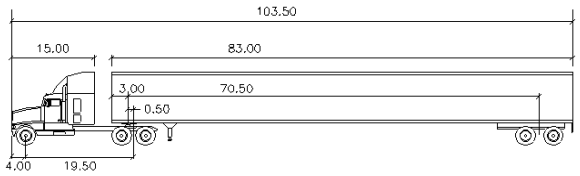
Selection Criteria for Rural High-Speed Intersections (Posted Speed >= 50 mph)

INTERSECTION TYPE [A]	TYPE OF THROUGH HIGHWAY	
	FOUR LANE DIVIDED	TWO LANE
A1 450-ft full-width turn lane, exclusive of storage [C]	**For posted speed of 65 or 60 mph**: Use if: The intersection design vehicle is a WB-62 or larger, or Current traffic volume on the side road exceeds 1,000 AADT regardless of the design traffic volume on the through highway, or Current traffic volume on the side road is between 400 and 1,000 AADT and the design traffic volume on the through highway exceeds 4,000 AADT.	Do not use on two-lane highways.
A2 350 ft full-width turn lane exclusive of storage [C]	**For posted speed of 55 mph or 50 mph:** Use if: The intersection design vehicle is a WB-62 or larger, or Current traffic volume on the side road exceeds 1,000 AADT regardless of the design traffic volume on the through highway, or Current traffic volume on the side road is between 400 and 1,000 AADT and the design traffic volume on the through highway exceeds 4,000 AADT.	Use if: The intersection design vehicle is a WB-62 or larger, or Current traffic volumes exceed 2500 AADT on the through highway and 1000 AADT on the side road.
B1 300 ft full-width turn lane exclusive of storage [C]	**For posted speed of 65 or 60 mph:** Use at all intersections not meeting the criteria for Intersection Type A1 **For posted speed of 55 mph or 50 mph:** Use at all intersections not meeting the criteria for Intersection Types A2 or B2	Use if current traffic volumes on both the through highway and the side road exceed 500 AADT and the sum of both exceeds 2500 AADT.
B2 200 ft full-width turn lane exclusive of storage [C]	**For posted speed of 55 mph or 50 mph:** Use if the design traffic volume on the through highway is less than 7000 AADT and the current traffic volume on the side road is less than 100 AADT.	Use if the current traffic volumes on both the through highway and the side road exceed 100 AADT and the sum of both exceeds 1250 AADT. [B]
C or D	Do not use on divided highways.	Use at all intersections not meeting the criteria for intersection Types A, B1 or B2.

A See SDD 9A1 for intersection details.

B If the acquisition of new right of way or substantial earthwork would be required for Resurfacing and Pavement Replacement projects, the merits of improved traffic flow should be weighed against increased construction costs, lengthened project development time to acquire R/W, disruptions to adjacent property, etc. If a Type B2 intersection cannot be justified at a specific location, the designer should evaluate using a Type C or D intersection.

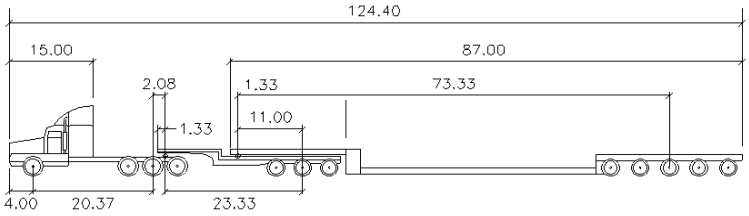
C These full-width turn lane lengths apply to both left turn lanes and right turn lanes for traffic entering the same side road leg of the intersection. Additional lengths are necessary to store turning vehicles - see FDM 11-25-1, and FDM 11-25-5. Also, see FDM 11-25-5 attachments.



Overall Length	103.50 ft
Overall Width	8.50 ft
Max Track Width	8.50 ft
Lock to Lock Time	6.00 sec

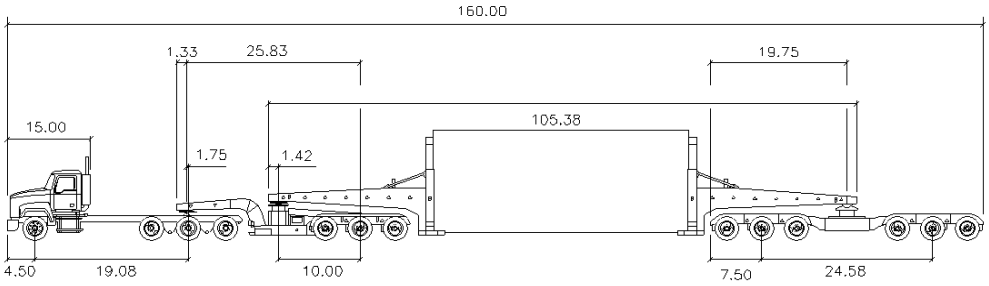
OSOW - MT
WB-92

NOTE: Data depicted on this sheet was current as of time of production. Vehicle dimensions, capabilities, and overall design may vary by transit carrier and manufacturer. Different characteristics may result in more or less maneuverable vehicles than those depicted here. THE USER IS RESPONSIBLE for confirming a vehicle's specific capabilities and dimensions for their specific project.



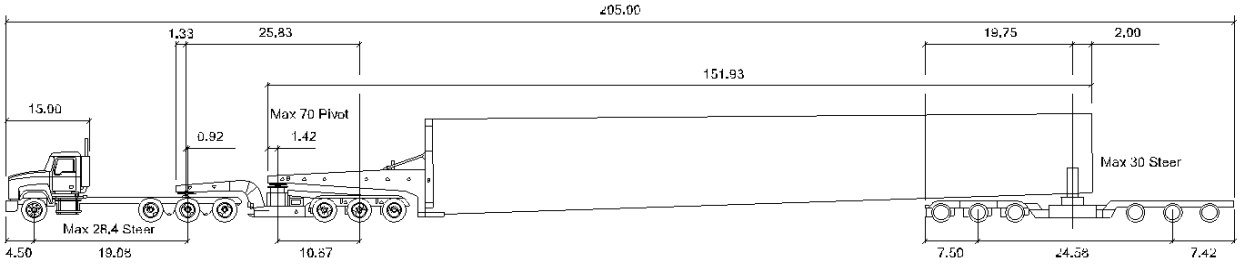
Overall Length	124.40 ft
Overall Width	12.50 ft
Max Track Width	10.00 ft
Min Body Ground Clearance	5.0 Inches

OSOW - ST
DST LOWBOY



Overall Length	160.00 ft
Overall Width	16.00 ft
Max Track Width	10.00 ft
Lock to Lock Time	6.00 sec

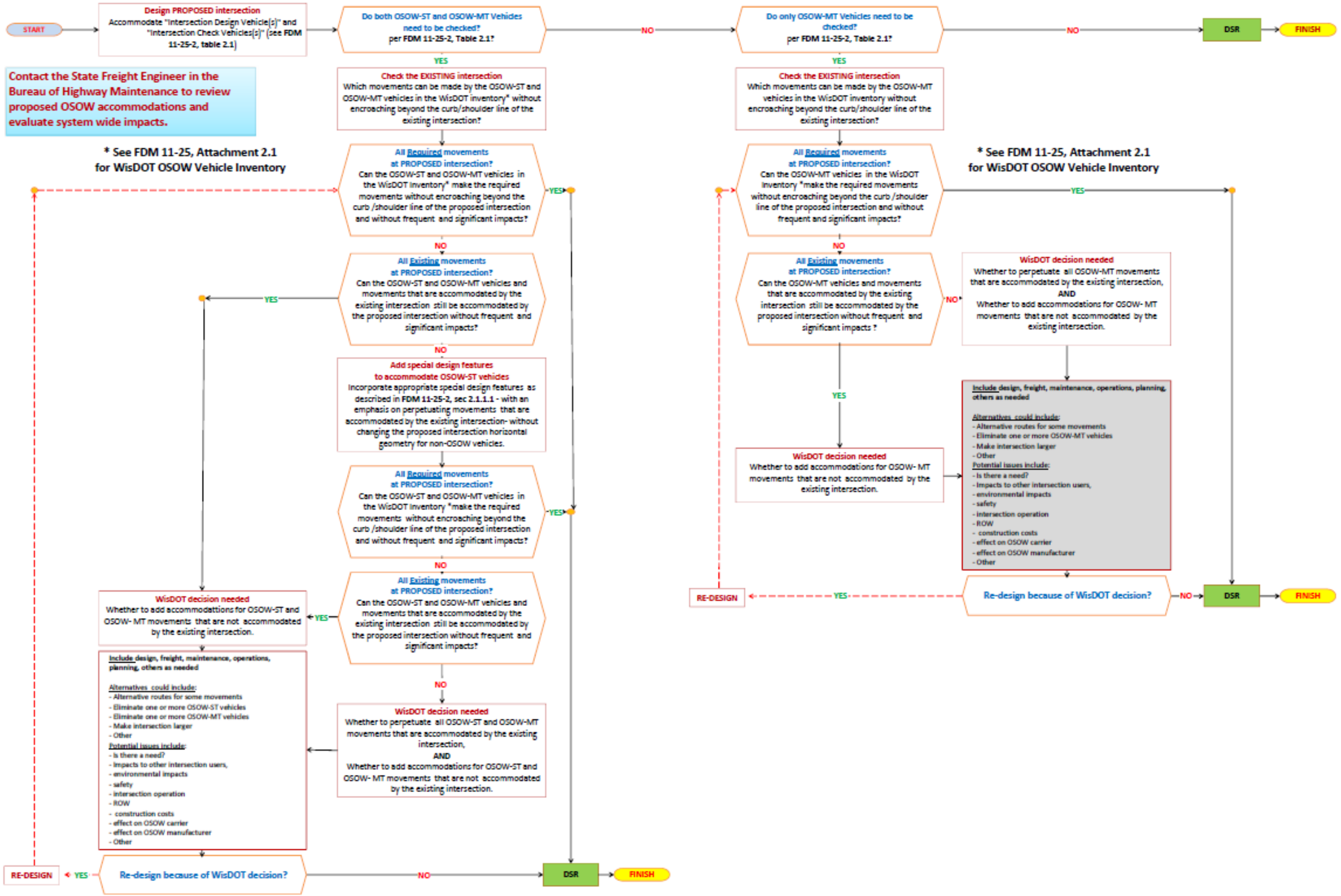
OSOW - ST
160' x 16' *



Load: Wind Tower 205'	
Overall Length	205.00 ft
Overall Width	13.00 ft
Max Track Width	10.00 ft
Lock to Lock Time	6.00 sec

OSOW - WT
Wind Tower 205' *

* REAR-STEER CAPABLE


START
Design PROPOSED intersection
Accommodate "Intersection Design Vehicle(s)" and "Intersection Check Vehicles(s)" (see FDM 11-25-2, table 2.1)
Contact the State Freight Engineer in the Bureau of Highway Maintenance to review proposed OSOW accommodations and evaluate system wide impacts.
Do both OSOW-ST and OSOW-MT Vehicles need to be checked? per FDM 11-25-2, Table 2.1?
NO
Do only OSOW-MT Vehicles need to be checked? per FDM 11-25-2, Table 2.1?
NO
DSR
FINISH
YES
Check the EXISTING intersection
Which movements can be made by the OSOW-ST and OSOW-MT vehicles in the WisDOT inventory* without encroaching beyond the curb/shoulder line of the existing intersection?
Check the EXISTING intersection
Which movements can be made by the OSOW-MT vehicles in the WisDOT inventory without encroaching beyond the curb/shoulder line of the existing intersection?
* See FDM 11-25, Attachment 2.1 for WisDOT OSOW Vehicle Inventory
All Required movements at PROPOSED intersection?
Can the OSOW-ST and OSOW-MT vehicles in the WisDOT inventory* make the required movements without encroaching beyond the curb /shoulder line of the proposed intersection and without frequent and significant impacts?
YES
NO
All Existing movements at PROPOSED intersection?
Can the OSOW-ST and OSOW-MT vehicles and movements that are accommodated by the existing intersection still be accommodated by the proposed intersection without frequent and significant impacts?
YES
NO
Add special design features to accommodate OSOW-ST vehicles
Incorporate appropriate special design features as described in FDM 11-25-2, sec 2.1.1.1 - with an emphasis on perpetuating movements that are accommodated by the existing intersection- without changing the proposed intersection horizontal geometry for non-OSOW vehicles.
All Required movements at PROPOSED intersection?
Can the OSOW-ST and OSOW-MT vehicles in the WisDOT inventory *make the required movements without encroaching beyond the curb /shoulder line of the proposed intersection and without frequent and significant impacts?
YES
NO
All Existing movements at PROPOSED intersection?
Can the OSOW-ST and OSOW-MT vehicles and movements that are accommodated by the existing intersection still be accommodated by the proposed intersection without frequent and significant impacts?
YES
NO
WisDOT decision needed
Whether to add accommodattions for OSOW-ST and OSOW- MT movements that are not accommodated by the existing intersection.
WisDOT decision needed
Whether to perpetuate all OSOW-ST and OSOW-MT movements that are accommodated by the existing intersection,
AND
Whether to add accommodations for OSOW-ST and OSOW- MT movements that are not accommodated by the existing intersection.
Include design, freight, maintenance, operations, planning, others as needed
Alternatives could include:
- Alternative routes for some movements
- Eliminate one or more OSOW-ST vehicles
- Eliminate one or more OSOW-MT vehicles
- Make intersection larger
- Other
Potential issues include:
- Is there a need?
- Impacts to other intersection users,
- environmental impacts
- safety
- intersection operation
- ROW
- construction costs
- effect on OSOW carrier
- effect on OSOW manufacturer
- Other
RE-DESIGN
YES
Re-design because of WisDOT decision?
NO
DSR
FINISH
* See FDM 11-25, Attachment 2.1 for WisDOT OSOW Vehicle Inventory
YES
NO
All Existing movements at PROPOSED intersection?
Can the OSOW-MT vehicles and movements that are accommodated by the existing intersection still be accommodated by the proposed intersection without frequent and significant impacts ?
YES
NO
WisDOT decision needed
Whether to add accommodations for OSOW- MT movements that are not accommodated by the existing intersection.
WisDOT decision needed
Whether to perpetuate all OSOW-MT movements that are accommodated by the existing intersection,
AND
Whether to add accommodations for OSOW- MT movements that are not accommodated by the existing intersection.
Include design, freight, maintenance, operations, planning, others as needed
Alternatives could include:
- Alternative routes for some movements
- Eliminate one or more OSOW-MT vehicles
- Make intersection larger
- Other
Potential issues include:
- Is there a need?
- Impacts to other intersection users,
- environmental impacts
- safety
- intersection operation
- ROW
- construction costs
- effect on OSOW carrier
- effect on OSOW manufacturer
- Other
RE-DESIGN
YES
Re-design because of WisDOT decision?
NO
DSR
FINISH

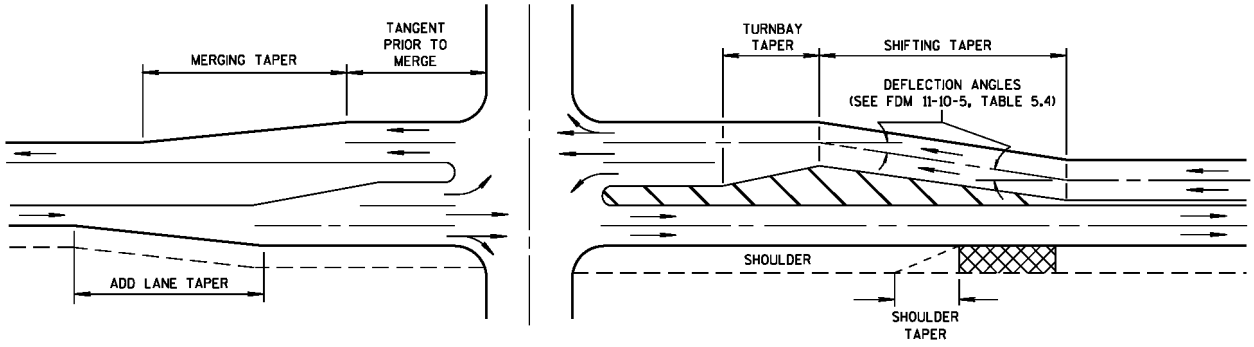


Table A2.1 Taper Descriptions and Formulas

Type of Taper	Definition of "W" (feet)	S* (mph)	L=Taper Length (feet)	
			Desirable	Minimum
Merging Taper **	The difference in travel way width from the beginning to the end of the taper	<=40	$L = W \times (S + 5)$	$L = W \times S$
		>=45	$L = W \times (S + 5)$	$L = W \times S$
Add Lane Taper **	The difference in travel way width from the beginning to the end of the taper	<=40	$L = (W \times (S + 5)^2)/60$	$L = (W \times S^2)/60$
		>=45	$L = W \times (S + 5)$	$L = W \times S$
Shifting Taper	The distance (left or right) a vehicle path is shifted from the beginning to the end of the taper	<=40	L = greater of 100-feet or $(W \times (S + 5)^2)/60$	L = greater of 100-feet or $(W \times S^2)/60$
		>=45	L = greater of 200-feet or $W \times (S + 5)$	L = greater of 200-feet or $W \times S$
Shoulder Taper	The difference in Shoulder width from the beginning to the end of the taper	<=40	$L = (W \times (S + 5)^2)/180$	$L = (W \times S^2)/180$
		>=45	$L = \big(W \times (S + 5)\big)/3$	$L = (W \times S)/3$
Turn Bay Taper	The distance (left or right) a vehicle path is shifted from the beginning to the end of the taper See Table A2.2 below for Turn Bay taper rates			

S* = Posted speed or off-peak 85th percentile speed

**Add Lane and Merging tapers for passing and climbing lanes are shown in SDD 15C8.

Table A2.2 Tangent Prior to Merge and Turn Bay Taper Rates

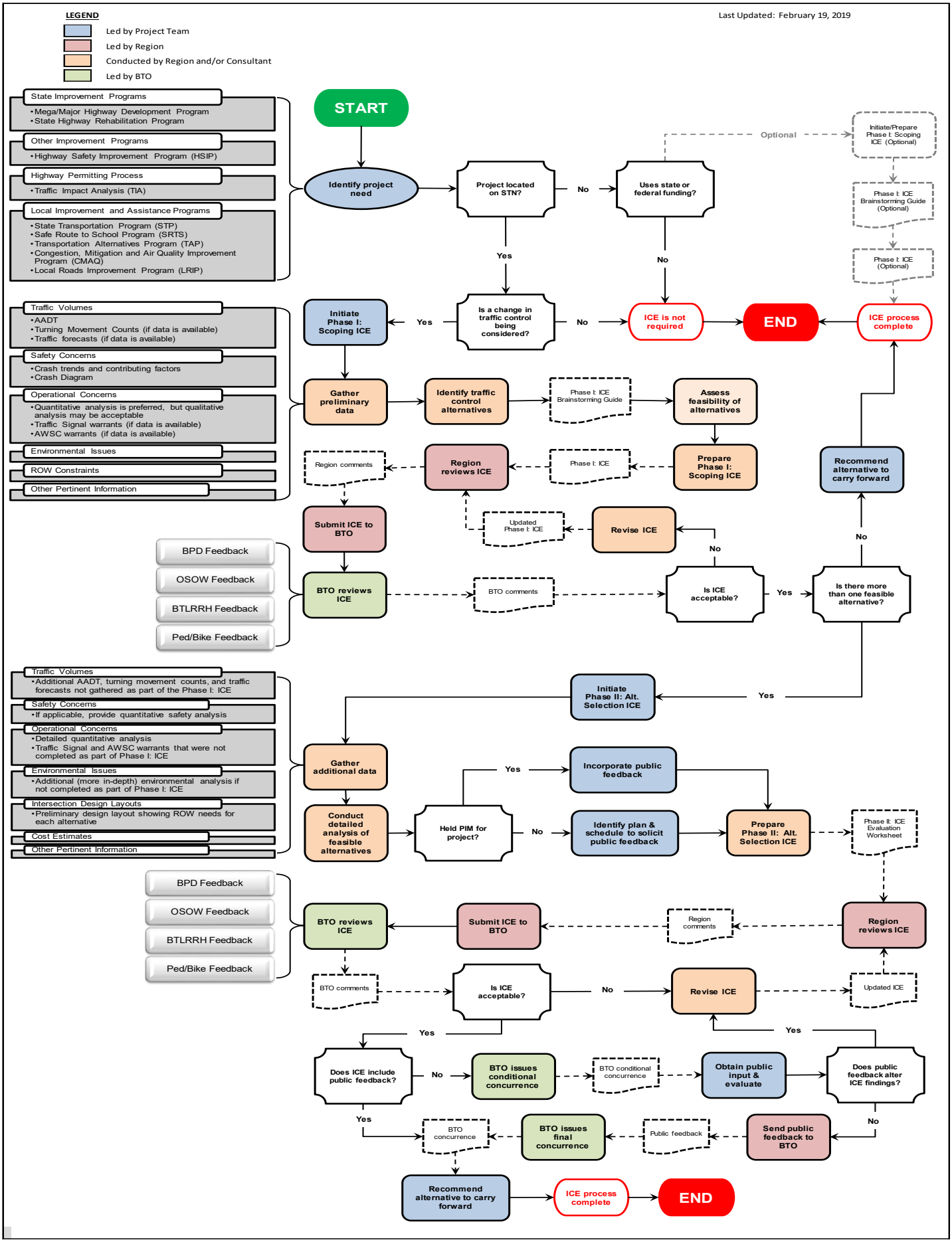
Posted Speed (mph)	Tangent prior to merge[1] (feet) Desirable (Minimum)	Turn Bay taper rates *** Normal (Minimum)	
		Rural	Urban
25	**525** (325)	**8:1**	8:1 (6:1)
30	**660** (460)	**8:1**	8:1 (6:1)
35	**765** (565)	**12.5:1**	**8:1** (6:1)
40	**870** (670)	**12.5:1**	**8:1** (6:1)
45	**975** (775)	**12.5:1**	**12.5:1**
50	**1085** (885)	**12.5:1**	**12.5:1**
55	**1190** (990)	**12.5:1**	**12.5:1**
65	**1400** (1200)	**12.5:1**	**12.5:1**

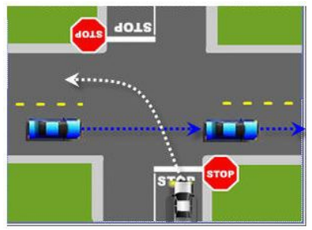
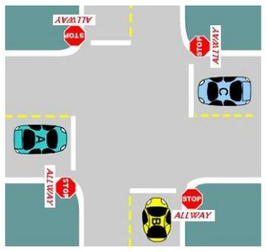
*** Use the same turn bay taper rate for single, dual and triple turn lanes.

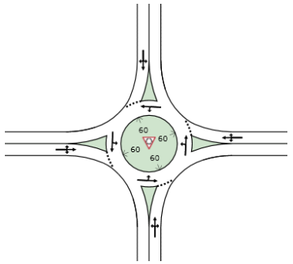
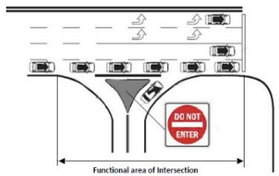
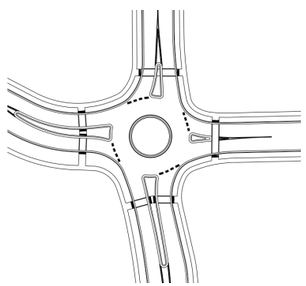
[1] Minimum values from (*1)* Placement of Warning Signs. In *Manual on Uniform Traffic Control Devices* *Chapter 2C: Warning Signs and Object Markers* Federal Highway Administration, 2009, Section 2C.05. http://mutcd.fhwa.dot.gov/pdfs/2009/part2c.pdf., Table 2C-4 on p.108. Values also shown in Wisconsin MUTCD Table 2C-4.

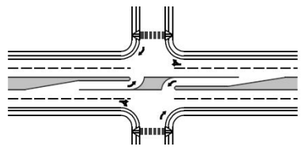
Relationship between the Facilities Development Process and the ICE Process

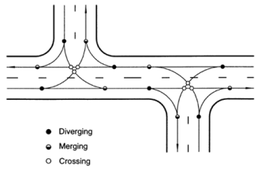
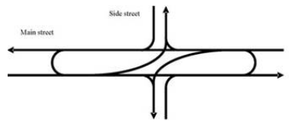
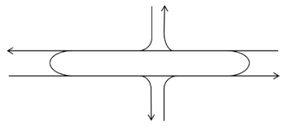
Phase Elements \ Phase Names			Project Initiation	Project Definition		Project Delivery			Project Proposal Execution		
Life Cycle (Construction ID)			00	10		11	12	15	20		40
Milestone				Project Initiation Complete	Prelim. Scope Complete	Final Scope Certification Approved	Resourcing Complete / Start Final Delivery	Design Study Report Approved	PS&E Submitted	Project LET	Project Award
Deliverables (Deliverables listed may have been started in a previous phase but must be completed prior to advancing to the next phase)	Project Management Plan	Scope	• Conceptual Scope	• Prelim. Scope	• Final Scope	• Implement Scope					
		Schedule	• Conceptual Milestone Schedule • APLP Target Goals & Schedule • Program Let Schedule	• Final Milestone Schedule • Final Work Breakdown • Final APLP Schedule • Final Let Schedule Date • Non-let Schedule Dates		• Monitor and Manage Schedules					
		Budget	• Conceptual Const.Estimate	• Design Delivery Budget • Const. Estimate • Non-Let Estimate		• Refine Const. Estimate • Refine Non-Let Estimate					
	Phase Deliverables		• Design ID(s) loaded • Construction ID(s) loaded • Design ID(s) Authorized • Highway Improvement Type • Structures Identified • Signed SMFA (design connect.hwy.)	**Phase I: ICE** • Purpose and Need • Resource Assignments • Safety Certification • Improvement Strategy • Risk Assessment	**Phase II: ICE** • Signed Pavement Design Report • Draft Env. Document • Utility Impacts • R/W Impacts • Structure Certification • Railroad Proj. Submittal Package • Signed SMFA & SMMA (const.) • Risk Assessment	• Final Delivery Resourcing	• Prelim. Plan • Structure Survey Report • Prelim. Structure Plan • Signed Env. Document • Signed DSR • Recordable Plat • Risk Assessment	• PS&E package • Permits • Risk Assessment	• Plan Revisions • Bid Advertisement • Addenda (if required)	• Bid Review	• Design ID Closed • Design Files Archived
Phase Activities			see FDM Chapter 3 - attachment 1.2								
Change Management			Establishes original baseline for applying Change Management process.			Change Management process in effect.					

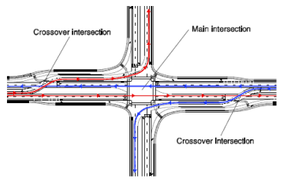
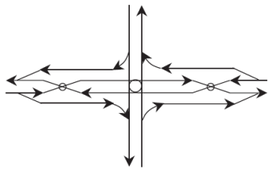
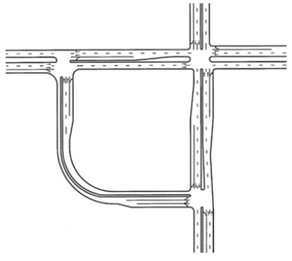

LEGEND
Led by Project Team
Led by Region
Conducted by Region and/or Consultant
Led by BTO
Last Updated: February 19, 2019
State Improvement Programs
•Mega/Major Highway Development Program
•State Highway Rehabilitation Program
Other Improvement Programs
•Highway Safety Improvement Program (HSIP)
Highway Permitting Process
•Traffic Impact Analysis (TIA)
Local Improvement and Assistance Programs
•State Transportation Program (STP)
•Safe Route to School Program (SRTS)
•Transportation Alternatives Program (TAP)
•Congestion, Mitigation and Air Quality Improvement Program (CMAQ)
•Local Roads Improvement Program (LRIP)
START
Identify project need
Project located on STN?
No
Uses state or federal funding?
Optional
Initiate/Prepare Phase I: Scoping ICE (Optional)
Phase I: ICE Brainstorming Guide (Optional)
Phase I: ICE (Optional)
Yes
No
Traffic Volumes
•AADT
•Turning Movement Counts (if data is available)
•Traffic forecasts (if data is available)
Safety Concerns
•Crash trends and contributing factors
•Crash Diagram
Operational Concerns
•Quantitative analysis is preferred, but qualitative analysis may be acceptable
•Traffic Signal warrants (if data is available)
•AWSC warrants (if data is available)
Environmental Issues
ROW Constraints
Other Pertinent Information
Initiate Phase I: Scoping ICE
Yes
Is a change in traffic control being considered?
No
ICE is not required
END
ICE process complete
Gather preliminary data
Identify traffic control alternatives
Phase I: ICE Brainstorming Guide
Assess feasibility of alternatives
Region comments
Region reviews ICE
Phase I: ICE
Prepare Phase I: Scoping ICE
Recommend alternative to carry forward
Submit ICE to BTO
Updated Phase I: ICE
Revise ICE
No
No
BPD Feedback
OSOW Feedback
BTLRRH Feedback
Ped/Bike Feedback
BTO reviews ICE
BTO comments
Is ICE acceptable?
Yes
Is there more than one feasible alternative?
Traffic Volumes
•Additional AADT, turning movement counts, and traffic forecasts not gathered as part of the Phase I: ICE
Safety Concerns
•If applicable, provide quantitative safety analysis
Operational Concerns
•Detailed quantitative analysis
•Traffic Signal and AWSC warrants that were not completed as part of Phase I: ICE
Environmental Issues
•Additional (more in-depth) environmental analysis if not completed as part of Phase I: ICE
Intersection Design Layouts
•Preliminary design layout showing ROW needs for each alternative
Cost Estimates
Other Pertinent Information
Initiate Phase II: Alt. Selection ICE
Yes
Gather additional data
Yes
Incorporate public feedback
Conduct detailed analysis of feasible alternatives
Held PIM for project?
No
Identify plan & schedule to solicit public feedback
Prepare Phase II: Alt. Selection ICE
Phase II: ICE Evaluation Worksheet
BPD Feedback
OSOW Feedback
BTLRRH Feedback
Ped/Bike Feedback
BTO reviews ICE
Submit ICE to BTO
Region comments
Region reviews ICE
BTO comments
Is ICE acceptable?
No
Revise ICE
Updated ICE
Yes
Yes
Does ICE include public feedback?
No
BTO issues conditional concurrence
BTO conditional concurrence
Obtain public input & evaluate
Does public feedback alter ICE findings?
Yes
BTO concurrence
BTO issues final concurrence
Public feedback
Send public feedback to BTO
No
Recommend alternative to carry forward
ICE process complete
END

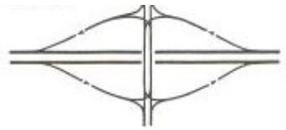
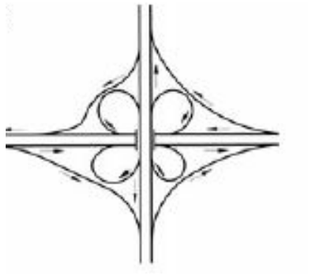
Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Intersection Control Types					
Minor Road Stop Control  Vehicles on the minor road stop and wait for a sufficient gap before making their desired movements, while mainline traffic does not stop.	• Major and minor road functional classification are clearly defined • Low minor road volume, especially for through and left movements • Major road mobility is the primary concern • Signal warrants not met • AWSC warrants not met	• Major road delay is nonexistent or minimal • Inexpensive to install and maintain • Clearly defines which vehicles have the priority	• Higher major road volumes reduce minor road gap availability and can result in high delays • Significant sight distance can be required when the major road operates at higher speeds • Potential for high-severity angle crashes, especially with higher major road speeds or volumes	• Least restrictive form of intersection control • Often appropriate for low-volume county or local roads that intersect with STN routes • Wide, open medians can be used for two-stage crossings	• FDM 11-25.3.1.2.1
All-Way Stop Control  All vehicles stop before making their desired movements. Priority is assigned based on arrival time.	• Balanced traffic volumes • ROW or sight distance constraints • AWSC warrants met • Signal warrants not met • Maintaining major street through movements as free flow is not the primary concern • Relatively low approach speeds	• Can be very safe • Requires minimal ROW and sight distance • Inexpensive to install and maintain	• Operationally inefficient under most conditions • Higher vehicle emissions due to required stopping	• AWSC is not preferred as a permanent solution on the STN, especially if there are other viable alternatives • AWSC may be appropriate as an interim solution • Wisconsin-specific AWSC warrants apply in addition to MUTCD AWSC warrants	• FDM 11-25.3.1.2.1 • TEOpS 13-26-5 • MUTCD 2B.07
Traffic Signal (Signal)  Priority is assigned by traffic signal indications.	• Available gaps are not adequate to complete desired movements under less restrictive control • Signal warrants met • Nearby intersections are signalized, and coordination is possible	• Can be coordinated with other signals to provide desired progression • Flexibility can be achieved via timing adjustments • Adaptive control can be implemented along a signalized corridor • Pedestrians are assigned crossing times rather than having to find gaps	• Major road delay is often greater than it is under less restrictive control • Severe crashes can occur due to red light running or poor visibility of the signal heads • Dedicated turn lane requirements can result in wider approaches, meaning longer pedestrian crossings and additional ROW requirements • Can experience extensive queuing, especially with longer cycle lengths	• Preferred control when railroad or lift-bridge pre-emption is required • Can also accommodate emergency vehicle or transit pre-emption	• FDM 11-25.3.1.2.2 • TSDM Chapter 2 • Signal Warrants

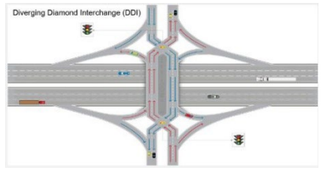
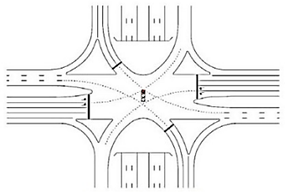
Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Roundabout (RAB)  Vehicle speeds are reduced via geometry approaching the intersection. Entering vehicles yield to circulating vehicles.	• Relatively balanced traffic volumes • Signal or AWSC warrants met • Significant crash history, especially angle crashes • Unconventional geometry (5 or more legs, high skew, etc.) present	• Significantly reduces risk of serious crashes via geometry • Lower vehicle emissions due to limited stopping and idling • Can reduce number of approach lanes, and therefore approach width and ROW requirements along the roadways • Can have traffic calming effects • Can accommodate closely spaced intersections better than other traffic control options • Allows for convenient U-turn movement • Pedestrian crossings are shorter	• Coordination not possible • May require additional ROW at the intersection to accommodate the center island and circulating roadway • No flexibility in assigning priority • All vehicles are required to slow down from free-flow speeds • Can see operations deteriorate rapidly under congested conditions, potentially resulting in the circulating roadway becoming gridlocked • Pedestrian crossings are uncontrolled	• Accommodation of larger vehicles, including OSOW, can be challenging but may be addressed with unique design considerations • Consider need for expandable design (e.g., one lane to two lanes) • Single-lane roundabouts are preferred to multi-lane roundabouts	• FDM 11-25.1.1.2 • FDM 11-25-3.1.2.3 • FDM 11-26 • FHWA RAB Guide
Right-In/Right-Out (RI/RO)  Left turns into the minor road and through and left movements out of the minor road are not permitted.	• History of angle crashes involving minor street through/left and major street left movements • Other intersections nearby to facilitate restricted movements • Intersection encroaches on the influence area of an adjacent intersection • Signal warrants not met • AWSC warrants not met	• Crossing conflicts are eliminated so overall safety is increased • Operations at the intersection are enhanced due to elimination of minor road through and left movements and major street left movement	• Access at the intersection is severely reduced – generally not favored by businesses • Adjacent intersections may be adversely affected as vehicles will be forced to execute turning maneuvers at locations other than the restricted access intersection • Travel time may increase for drivers wanting to make minor road left/ through movements and major road left turn movements at this location	• Access restrictions like RI/RO may be more feasible in combination with nearby intersections that allow for U-turns.	
Compact Roundabout  Smaller diameter roundabouts with traversable islands.	• Intersection has an AADT of <15,000 vehicles per day • Posted speed 40 mph or less • Truck percentages are 5% or less • Existing all-way stop intersections • Constrained right of way that may not accommodate a traditional roundabout	• Has many of the benefits of a traditional roundabout in a smaller footprint • Lower construction cost than traditional roundabout	• Turns and U-turns for larger vehicles may be difficult to accommodate • Has less capacity than a traditional roundabout • Physical speed control can be more difficult to achieve	• OSOW through movements can usually be accommodated with a traversable central island and splitter islands, but turning movements may be difficult to accommodate • Compact roundabouts should be restricted to single lane entries; however, the addition of a right-turn only lane could be considered	• FDM 11-25.1.1.2 • FDM 11-25.3.1.3 • FDM 11-26 • FHWA RAB Guide

Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Right-In/Right-Out/Left-In (3/4 access)  Through and left movements out of the minor road are not permitted.	• History of angle crashes involving minor street through/left movements • There is not a significant history of crashes involving the major street left turn movements • Signal warrants not met • AWSC warrants not met	• Crossing conflicts are significantly reduced so overall safety is increased • Operations at the intersection are enhanced due to elimination of minor road through and left movements • Provides more access than RI/RO • All movements from the mainline are maintained	• Access at the intersection is reduced for exiting vehicles from the minor road • Adjacent intersections may be adversely affected as vehicles will be forced to execute turning maneuvers at locations other than the restricted access intersection • Travel time may increase for drivers wanting to make minor road left turn and through movements at this location	• May be more palatable to businesses than RI/RO	

Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Offset T  Direct minor road through movements are not possible and become a left onto the main road and right onto the other minor road, or vice versa.	• Existing four-leg intersection with a history of angle crashes for minor road through vehicles • Low minor road volumes, especially for the minor road through movement • Intersection skew present	• Removes crossing conflicts for minor road through vehicles • Can correct intersection skew	• ROW is required to accommodate the offset between the two intersections • Rear-end crashes could increase due to low vehicle speeds as minor road through movements require a series of two consecutive turns	• The location of offset intersections relative to each other can make a difference. For minor road through vehicles, the offset can be done so that either the left turn or right turn is made on the mainline. Depending on the situation, one may be preferable to the other • Offset distance will vary by location • Can be used at both unsignalized and signalized intersections	• FHWA Offset T Information
J-Turn (RCUT)  Through and left movements out of the minor road are not permitted. U-turns are provided downstream in the median to facilitate these movements.	• History of angle crashes, especially far-side • Located on a high-speed, divided facility • Located in a relatively rural area with significant intersection spacing • Signal warrants not met • AWSC warrants not met	• Crossing conflicts are significantly reduced, so overall safety is increased • Vehicles only focus on finding a gap in one direction of traffic at a time • Operations at the intersection are enhanced due to elimination of minor road through and left movements • U-turns are handled within the intersection and will not affect adjacent intersections	• Minor street through and left movements are more indirect than at a traditional intersection; travel time and distance are increased • Direct access to the major road in between the intersection and the U-turns is typically removed	• Larger vehicles may have to be accommodated with a “loon” at the U-turn • This may not be feasible on some curves • Analysis methods are currently in development • Bicycle and pedestrian crossings can be maintained through the center of the J-Turn	• FDM 11-25.1.3.2 • FHWA RCUT Informational Guide
Median U-Turn/Modified J-Turn  Left turns into the minor road and through and left movements out of the minor road are not permitted. U-turns are provided downstream in the median to facilitate these movements.	• History of angle crashes, especially far-side • Located on a high-speed, divided facility • Located in a relatively rural area with significant intersection spacing • Major street left turn volumes are low • There is a history of crashes involving the major street left turn movements • Signal warrants not met • AWSC warrants not met	• Crossing conflicts are eliminated, so overall safety is increased • Vehicles only focus on finding a gap in one direction of traffic at a time • Operations at the intersection are enhanced due to elimination of minor road through and left movements and major street left movement • U-turns are provided within the intersection and will not affect adjacent intersections	• Minor street through and left movements and major street left movement are more indirect than at a traditional intersection; travel time and distance are increased • Direct access to the major road in between the intersection and the U-turns is typically removed	• Larger vehicles may have to be accommodated with a “loon” at the U-turn • This may not be feasible on some curves • Analysis methods are currently in development	• FDM 11-25.1.3.2 • FHWA RCUT Informational Guide
Continuous Green-T  Priority is assigned by traffic signal indications, with one of the major street approaches always having a green light as minor street left turns merge from the left.	• Intersection has three legs, typically two major street approaches and one minor street approach • Signal warrants are met	• One of the major street movements will be free-flow, reducing potential delay • Safety can be improved	• The minor street left movement joins major street through traffic from the left with a merge maneuver, which is contrary to driver expectations	• Analysis of operations can be difficult given software limitations	• FHWA Continuous Green T Case Study

Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Displaced Left Turn (DLT)/ Continuous Flow Intersection  Major street left turns cross over to the other side of the roadway upstream of a signalized intersection. They can then complete their movement while the opposing through vehicles are also moving.	• High volume of traffic • Signal warrants are met • Urban or suburban setting • Intersection expected to reach capacity for a traditional signalized intersection • Heavy left turn volumes	• Since the left turn is relocated, the left turn phase is eliminated, and thus green time can be distributed to other movements • Throughput can be increased 10-30%, based on flow balance and whether the DLT is partial or full. Delay can be reduced by 30-80% • Fewer conflict points can result in a safer intersection	• More ROW is required to accommodate the crossovers • This intersection type can be unfamiliar to drivers • Design standards are not fully developed • Coordination with other signals could be impacted • Access must be restricted within the vicinity of the intersection • Additional signals are needed	• It is possible to have a corridor of DLT intersections	• FDM 11-25.3.1.2.4 • FHWA DLT Informational Guide
Double Crossover Intersection (DXI)  Major street vehicles going through or left to cross over to the other side of the road at a signalized intersection upstream of the main intersection. Left turns are then unopposed. Remaining vehicles cross back over at a downstream signal.	• High volume of traffic • Signal warrants are met • The setting is urban or suburban • The intersection is expected to reach capacity for a traditional signalized intersection • There are heavy left turn volumes • The intersection is not part of a coordinated corridor	• Reduced-signal phasing (2 phases total) • Left turns are free-flow – conflict removed • Potential for right angle crashes reduced • Capacity can be increased over a traditional signal	• Can be disorienting to drivers who may not know where to look for conflicting traffic, and may realize they are on the “wrong” side of the road • Increased potential for wrong-way driving • Unusual pedestrian crossing patterns • Difficult to coordinate with adjacent intersections • At least one additional signal is added to the intersection	• Newer type of intersection – drivers and public may be unfamiliar or cautious • Vehicles are unable to exit and reenter mainline (Emergency, OSOW, unfamiliar drivers, etc.)	• Double Crossover Interchange TRB Article
Quadrant Roadway Intersection/Jughandle  For one approach, left turns are completed upstream of the main intersection via a right turn onto a secondary roadway followed by a left turn onto the desired roadway.	• The intersection has a high volume of through movements and left turns	• By removing turning movements, the main intersection of the two major roadways can function more efficiently • Reduced-signal phasing (2 phases total) at the main intersection • May provide safer pedestrian crossing opportunities vs. high speed interchange ramps	• A large amount of ROW is required, especially if used in more than one quadrant • Additional intersections are created and turning movements become more complex • The intersection area can be difficult to sign and confusing or unexpected for unfamiliar drivers	• The crossing roadways can be grade-separated, the loop maintains access even with the overpass • The jughandle version of this intersection implies a tighter loop that may be unidirectional and be free-flow rather than creating an additional intersection	• FHWA Quadrant Roadway Intersection Technical Summary

Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Interchange Control Types					
Diamond  Vehicles enter and exit the highway via ramps that start or end at the intersecting roadway. These intersections can be controlled by stop signs, roundabouts, or traffic signals.	• Traffic volumes, especially on the ramps, are not high enough to need another interchange type • The major street (freeway) has a much higher functional class than the minor street	• Less ROW is required for this interchange type than for others • There are no weaving or crossing movements between the ramp and freeway traffic • The appropriate intersection control can be chosen for the ramp terminals, allowing flexibility	• The minor street cannot be another freeway, so diamonds are only appropriate for service interchanges	• Can be built to allow vehicles to exit and re-enter freeway directly, which can be useful for low bridges or traffic events that close the bridge segment	• FDM 11-30.1.3.1
Cloverleaf  Vehicles enter and exit the highway via free-flow ramps.	• High volumes experienced for multiple movements • Significant ROW is available in the immediate vicinity of the interchange	• Ramp movements are free-flow • Reduces left turn conflicts	• A large amount of ROW is required • One-sided weaving between traffic getting on and traffic getting off occurs and is often a limiting factor • Speeds can be low on tight ramp curves • Trucks can have difficulty negotiating tight ramp curves	• Cloverleaf interchanges are not typically being installed given other available interchange options	• FDM 11-30.1.3.3
Partial Cloverleaf **(Par-clo)/Loop Ramps**  Some vehicles enter and exit the highway via free-flow ramps while others use ramps with intersections.	• Constrained ROW in one or more (but not all) quadrants • Several high-volume movements	• Movements can be turned into free flow	• Speeds can be low on tight ramp curves • Trucks can have difficulty negotiating tight ramp curves		• FDM 11-30.1.3.3

Control Type	When to Consider	Potential Benefits	Potential Concerns	Other Considerations	Additional Information
Diverging Diamond Interchange (DDI)  Vehicles enter and exit the highway via ramps that begin or end at the intersecting roadway. These intersections are controlled by traffic signals. Intersecting roadway traffic crosses over to the opposite side of the roadway, allowing unopposed left turn movements to the highway. Remaining traffic then crosses back over.	• Volumes for left turns to or from the minor street are dominant • Volume for through movements on the arterial are relatively low	• Reduced-signal phasing (2 phases total) • Left turns are free-flow – conflict removed • Potential for right angle crashes reduced • Capacity can be increased over a traditional signal	• Can be disorienting to drivers, who may not know where to look for conflicting traffic and may realize they are on the “wrong” side of the road • Increased potential for wrong-way driving • Unusual pedestrian crossing patterns • Difficult to coordinate with adjacent intersections	• Newer type of interchange – drivers and public may be unfamiliar or cautious	• FDM 11-25.1.1.2 • FDM 11-25.3.1.2.4 • FHWA DDI Informational Guide
Single Point Interchange (SPI)  Vehicles enter and exit the highway via ramps that begin or end at a single intersection with the other roadway.	• ROW availability is limited • Left turns are a dominant movement	• Opposing left turns can move simultaneously • One signal controls the interchange so no coordination is required • ROW requirements are reduced	• Structure costs can be significant due to intersection size • Signal phasing can require longer yellow and all-red periods due to intersection size • The design is not conducive to bicycle or pedestrian traffic	• Effects on interchange safety seem to vary	• FDM 11-25.1.1.2 • FHWA Alternative Interchange Report
Echelon  One approach of the intersecting roadway is elevated via a structure. Two separate intersections are created. Turning movements that require moving from one intersection to another can be accomplished via ramps.	• A large intersection is operating at or near capacity • The intersection is part of a high-volume, signalized urban street system	• Capacity is higher than at-grade intersections • ROW impacts can be limited since grade separation is introduced	• Structures are involved, which dramatically increases the cost of the intersection • Access is reduced		• FHWA Alternative Interchange Report

Phase I: ICE Memorandum Worksheet

Form available on Traffic Operation Manual website under Intersection Control Evaluations (ICE) at

https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/manuals.aspx

PHASE I: ICE MEMORANDUM

BUREAU OF TRAFFIC OPERATIONS

To: DOT ICE Review
From: ICE Submitter
Date: Click here to enter a date.
RE: Project ID #
Choose an item.
Intersection Street Names
City/Town/Village, County
Region

Project Description:
Include the project need, objectives, and existing conditions.

Description of Alternatives:
Provide a description of the alternatives under consideration. Reference the Phase I: ICE Brainstorming Guide as appropriate.

Safety Considerations:
Observed Crash History Years:

Crash Type	Fatal	Injury A	Injury B	Injury C	KABC	PDO	Total
Total							

(add more rows as needed)

Crash Trends: Describe the crash trends at the intersection.

Contributing Factors: Describe the contributing factors of the crashes.

Operational Considerations:
Summarize operational concerns, evaluate warrants and conduct capacity analysis as applicable.

Other Considerations:
Include any other factors or information that affected the decisions resulting from the scoping analysis.

Reasonableness of Alternatives:
Discuss the feasibility of each of the alternatives under consideration. Reference the Phase I: ICE Brainstorming Guide as appropriate.

Conclusion:
Identify if there is a need to complete a Phase II: ICE and, if applicable, summarize which alternatives are moving forward.

Attachments:
Provide attachments outlined in FDM 11-25-3 Attachment 3.7 as appropriate

Phase I: ICE Brainstorming Guide Worksheet

Form available on Traffic Operation Manual website under Intersection Control Evaluations (ICE) at:

https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/manuals.aspx

Phase I: ICE Brainstorming Guide

Date:
Project ID:
Control:
Major Road AADT:
Minor Road AADT:

Intersection:
Reason for ICE:

List of Alternatives:

v02

Alt. #	Control Type	Is Alt. Viable?	Meets Purpose & Need?	Performance Measures Acceptable?	ROW Impacts Acceptable?	Meets Warrants? (If Applicable)	Manual Override (Optional)	Explanation/Comments
1	Minor Road Stop Control	-						
2	All-Way Stop Control	-						
3	Traffic Signal	-						
4	Roundabout	-						
5	Right-In/Right-Out	-						
6	Right-In/Right-Out/Left-In	-						
7	Offset T	-						
8	J-turn	-						
9	Median U-Turn	-						
10	Continuous Green-T	-						
11	Quadrant/Jughandle	-						
12	Diamond	-						
13	Cloverleaf/ Partial Cloverleaf	-						
14	Diverging Diamond	-						
15	Single Point	-						
16	Echelon	-						
17	[Add more as needed]	-						

Phase II: ICE Worksheets

Form available on Traffic Operation Manual website under Intersection Control Evaluations (ICE) at:

https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/manuals.aspx

PHASE II: ICE REPORT

BUREAU OF TRAFFIC OPERATIONS

Project and Analyst Information:

Project ID:	
Project Type:	Choose an item.
Location:	Intersection Street Names
	City/Town/Village
	County
	Region
Analyst:	
Agency:	
Date:	

Background Information:

Project Need:	Ex: Operations, Safety, etc.
Project Objective(s):	Describe the main objectives of this project.
Additional Information:	Describe the scope of the project, the existing conditions, any constraints, and any previous work done in the area.

Existing Crash Information:

Observed Crash History:

Years:

Crash Type	Fatal	Injury A	Injury B	Injury C	KABC	PDO	Total
Total							

(add more rows as needed)

Crash Trends:

Describe the crash trends at the intersection.

Contributing Factors:

Describe the contributing factors of the crashes.

Additional Modes of Transportation:

Mode	Need? Yes/No	Nearby Generators and Existing Facilities	Volume	
			#	Unit
PED/BIKE				
OSOW				

(add more rows as needed)

Other Information: Identify any concerns or limitations the additional modes of transportation have.

Summary Tables:

Descriptions:

Alt.	Traffic Control	Description of Alternative
1	[Abstract]	
2	[Category]	
3	[Comments]	
4	[Company]	
5	[Company Address]	
6	[Company E-mail]	

Costs and Impacts:

Alt.	Traffic Control	Construction Cost	Real Estate Impacts			Environmental Impacts	
			# Build	# Acres	Cost	Impact Type	# Acres
1	[Abstract]					Choose an item.	
2	[Category]					Choose an item.	
3	[Comments]					Choose an item.	
4	[Company]					Choose an item.	
5	[Company Address]					Choose an item.	
6	[Company E-mail]					Choose an item.	

Safety Performance:

Alt.	Traffic Control	Analysis Period	KABC	PDO	Total
-	Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
-	Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
1	[Abstract]				
2	[Category]				
3	[Comments]				
4	[Company]				
5	[Company Address]				
6	[Company E-mail]				

Recommendation:

Alternative:

Influencing Factors:

Existing & Future No-Build Conditions:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	Existing Conditions											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	Future No-Build Conditions (Design Year)											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 1: [Abstract]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) and Contributing Factors:	
Conflict Points:	
Vulnerable Users:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 1: [Abstract]**:**				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	Alt. 1: [Abstract]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 1:** [Abstract]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 2: [Category]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	
Geometric Concerns:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 2: [Category]**:**				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	Alt. 2: [Category]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 2:** [Category]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 3: [Comments]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	
Geometric Concerns:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 3: [Comments]:				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	Alt. 3: [Comments]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 3:** [Comments]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 4: [Company]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	
Geometric Concerns:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 4: [Company]**:**				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	Alt. 4: [Company]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 4:** [Company]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 5: [Company Address]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	
Geometric Concerns:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 5: [Company Address]**:**				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	**Alt. 1:** [Company Address]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 1:** [Company Address]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Alt. 6: [Company E-mail]:

Practicality:

Public Opinion:	
Business Impacts:	
ROW Impacts:	
Utility Impacts:	
Cost Estimate:	
Additional Info:	

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	
Geometric Concerns:	
Additional Info:	

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	[Company Fax]	[Company Phone]	[Keywords]	[Manager]
Future No-Build	[Publish Date]	[Status]	Attachments	Attachments for FDM 11-25-1: General
Alt. 6: [Company E-mail]**:**				

Operational Analysis:

Warrant Analysis:	
Queue Impacts:	
Additional Capacity:	
Railroad Impacts:	
Additional Info:	

Operational Performance Measures:

Year:	**Alt. 1:** [Company E-mail]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Year:	**Alt. 1:** [Company E-mail]											
AM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
PM Peak	EB			WB			NB			SB		
	-	-	-	-	-	-	-	-	-	-	-	-
# Lanes												
LOS												
Delay (s)												
v/c												
Queue (ft.)												
Storage (ft.)												
Additional Information												

Attachments:

(Provide attachments outline in FDM 11-25-3 Attachment 3.7 as appropriate)

ICE Submittal Checklist

Form available on Traffic Operation Manual website under Intersection Control Evaluations (ICE) at:
https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/manuals.aspx

ICE SUBMITTAL CHECKLIST						
Level of ICE (Check Applicable Box): ☐ **Phase I: Scoping ICE** ☐ **Phase II: Alternative Selection ICE**						
Documentation	**Submittal Requirements**		**Submittal to Region**		**Submittal to BTO**	
	Phase I ICE	**Phase II ICE**	**Included**	**N/A**	**Included**	**N/A**
Report						
▪ Phase I: ICE Memorandum	Required	N/A	☐	☐	☐	☐
▪ Phase I: ICE Brainstorming Guide	Required	N/A	☐	☐	☐	☐
▪ Phase II: ICE Worksheet	N/A	Required	☐	☐	☐	☐
Project Description						
▪ Project Location Map	Required	Required	☐	☐	☐	☐
▪ Aerial Photo of Intersection	Optional	Optional	☐	☐	☐	☐
Traffic Volume Data						
▪ Turning Movement Counts (field count data)	Optional	Required	☐	☐	☐	☐
▪ Segment Traffic Forecasts	Optional	Required	☐	☐	☐	☐
▪ Intersection Traffic Forecasts	Optional	Required	☐	☐	☐	☐
Safety Considerations						
▪ Intersection Crash Diagram with summary of crashes	Required	Required	☐	☐	☐	☐
▪ Predictive Safety Analysis	Optional	Required	☐	☐	☐	☐
Additional Modes of Transportation						
▪ Wisconsin Bike Map (bike rating)	Optional	Optional	☐	☐	☐	☐
▪ 5-Year Summary of OSOW and Long Truck Routes	Optional	Optional	☐	☐	☐	☐
Operational Analysis (as applicable) [(a)]						
▪ AWSC Warrants	Optional	Required	☐	☐	☐	☐
▪ Traffic Signal Warrants	Optional	Required	☐	☐	☐	☐
▪ Model Files for HCS, Sidra, & Synchro	Optional [(a)]	Required	☐	☐	Not Applicable	

(a) Completion of the operational analysis for the Phase I: ICE is optional, however, if conducted the analyst shall submit all applicable warrants, model files, and model output worksheets. Region shall submit all DT1887 and DT2291 to BTO for all HCM-based and microsimulation analyses that is conducted.

ICE SUBMITTAL CHECKLIST

Level of ICE (Check Applicable Box): ☐ **Phase I: Scoping ICE** ☐ **Phase II: Alternative Selection ICE**

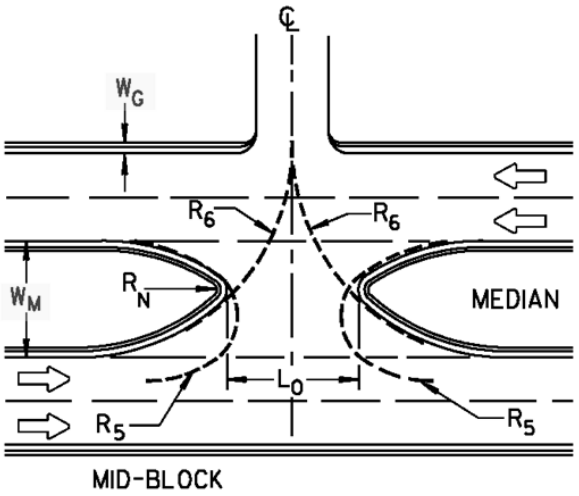
Documentation	Submittal Requirements		Submittal to Region		Submittal to BTO	
	Phase I ICE	Phase II ICE	Included	N/A	Included	N/A
▪ HCS Worksheets	Optional	Required				
~ *HCS7 Formatted Summary Report (AWSC, TWSC, Roundabouts)*			☐	☐	☐	☐
~ *HCS7 Full Formatted Report (Signals)*			☐	☐	☐	☐
▪ Sidra Worksheets (Roundabouts only) [(b)]	Optional	Required				
~ *Site Layout*			☐	☐	☐	☐
~ *Input Volumes*			☐	☐	☐	☐
~ *Input Comparison ("with Standard Model Defaults")*			☐	☐	☐	☐
~ *Movement Summary*			☐	☐	☐	☐
~ *Lane Summary*			☐	☐	☐	☐
▪ Synchro Worksheets [(c)]	Optional	Required				
~ *Signalized Intersection Report (with following data: Lane Inputs, Volume Inputs, Timing Inputs, Actuated Inputs, Queues)*			☐	☐	☐	☐
~ *HCM 6th Edition Signalized "Summary" report (with 95th percentile queue)*			☐	☐	☐	☐
~ *Unsignalized Intersection Report (with following data: Lane Inputs, Volume Inputs)*			☐	☐	☐	☐
~ *HCM 6th Edition AWSC or TWSC*			☐	☐	☐	☐
▪ SimTraffic Outputs for each run	Optional	Required	☐	☐	☐	☐
Traffic Model Peer Review (as applicable) [(a)]						
▪ DT 1887 for all HCM-based Analyses	Optional	Required	Not Applicable		☐	☐
▪ DT 2291 for Microsimulation Analyses (specifically SimTraffic) [(d)]	Optional	Required	Not Applicable		☐	☐
Region Comments						
▪ Region Comments on Phase I: ICE	Optional	Optional	Not Applicable		☐	☐
Other Reference Material (as applicable)						
▪ TIA (relevant pages)	Optional	Optional	☐	☐	☐	☐

(b) If Sidra analysis is conducted, submit copies of **all** five worksheets listed below.
(c) If Synchro analysis is conducted, submit **both** the intersection report (signalized or unsignalized as applicable) and the HCM 6th Edition report (signalized summary, AWSC or TWSC as applicable)
(d) Submit all Paramics or Vissim models to BTO for review as a separate process outside of the ICE process. BTO does not generally review the SimTraffic analyses, thus the DT 2291 form for SimTraffic models should be submitted along with the ICE report to ensure that all SimTraffic analyses referenced in the ICE report has gone through the Traffic Model Peer Review Process

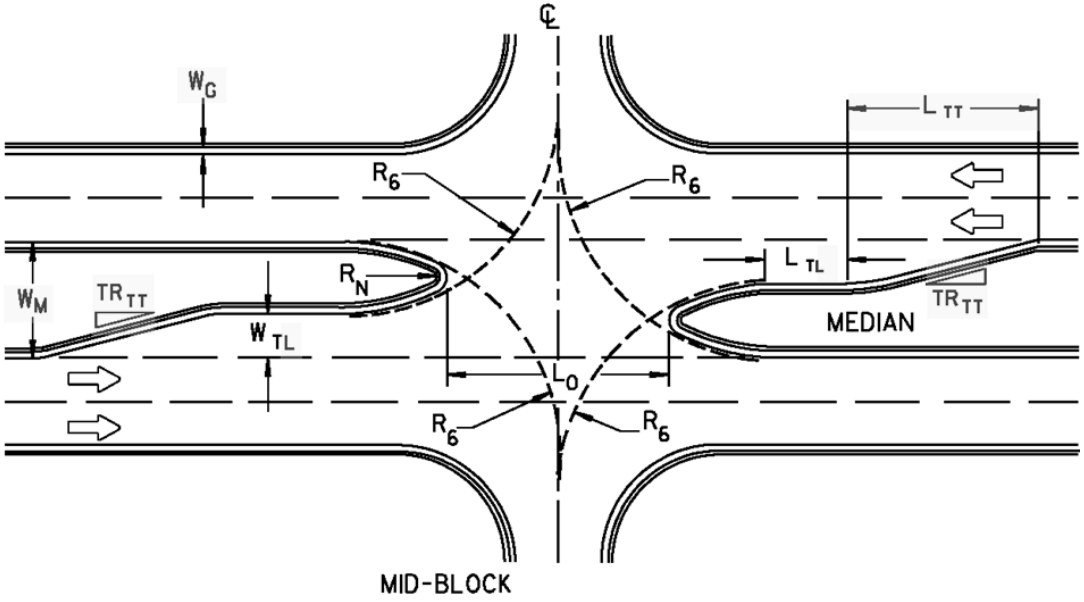
Urban Median Opening and Intersection Guidelines

Design Feature	Designation	Reference	Minimum (1)	Desirable (1)
SPACING BETWEEN MIDBLOCK MEDIAN OPENINGS (CL to CL)	NA	NA	Median openings within the functional length of intersection are either not allowed or restricted. See FDM 11-25-20.4 for median opening location requirements and criteria	
LENGTH OF MEDIAN OPENING	L_O	Att. 5.2 & 5.3	See FDM 11-25-20	
NOSE RADII	R_N	Att. 5.2 & 5.3	1'	2'
TURNING RADII at Intersections				
Without islands	R_3	Att. 5.3	--	60'
With islands	R_4	Att. 5.3	--	75'
TURNING RADII At mid-block				
For U-turns	R_5	Att. 5.2	40'	50'
For turns into driveways	R_6	Att. 5.2	60'	--
TURN BAY ELEMENTS - TAPER				
Turn Bay Taper Length	L_{TT}	Att. 5.2 & 5.4	FDM 11-25 Att. 2.2	
Turn Bay Taper Rate	TR_{TT}	Att.5.3		
Radius of connecting curves Straight Line Taper				
Radius	R_C	Att. 5.2(d) & 5.3	5'	10'
Radius of connecting curves Reverse Curve Taper				
Radius of lead curve	R_L	Att. 5.2(c)	200'	300'
Radius of final curve	R_F	Att. 5.2(c)	150'	200'
TURN BAY ELEMENTS – FULL WIDTH TURN LANE				
Length of Full Width Turning Lane	L_{TL}	Att. 5.2 & 5.3	FDM 11-25-2	
Width of Full Width Turning Lane	W_{TL}	Att. 5.2 & 5.3	See FDM 11-25 Table 5.2	
Turn Lane Offset from Edge of Travel Lane	W_{TO}			
Gutter Width				
Travel Lane	W_G	Att. 5.2 & 5.3	FDM 11-20-1	
Turn Bay Taper	W_G	Att. 5.2 & 5.3	Same as travel lane	
Full Width Turn Lane	W_G	Att. 5.2 & 5.3	1.0	2.0
Separator Width				
Between left turn lane and Opposing Travel Lane (curb face – curb face)	W_S	Att. 5.2 & 5.3	See FDM 11-25 Table 5.2	
MEDIAN WIDTH REQUIRED TO PROVIDE MEDIAN OPENINGS (1) **Without Left Turn Lanes**				
For turns into driveways	W_M	Att. 5.2	20'	24'
For U-turns	W_M	Att. 5.2	20'	30'
With Left Turn Lanes				
For left turns	W_M	Att. 5.2 & 5.3	See FDM 11-25 Table 5.2	See FDM 11-25 Table 5.2
For U-turns	W_M	Att. 5.2 & 5.3	30'	42'

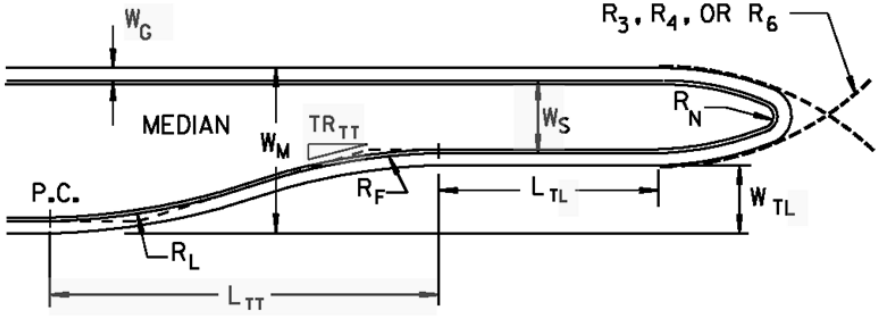
(1) Measured between edges of median travel lanes (includes gutters).



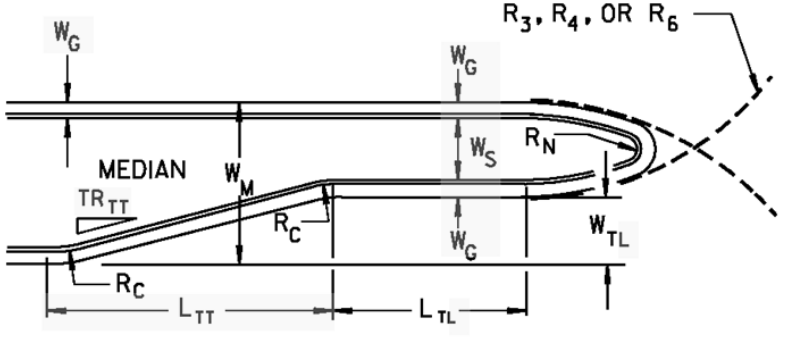
(a) MEDIAN OPENING WITHOUT LEFT TURN LANE



(b) MEDIAN OPENING WITH LEFT TURN LANE



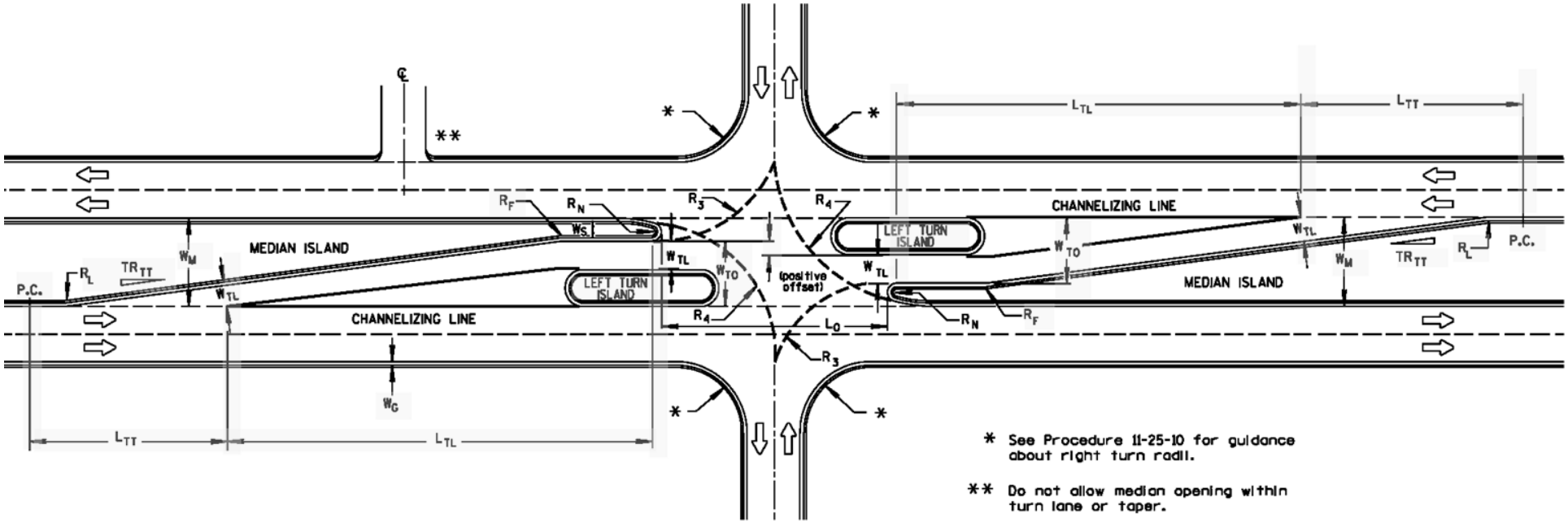
(c) REVERSE CURVE TAPER



(d) STRAIGHT LINE TAPER

MEDIAN OPENINGS AND LEFT TURN LANES IN URBAN ROADWAYS

Details for Slotted Left Turn Lanes and Median Opening at Urban Intersections



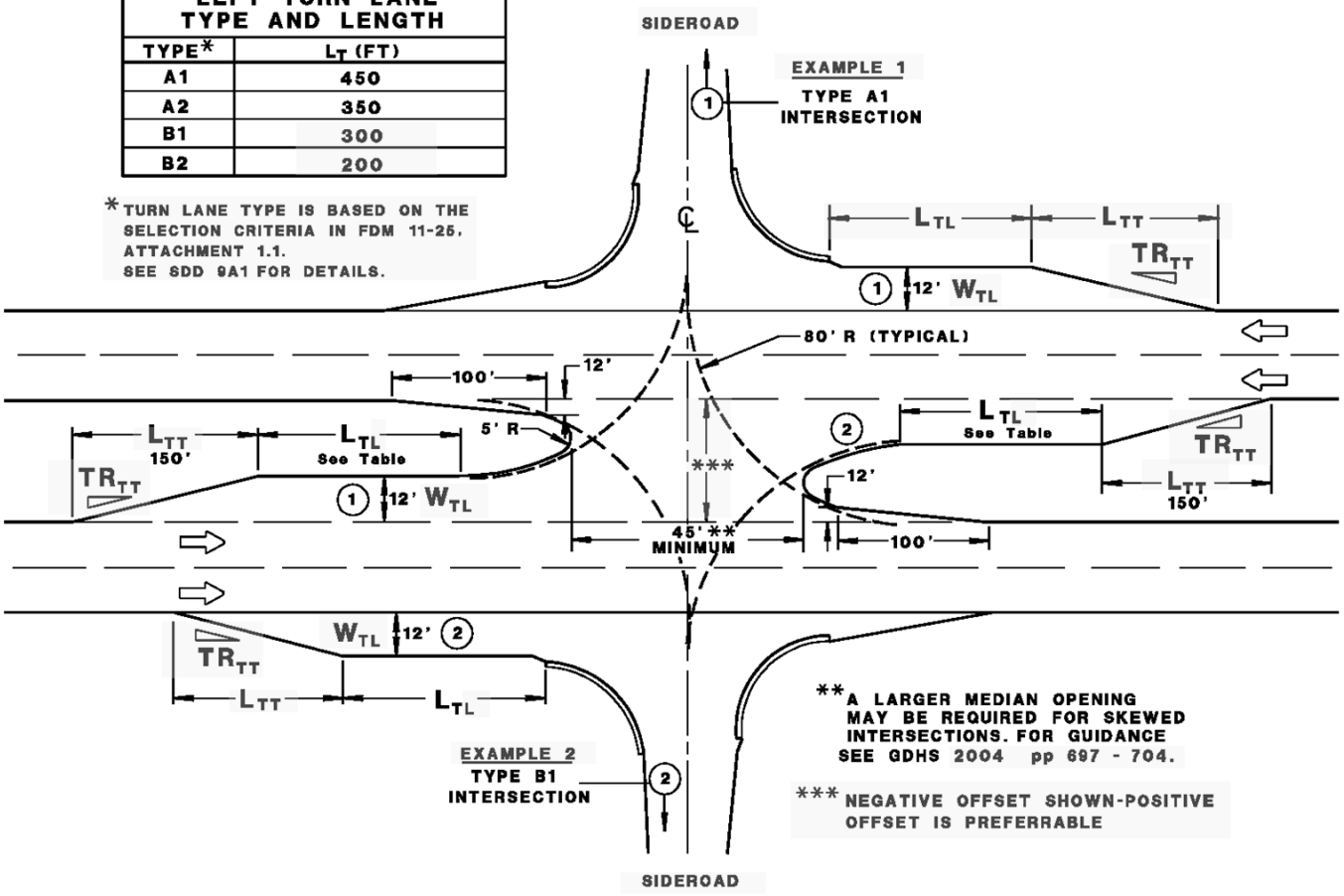
THE LEFT TURN LANE AND THE RIGHT TURN LANE SERVING THE SAME SIDEROAD SHOULD BE THE SAME LENGTH, UNLESS ONE OF THE TURN LANES REQUIRES ADDITIONAL LENGTH FOR STORAGE.

EXAMPLE 1: LEFT TURN LANE (1) AND RIGHT TURN LANE (1) ARE BOTH 450-FT. LONG BECAUSE THE SELECTION CRITERIA FOR SIDEROAD (1) CALLS FOR A TYPE A1 INTERSECTION.

EXAMPLE 2: LEFT TURN LANE (2) AND RIGHT TURN LANE (2) ARE BOTH 300-FT. LONG BECAUSE THE SELECTION CRITERIA FOR SIDEROAD (2) CALLS FOR A TYPE B1 INTERSECTION.

LEFT TURN LANE TYPE AND LENGTH	
TYPE*	L_T (FT)
A1	450
A2	350
B1	300
B2	200

*TURN LANE TYPE IS BASED ON THE SELECTION CRITERIA IN FDM 11-25, ATTACHMENT 1.1. SEE SDD 9A1 FOR DETAILS.



**A LARGER MEDIAN OPENING MAY BE REQUIRED FOR SKEWED INTERSECTIONS. FOR GUIDANCE SEE GDHS 2004 pp 697 - 704.

*** NEGATIVE OFFSET SHOWN-POSITIVE OFFSET IS PREFERRABLE

MEDIAN OPENING AND TURN LANES ON RURAL HIGH SPEED 4-LANE DIVIDED HIGHWAYS