Attachment A

Evaluating Offset Connections for Access Permitting:

Interpretations, Applications and Explanations of
Each Step of the Evaluation Process.

The purpose of evaluating a proposed or existing approach under OAR 734-051-4020(3)(b), is to determine if overlapping left turn movements or competing use of a center turn lane presents any safety and operations concerns. The following procedures provide guidance to be used in the application of this rule.

DEFINITIONS

"Offset Connection" means a connection to the highway located a distance to the left or right of a proposed approach and on the opposite side of the highway.

The next three definitions are the same as in OAR 734-051-1070.

(9) "Approach" means a legally constructed public or private connection that provides vehicular access to or from a state highway that:

(a) Has written permission under a Permit to Operate issued by the department under OAR 734-051-3010; or

(b) The department has recognized as grandfathered under OAR 734-051-1070(29); or

(c) The department does not rebut as having a presumption of written permission under OAR 734-051-3015.

(10) "Average Daily Trips" means the total of all one-direction vehicle movements with either the origin or destination inside the study site that includes existing, primary, pass by, and diverted linked trips and is calculated in accordance with the procedures contained in the Trip Generation Manual, 9th Edition published by the Institute of Transportation Engineers (ITE). Adjustments to the standard rates in the ITE Manual for mode split may be allowed if calculated in accordance with Transportation Planning Rule and the ITE procedures. Adjustments to the standard rates for multi-use internal site trips may be allowed if calculated in accordance with ITE procedures and if the internal trips do not add vehicle movements to the approaches to the highway.

(78) "Trip" means a one-way vehicular movement that consists of a motor vehicle entering or exiting a property.

EXPLANATION

Overlapping and Competing Turns

Overlapping Left Turn Movements

Overlapping left turn movements can occur under two circumstances. The first is when a vehicle turning left out of a connection crosses the path of a vehicle turning left out of a left offset connection while both vehicles are trying to reach opposite travel lanes (See Figure 1). The second is when a vehicle stopped in the far travel lane attempts to turn left into the

connection while a vehicle stopped in the near travel lane attempts to turn left into a right offset connection (See Figure 2). Both types of conflicts can occur on any undivided highway.

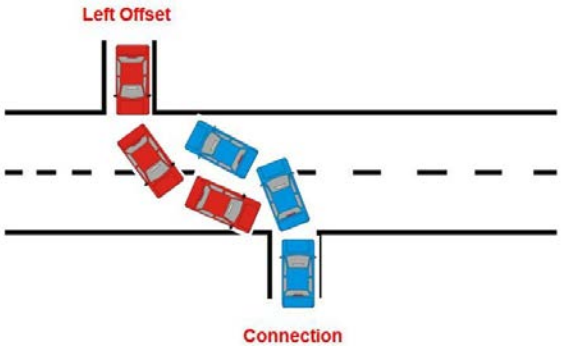

Figure 1: Left Overlapping Conflict

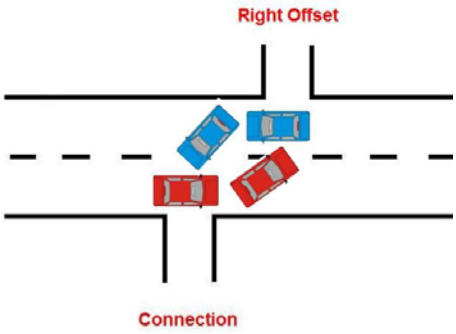

Figure 2: Right Overlapping Conflict

Competing Use of a Center Turn Lane

Competing use of a center turn lane can occur under two circumstances. The first is when vehicles turning left out of a connection attempt to enter a two-way left-turn lane (TWLTL) to make a "two-stage left turn" just as a vehicle leaving a left offset connection attempts to enter the same TWLTL (See Figure 3). A "two-stage left turn" is made when a left-turning vehicle makes two movements: the first movement is out of a connection to a stopped position within the TWLTL followed by the second movement of accelerating to merge into the nearest travel lane.

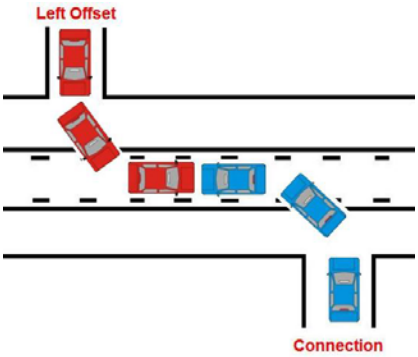

Figure 4: Left Competing Use of TWLTL

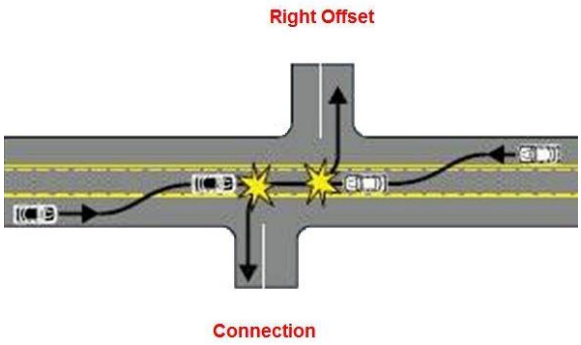

Figure 3: Right Competing Use of TWLTL.
Source: FHWA Technical Summary: Access Management in the Vicinity of Intersections (http://safety.fhwa.dot.gov/intersection/resources/fhwasa10002/#s17).

The second circumstance is when vehicles approaching from the right of the connection attempt to enter the TWLTL before turning into the proposed approach. These vehicles may conflict with vehicles approaching from the left of the connection that attempt to enter the TWLTL to turn into a right offset connection as shown in Figure 4.

If any of the preceding conflicts exist or will be introduced by a proposed approach, qualified ODOT staff will need to conduct further investigation to determine if these anticipated conflicts should be of concern. The following steps may be taken to determine if the proposed approach may introduce any of these conflicts.

Left Turn Conflict Evaluation

Use the following steps to evaluate left turn conflicts. Steps 1 through 3 are completed by the staff member(s) conducting the field visits and completing data entry in CHAMPS. Step 4, when applicable, is conducted by the Region Access Management Engineer or other qualified ODOT staff.

Step 1 - Determine if a conflict may exist

If the connection being evaluated is limited to right-in and/or right-out movements, no left turn conflicts will occur. Also, if the highway is divided, limited to one-way traffic, or contains a non-traversable median, no left turn conflicts will occur. In such situations, staff conducting CHAMPS data entry check the "No" radio button located on the Findings/COU tab next to the "Left Turn Conflicts" heading.

However, if the connection being evaluated has left turn movements, left turn conflicts *may* occur. In these situations, use one or more of the tables identified in Step 2 to determine whether to check the "Yes" or "No" Left Turn Conflicts radio button.

Step 2 - Determine offset connection desirable spacing

If it is determined in Step 1 that conflicts may exist, the next step is to determine what the desirable offset connection spacing(s) is to avoid a conflict. This determination is made using the applicable table(s) 1-4 for desirable offset spacing.

In the tables below, a 2-lane highway is a highway segment with two through lanes, one lane in each direction of travel, with or without dedicated left turn lanes. A 3-lane highway segment has one through travel lane in each direction and a continuous two-way left turn lane (TWLTL). A 4-lane highway segment has two through lanes in each direction, with or without dedicated left turn lanes. A 5-lane highway segment has two through travel lanes in each direction and a continuous TWLTL. Right turn lanes, acceleration lanes, deceleration lanes, climbing lanes, and passing lanes are not counted in determining the number of highway lanes in Tables 1-4.

The value selected from the table should be based on the largest design vehicle expected to use either connection (the one being evaluated or the offset) on a regular basis (refer to the Highway Design Manual 8.2.2, Design Requirements for Private Road Approaches, for further guidance on design vehicle).

Table 1: 2-Lane Highway, Desirable Offset Spacing
A 2-lane highway has two through lanes, one lane in each direction of travel, with or without dedicated left turn lanes.

	Design Vehicle		
	Car (P)	Single Unit (SU) Truck	WB67 Truck
Left Offset	130′	192′	433′
Right Offset	68′	103′	195′

Table 2: 4-Lane Highway, Desirable Offset Spacing

A 4-lane highway has four through lanes, two lanes in each direction of travel, with or without dedicated left turn lanes.

	Design Vehicle		
	Car (P)	Single Unit (SU) Truck	WB67 Truck
Left Offset	130′	192′	427′
Right Offset	47′	119′	223′

Table 3: Highway with a TWLTL, Desirable **Left** Offset Spacing (Single-Stage Turn).

		Design Vehicle		
		Car (P)	Single Unit (SU) Truck	WB67 Truck
3-Lane	14′ TWLTL	119′	125′	317′
	16′ TWLTL	95′	106′	294′
5-Lane	14′ TWLTL	75’	109’	291’
	16′ TWLTL	75’	109’	291’

Table 4: Highway with TWLTL, Desirable **Right** Offset Spacing

Speed (mph)	Desirable Right Offset Deceleration + Storage
30	285′
35	355′
40	435′
45	525′
50	625′
55	735′
60	845′

Note: Offset spacings in Tables 1, 2, and 3 were determined via AutoTurn software. Table 4 offset spacings were determined by upstream functional intersection area plus an assumed storage length of 60 feet[1].

Step 3 - Determine if offset connection spacing meets desirable spacing

With the desirable left and right offset spacing determined from Step 2, measure from the connection being evaluated (existing or proposed) to all of the vehicular highway connections to the left and right on the opposite side of the highway within this desirable spacing distance. Offset connections are measured from the centerline of the connection being evaluated to the centerline of the offset connections.

[1] Reference Access Management Manual, Vol. 2, Discussion Paper No. 7, *Functional Intersection Area*, Table 1-B.

Spacing is adequate to avoid a conflict if the measured spacing is greater than the desirable offset spacing. A conflict will exist if the measured spacing is less than the desirable offset spacing in the appropriate table.

If any measured offset connection spacing is less than the desirable offset spacing, then the "Yes" radio button is selected on the CHAMPS Findings/COU tab next to the "Left Turn Conflicts" heading; if all measured offset connection spacings are greater than the desirable value, then the "No" radio button is selected.

If the highway cross-section is not defined by Tables 1-4, the RAME or other qualified staff should be consulted to conduct further evaluation. Also any connection utilizing a two-stage left turn for the design movement will require further engineering evaluation by the RAME or qualified staff. The two-stage left turn typically applies on three-lane and five-lane highways where it is expected that there will be insufficient gaps to complete the left turn directly into the lane of travel in the desired direction during peak hours. In such situations, the staff conducting data entry should check the "Yes" radio button located on the CHAMPS Findings/COU tab next to the "Left Turn Conflicts" heading.

Step 4 - Determine if conflicts from offset connection(s) not meeting desirable spacing are a concern (Qualified ODOT Staff)

If Step 3 indicates that any measured offset connection spacing is less than the desirable offset spacing, then the RAME or other qualified ODOT staff must decide if these conflicts are of concern to the department. The following criteria will be used as a baseline for this determination. Conflicts may be of concern if the:

(A) Average daily trips of the connection being evaluated and any offset connection (left or right) *each* exceed 1,000 on a two- or three-lane highway with annual average daily traffic of 5,000 or more motor vehicles; or

(B) Average daily trips of the connection being evaluated and any offset connection (left or right) *each* exceed 1,000 on a four or five-lane highway with annual average daily traffic of 10,000 or more motor vehicles; or

(C) Qualified ODOT staff determines offset connection conflicts are of concern for other reason(s).

(A) and (B) indicate that conflicts are generally only of concern when both the connection being evaluated and offset connection are large ADT generators. The 1,000 ADT thresholds avoid large developments needing to be mitigated because of conflicting movements with a much smaller ADT generator. These thresholds for concern assume a worse-case scenario where all connection being evaluated and offset connection peak hour trips create conflicting movements. Field observation may establish different operating conditions than the worse-case assumption. Finally, only highways with AADTs that exceed the thresholds in (A) and (B) should be of concern,

as these highways present fewer acceptable gaps for entering and exiting traffic, increasing the potential for drivers to encounter overlapping movements and competing use of a center turn lane.

Offset connection ADT should be roughly estimated based on apparent land use as identified by either a field visit or through the use of various office resources. As a reminder, meeting (A) or (B) in itself does not constitute a concern but rather identifies when there may be a concern to be evaluated by the RAME or other qualified ODOT staff. If it is determined that conflicts are a concern, the department may decide to approve the existing connection or approach application with mitigation, or if no mitigation options are available, the department may deny the application based on safety and operations concerns.

EXAMPLES

Step-by-step examples illustrating the offset connections evaluation process,

Example A - 2-lane highway, 50 mph (4,000 AADT)

Proposed approach	Full movement (50 ADT Design vehicle = P
Left offset connection	Full movement (10 ADT) Spacing = 180' Design vehicle = P
Right offset connection	Full movement (100 ADT) Spacing = 90' Design vehicle = SU
CHAMPS data entry	• Possible left turn conflicts? – Yes (all full movement) • Are all desirable spacing distances met? – No • (Table 1: 180' > 130', but Table 1: 90' < 103') • CHAMPS radio button checked "Yes"
Qualified ODOT Staff	• CHAMPS radio button checked "Yes"? – Action needed • Each conflicting offset ADT greater than 1,000? – No. All less than 1000. • (Approach = 50, Right offset = 100, Left offset = 10) • 2-lane highway AADT greater than 5,000? – No • Are conflicts of concern? – Only if qualified ODOT staff documents reason for concern (See Step 4 in Evaluation Procedures).

Example B - 3-lane highway, 14' TWLTL, 40 mph (6,000 AADT)

Proposed approach	Full movement (150 ADT) Design vehicle = P
Left offset connection	Full movement (100 ADT) Spacing = 100 ft Design vehicle = P
Right offset connection	Full movement (100 ADT) Spacing 380 ft

	Design vehicle = SU
CHAMPS data entry	• Possible left turn conflicts? - Yes (all full movement) • All desirable spacing met? – No (Table 3: 110' < 119', Table 4: 380' < 435') • CHAMPS radio button checked "Yes".
Qualified ODOT Staff	• CHAMPS radio button checked "Yes"? – Action needed • Each conflicting offset ADT more than 1,000? – No. All less than 1000. • (Approach = 150, Left Offset = 100, Right offset = 100) • 3-lane highway AADT more than 5,000? – Yes • Are conflicts of concern? – Only if qualified ODOT staff documents reason for concern (See Step 4 in Evaluation Procedures).

Example C - 3-lane highway, 14' TWLTL, 40 mph (8,000 AADT)

Proposed approach	Full movement (150 ADT) Design vehicle = P
Left offset connection	Full movement (250 ADT) Spacing = 245 ft Design vehicle = P
Right offset connection	Full movement (200 ADT) Spacing 315 ft Design vehicle = P
CHAMPS data entry	• Possible left turn conflicts? – Yes (all full movement) • All desirable spacings met? – No (Table 3: 245' > 119', but Table 4: 315' < 435') • Check CHAMPS radio button checked "Yes"
Qualified ODOT Staff	• CHAMPS radio button checked "Yes" – Action needed • Each conflicting offset ADT more than 1,000? – No. All less than 1000. • (Approach = 150, Left offset = 250, Right offset = 200) • 3-lane highway AADT more than 5,000? – Yes • Are conflicts of concern? – Only if qualified ODOT staff documents reason for concern (See Step 4 in Evaluation Procedures).

Example D - 5-lane highway, 16' TWLTL, 35 mph (11,000 AADT)

Proposed approach	Right-in, right-out (300 ADT) Design vehicle = SU
Left offset connection	Full movement (100 ADT) Spacing = 120 ft Design vehicle = P
Right offset connection	Full movement (200 ADT) Spacing 380 ft Design vehicle = P

CHAMPS data entry	Possible left turn conflicts? No (proposed right-in, right-out CHAMPS radio button – No.
Qualified ODOT Staff	CHAMPS radio button checked “No” (no action needed)

Example E - 5-lane highway, 16’ TWLTL, 35 mph (13,000 AADT)

Proposed approach	Full movement (1001 ADT) Design vehicle = SU
Left offset connection	Full movement (1,001 ADT) Spacing = 100’ Design vehicle = SU
Right offset connection	Full movement (1,001 ADT) Spacing = 315’ Design vehicle = P
CHAMPS data entry	• Possible left turn conflicts? – Yes (all full movement) • Are all desirable spacing distances met? – No • (Table 3: 100’ < 109’, Table 4: 315’ < 355’) • CHAMPS radio button checked “Yes**”**
Qualified ODOT Staff	• CHAMPS radio button checked “Yes” – Action needed • Each conflicting offset ADT more than 1,000? – Yes. All more than 1000. • 5-lane highway AADT more than 10,000? – Yes • Are conflicts of concern? – Yes. Qualified staff determines appropriate mitigation, if any. • Mitigation must be limited to addressing the documented safety and/or operations **concern(s).**