to Attachment 15.4 (Interstate Access Justification Report Process), Attachment 15.5 (Standard Interstate Access Justification Report Process), Attachment 15.6 (IAJR SO&E Process for Complex Projects), and Attachment 15.7 (IAJR SO&E Process for High Risk Complex Projects) for detailed Interstate Access change request and approval process flowcharts. These criteria, which must be documented in the IAJR or with the DSR for WisDOT Only Access Change approvals, are:

Criteria 1

An operational and safety analysis based on both the current and the planned future traffic projections has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes; existing, new, or modified ramps; and ramp intersections with crossroad). It should also evaluate and conclude that the proposed change in access does not have a significant adverse impact on the safety and operations on the local street network. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access to ensure an appropriate scope of analysis (23 CFR 625). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625).Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625 and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

The operational and safety analysis performed needs to include all elements of the Interstate System, including collector-distributor roads, and provide a comparison of the no-build and build conditions anticipated to occur through the design years of the project. The analysis may be extended beyond the minimum requirements outlined above to establish the potential extent and scope of the impacts. Extending the limits of the analysis in urbanized areas where there are closely spaced interchanges may be required. The analysis should demonstrate the engineering and operational acceptability of the proposed change in access. When considering the impacts of various alternatives, give priority to the performance of the Interstate System within the context of the local planning, environmental, design, safety, and operational conditions.

Criteria 2

The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2) and 655.603(d), connects only to a public road; does not utilize ramps serving rest areas, information centers, or weigh stations; and will provide for all traffic movements. Less than ``full interchanges'' may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit or high occupancy vehicle and high occupancy toll, lanes) or park and ride lots. In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analysis to the partial-interchange option. The report should describe why a partial interchange is proposed and include the mitigation proposed to compensate for the missing movements, include wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements on ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.

All interchanges need to provide for each of the eight basic movements (or four basic movements in the case of a three-legged interchange), except in the most extreme circumstances. Partial interchanges usually have undesirable operational characteristics. If circumstances exist where a partial interchange is considered appropriate as an interim improvement, then commitments need to be included in the request to accommodate the ultimate design. These commitments may include purchasing the right-of-way required during the interim improvements.

Access to special use lanes, transit stations, or park and ride lots that are part of the Interstate System are special cases, and the movements requiring access should be determined on a case-by-case basis.

Provision of a change in access, particularly new access, should be considered in the context of statewide and local transportation and land use planning. The Interstate System typically serves as the backbone of the transportation network, and access to this facility can have significant impact on local and regional traffic circulation. The existing transportation planning activities provide a venue for coordination of stakeholders with divergent interests and concerns. Understanding the stakeholder interests and concern is an important aspect of developing an informed decision about the merits of a change in access.

Chapter 4 of the Interstate System Access Informational Guide discusses the various transportation planning activities that may be significant in considering proposed changes in Interstate access. The various factors and considerations of the relationship between the transportation planning process and the policy are discussed. The documentation requirements for ensuring the information needed to support informed decision making is also discussed in chapter four.

The FHWA approval of Interstate System Access Requests constitutes a Federal Action, and as such, requires that the National Environmental Policy Act (NEPA) is followed. NEPA codified the national commitment to the environment quality, established a national environmental policy, and provided a framework for environmental planning and decision-making by Federal agencies. NEPA directs Federal agencies, when developing projects or issuing permits, to conduct environmental reviews to consider the potential impacts on the environment by their proposed actions. NEPA also established the Council on Environmental Quality (CEQ), which is charged with the administration of NEPA. The NEPA process consists of a set of fundamental objectives that include interagency coordination and cooperation and public participation in planning and project development decision making.

With the Two (2) Step process for approval of Interstate System Access Change Requests, compliance with the NEPA procedures need not precede the determination of safety, operations and engineering acceptability. However, final approval of access cannot precede the completion of NEPA, even if no Federal funds are used. Once NEPA has been completed, approval of access is granted as long as there are no changes to the location or design of the accepted concept. Typically, NEPA requirements are met through the normal project development process of each State. See Chapter 5 of the Interstate System Access Information Guide for more detailed information on the environmental considerations of changes to interstate access.

Geometric design relates to the visible dimensions of a highway and includes horizontal and vertical alignments, cross-sectional elements (lanes, shoulders, roadside, etc.), lateral and vertical clearances, sight lines, and so forth for the mainline, ramps, and crossroad. These features of a design define the form of a facility and are directly influenced by variables such as modal types, volumes, speeds, desired operational quality of service, safety performance, available right-of-way, environmental impacts, and cost constraints. Consequently, geometric design is specifically addressed in an Interstate System Access Change Request. While detailed geometric design will be reviewed prior to approval of the plans, specifications, and estimate; information conveyed in the request should be of sufficient detail to allow full evaluation of the policy requirements and to determine overall adequacy in terms of design criteria and any anticipated design justifications. It should be noted that compliance with design criteria (as adopted in 23 CFR 625, specifically the AASHTO Interstate Highway Standards **and** the AASHTO Green Book) does not guarantee SO&E acceptability of an access request. It should also be noted that exceptions to vertical clearance requirements on the Interstate Highway need to be coordinated through Surface Deployment and Distribution Command (SDDCTEA). Other aspects of designs, such as structures, pavement, geotechnical, etc., need to be addressed in a request, but only to the conceptual level necessary to define potential impacts.

The proposal of a change in access that complies with design criteria does not guarantee SO&E acceptability, nor does the use of design justifications indicate that a proposed design will not function well. In general, design justifications should be avoided, however designers are often required to make trade-offs in balancing competing project needs and limited resources. Appropriate evaluation of design criteria, design justifications, and SO&E characteristics of the facility will all be considered in the determination of SO&E acceptability. See Chapter 6 of the Interstate System Access Information Guide for more detailed information on the design considerations of changes to interstate access.

It is in the national interest to maintain as high a degree of mobility and safety performance on the Interstate System as possible, while at the same time balancing the need to provide connectivity to the local road network. Therefore, quantifying the impacts of a change of access to each of these key factors is an important aspect of protecting the integrity of the Interstate System. For safety performance, this involves the need to examine both qualitatively and quantitatively, the effects of the proposed change in access. See Chapter 7 of the Interstate System Access Information Guide for more detailed information on the safety considerations of changes to Interstate access.

The operational analysis of new or modified access is integral to understanding the benefits and potential impacts to the Interstate System and local roadway network. In accordance with FHWA's Policy, a detailed traffic operational analysis must accompany all requests for change in interstate access. Chapter 8 of the Interstate System Access Information Guide discusses an approach to address the operational aspects of the policy, including defining an analysis study area, establishing operational performance measures, and selecting and interpreting the results of traffic analysis tools. The chapter draws heavily upon the guidance of the FHWA Traffic Analysis Toolbox.

Chapter 9 of the Interstate System Access Information Guide provides additional technical resources that contain guidance on the technical analysis of changes in interstate access.

LIST OF ATTACHMENTS

Attachment 15.1	Information Required for New or Revised Interstate Access
Attachment 15.2	FHWA Prompt List for Reviewing Interstate Access Requests
Attachment 15.3	Simplified Flowchart for Typical Interstate System Access Change Request and Approval Process
Attachment 15.4	Interstate Access Justification Report (IAJR) Process - Common Beginning Steps
Attachment 15.5	Standard Project IAJR Process
Attachment 15.6	Complex Project IAJR SO&E Process
Attachment 15.7	High Risk Complex Project IAJR SO&E Process
Attachment 15.8	IAJR Annual Report Template
Attachment 15.9	Programmatic Agreement between FHWA and WisDOT Re: Review and Approval of IAJRs