Analysis Procedure Manual – March 2008

Change Sheet – March 2008

Chapter 4, Pages 4-16, 4.4.2 Seasonal Trend Method

Changed:

It is important to note that these are the only trend grouping pairs that would be appropriate to average

Changed To:

It is important to note that these are the only trend grouping pairs that would be appropriate to average, with the exception of interchange ramps, which should use an average of the mainline and cross road seasonal adjustments.

Chapter 7, Pages 7-14 to 7-17, 7.3.6 Roundabouts

Changed:

Roundabouts are increasing in popularity as an alternative form of intersection control. Research indicates that roundabouts reduce crashes and vehicle delay, and can be particularly efficient where traffic volumes are roughly equal on all approaches or in situations with one-way streets like ramp terminals. However, they cannot supply as much capacity as traffic signals with multiple through or turn lanes, and are unable to provide for smooth progression of arterial traffic flows. The ODOT *Traffic Manua*l and *HDM* contain guidelines, standards and siting criteria developed to assist in the decision making on whether a site is optimal for a roundabout. See Chapter 10 for more information. Direction for conducting capacity analysis for roundabouts is provided below.

TPAU has selected both the aaSIDRA computer program and the German 'G2' methodology as the interim methodologies for analyzing roundabouts. Analysis should be made with both methodologies and the lower of the two values of entry leg v/c ratios will be selected as the design value.

Australian Method

The aaSIDRA (Signalized and Unsignalized Intersection Design and Research Aid) package has been developed by Australian Road Research Board (ARRB) Transport Research Ltd. as an aid for design and evaluation of the following intersection types:

- Signalized Intersections (Fixed-Time/Pre-timed and Actuated)
- Roundabouts
- Two-Way Stop Control

- All-Way Stop Sign Control
- Give-Way (Yield) Sign Control

It is recommended that the internal default parameters to aaSIDRA remain unchanged with the following exceptions:

- Peak Flow Factor
- Number of Approach Lanes
- Island Diameter
- Circulating Road Width
- Number of Circulating Lanes
- Number of Adjacent Exit Lanes
- Approach Grade
- Lane Width
- Approach Speed
- Exit Speed
- Lane Type

German 'G2' Formula

The German 'G2' methodology is a linear regression formula that has recently been developed by the federal government in Germany. This formula is:

$Q_e = C + DQ_c$

Q_e = entry flow capacity (vehicles/hour/lane)
Q_c = circulating flow rate (vehicles/hour/lane)

Values of C and D are as shown in Table 7-1.

Table 7-1 Parameters for Linear Regression

Number of Lanes Entry/Circle	C	D	N (Sample Size)*
1/1	1,218	-0.74	1,504
1/2 or 1/3	1,250	-0.53	879
2/2	1,380	-0.50	4,574
2/3	1,409	-0.42	295

*Number of observed one-minute intervals

Current Practice

A v/c ratio of 0.80 is generally required for roundabouts on state highways. However, the required v/c ratio for analysis of proposed roundabouts will be determined by the State Traffic Engineer with consultation with Region Traffic. The determination will include consideration of highway facility designation and function, traffic characteristics and system continuity. This v/c ratio is the ratio of the entering approach volume to the lowest entry approach capacity that was calculated by using both the aaSIDRA computer program and the German “G2” methodology. Roundabouts require approval of the State Traffic Engineer.

Both aaSIDRA and the German ‘G2’ methodology can overestimate or underestimate entry capacities under certain conditions, but they tend to compliment each other. The aaSIDRA program can overestimate entry capacity when circulating volumes are low, but the German ‘G2’ methodology tends to give a reasonable capacity for this situation. The German ‘G2’ methodology tends to underestimate entry capacity when circulating flows are high, but aaSIDRA tends to give a reasonable capacity for this condition. Here are some additional comments pertaining to this selection.

- A comparison can be made if there are two different methodologies used to calculate entry capacity.
- TPAU is more concerned when there are heavy traffic flows circulating in the roundabout. Both the aaSIDRA computer program and the German ‘G2’ methodology are more conservative in this situation compared to the other methods.
- ODOT wants to use a combination of both empirical and gap acceptance methodologies to calculate entry capacity values.
- ODOT wants to use conservative entry capacity values to insure that the first roundabouts will function as expected.
- *HCM* methodologies are not recommended at this time due to the low number of sample test sites.
- AUSTROADS was not selected because aaSIDRA is an update of the AUSTROADS methodology.
- The exponential German method ‘G1’ was not selected since the linear method ‘G2’ is an update of the ‘G1’ methodology.

In addition to research, TPAU has worked example problems comparing each of these methodologies. The results were compared, and it was TPAU’s determination that a combination of aaSIDRA and the German ‘G2’ methodology is the best analysis tool available at this time. This combination of methodologies should be considered as an interim methodology. As drivers in Oregon become familiar with roundabouts, the analysis methodologies used to evaluate the operation of roundabouts may be refined. Also, field observations of roundabouts in Oregon will provide guidance on what the best analysis methods are for both operation and planning applications.

Changed To:

See new pages: 7-14 to 7-38

Chapter 7, Pages 7-38, 7.4 Traffic Signal Warrants

Added:

..forward a copy of the PSW form and analysis to TRS and…

Chapter 7, Pages 7-59, 7.4 Traffic Signal Warrants

Added:

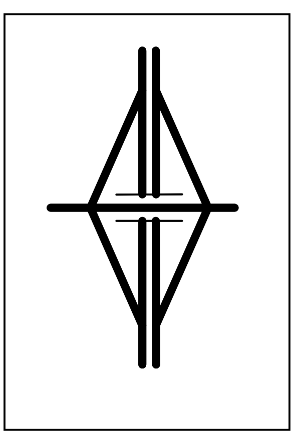
When signal installations are being considered, input from TRS must be obtained prior to reaching any conclusions. Coordination with TRS should occur early in the project development process to allow sufficient time to develop and evaluate alternatives to signalization if deemed necessary.

Chapter 10, Page 10-11 to 10-15, 10.3.2 Potential Facility Solutions

Changed:

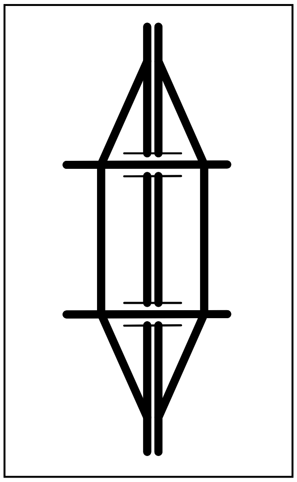
- o ***Tight Diamond Interchange:*** Sometimes the two ramp terminals can be operated with a single signal controller.

Figure 10-2 Tight Diamond Interchange



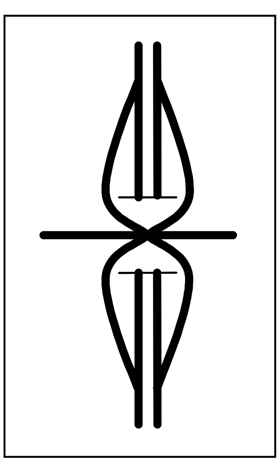
- o ***Split Diamond Interchange:*** Typically found on an urban grid system.

Figure 10-3 Split Diamond Interchange



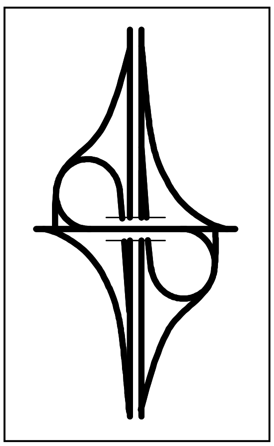
- ***Single Point Urban Interchange (SPUI):*** The SPUI is a relatively recent development that evolved out of the need to limit ROW acquisition in built-up urban areas. SPUIs are a variation of the diamond interchange, which has two ramp terminals with the local arterial. A SPUI combines those two ramp terminal intersections into one larger intersection so that all turning movement to or from the freeway utilize the same intersection. This feature resolves the queue spillback issue that can congest standard diamond intersections, and can be effective in serving high volumes of turning vehicle traffic. SPUI's need cross-street angles close to 90 degrees. High volume right turns may need to be signalized. SPUI's have nearly the same ROW costs as tight diamonds and the structure costs are often high.

Figure 10-4 Single Point Urban Interchange



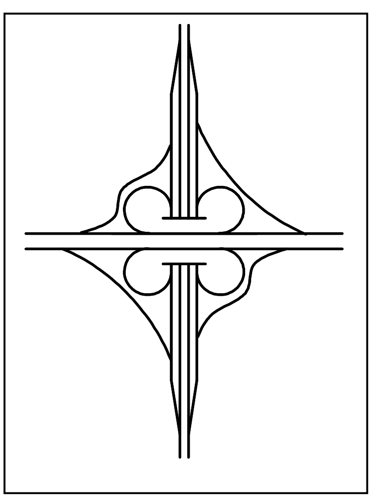
- ***Partial Cloverleaf Interchange:*** A partial cloverleaf layout combines loop ramps and straight ramps to better serve areas with expected high turning volumes at the ramp terminals. In general, a partial cloverleaf configuration has a higher carrying capacity than a diamond interchange. The preferred configuration is where loop ramps are located in opposite quadrants of the interchange. Loop ramps can also be recommended where topographical or environmental constraints adjacent to the interchange site do not favor the use of conventional straight ramps, e.g., where a railroad parallels the facility. Loop ramps that are located on the same side of a facility can create weaving sections on the mainline that may not be desirable.

Figure 10-5 Partial Cloverleaf Interchange



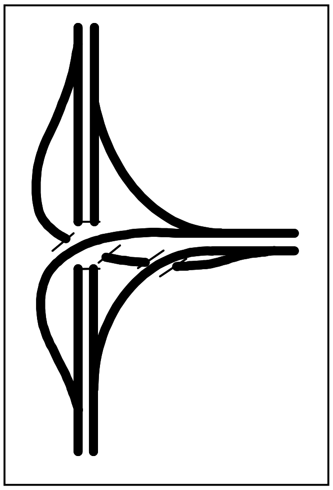
- ***Full Cloverleaf:*** This layout provides loop ramps in all four quadrants of the interchange, requiring a great deal of land area. It is a somewhat outdated design and should typically be used only where loop volumes are low.

Figure 10-6 Full Cloverleaf



- ***Directional Interchange:*** This type of interchange is more common in urban areas or at junctions of freeways or expressways with other freeways or expressways. An example would be I-5 at I-205. They are high speed high volume connections with all free flow movements. Can be full or partial, trumpet or flyover.

Figure 10-7 Directional Interchange



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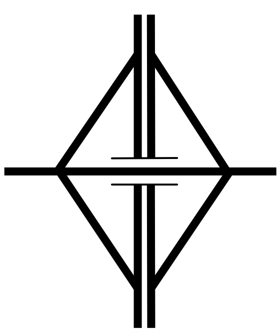
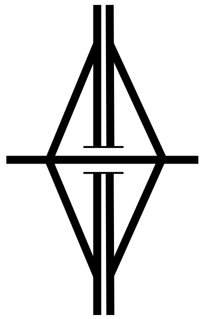
Interchange Types

Figure 10-2 Diamond Interchange



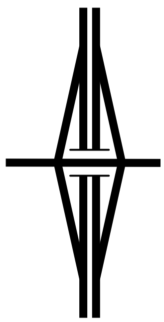
Diamond Interchange: An interchange that has straight ramps in all four quadrants is referred to as a diamond-shaped interchange. The capacity of this facility is typically determined by the operational analysis at the ramp terminals and merge/diverge areas on the mainline. The spacing of the intersections on the crossing street or highway will dictate the available vehicle storage and transition area. When volume forecasts are high at the terminal intersections, and the spacing is limited, these could be factors that influence the need for an alternative layout concept. An operational analysis of the two ramp terminal intersections, and any nearby intersections that could influence these locations, will be required. Some variations on the diamond interchange include:

Figure 10-3 Compressed Diamond Interchange



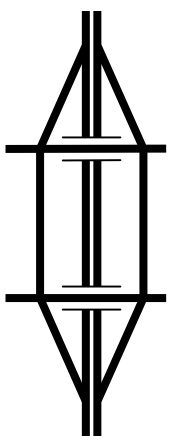
Compressed Diamond Interchange: A typically older interchange design where less than ideal ramp terminal spacing is present, between 400 and 800 feet. Sometimes the two ramp terminals can be operated with a single signal controller. Turn storage is done between the ramp terminals. Queue spillback between the ramp terminals is a common problem.

Figure 10-4 Tight Diamond Interchange



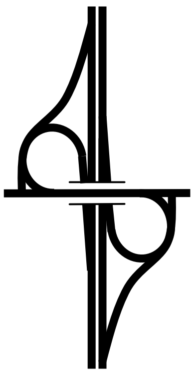
Tight Diamond Interchange: Typically found in urban areas, with ramp terminal spacing less than 400 feet. Usually the two ramp terminals can be operated with a single signal controller. Turn storage is done outside of the ramp terminals.

Figure 10-5 Split Diamond Interchange



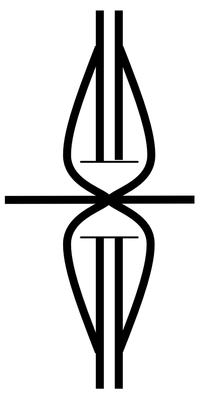
Split Diamond Interchange: Typically found on an urban grid system. Connections between each “half” of the interchange are one-way and are access-controlled.

Figure 10-6 Folded Diamond Interchange



Folded Diamond Interchange: This interchange type "folds" one or two legs of the configuration to minimize impacts in one or two quadrants. Loop ramps can be located where topographical or environmental constraints adjacent to the interchange site do not favor the use of conventional straight ramps, e.g., where a railroad parallels the facility. Loop ramps that are located on the same side of a facility can create weaving sections on the mainline or crossroad that may not be desirable.

Figure 10-7 Single Point Urban Interchange



Single Point Urban Interchange (SPUI) also known as Single Point Urban Diamond (SPUD): The SPUI is a relatively recent development that evolved out of the need to limit ROW acquisition in built-up urban areas. SPUIs are a variation of the diamond interchange, which has two ramp terminals with the local arterial. A SPUI combines those two ramp terminal intersections into one larger intersection so that all turning movement to or from the freeway utilize the same intersection. This feature resolves the queue spillback issue that can congest standard diamond intersections, and can be effective in serving high volumes of turning vehicle traffic. SPUI's need cross-street angles close to 90 degrees. High volume right turns may need to be signalized. SPUI's have nearly the same ROW costs as tight diamonds and the structure costs are often high.

Figure 10-8 Divergen

Divergent Diamond Interchange: This is a new type of interchange design that has very few installations in the U.S. This form of diamond interchange has the two directions of minor street traffic cross to the opposite side of the roadway under/over structure. This allows for two-phase signal operations since the left turns occur between the two signals in such a way that they do not cross the opposing through movements.

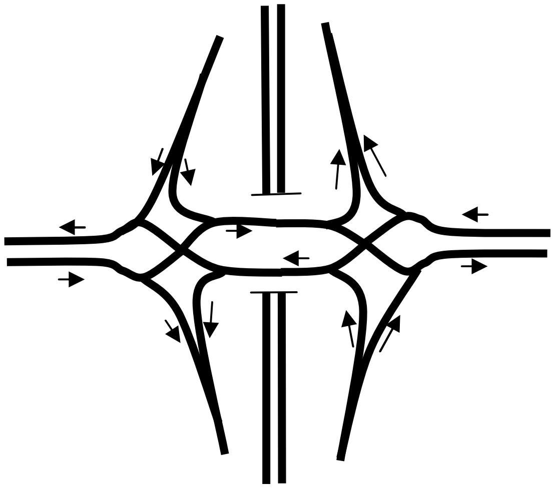
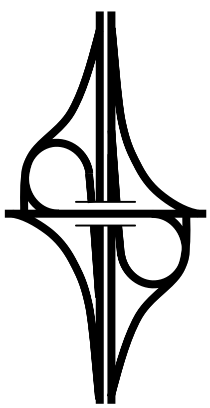


Figure 10-9 Partial Cloverleaf Interchange



Partial Cloverleaf Interchange: A partial cloverleaf layout combines loop ramps and straight ramps to better serve areas with expected high turning volumes at the ramp terminals. In general, a partial cloverleaf configuration has a higher carrying capacity than a diamond interchange. The preferred configuration is where loop ramps are located in opposite quadrants of the interchange. Loop ramps can also be recommended where topographical or environmental constraints adjacent to the interchange site do not favor the use of conventional straight ramps, e.g., where a railroad parallels the facility. Loop ramps that are located on the same side of a facility can create weaving sections on the mainline that may not be desirable.

Figure 10-10 Full Cloverleaf

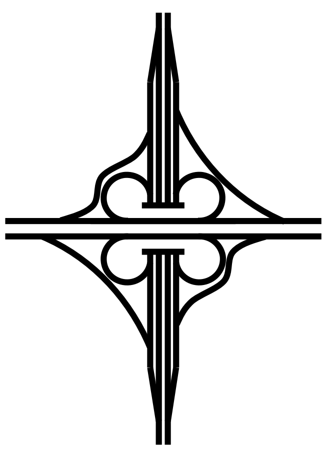


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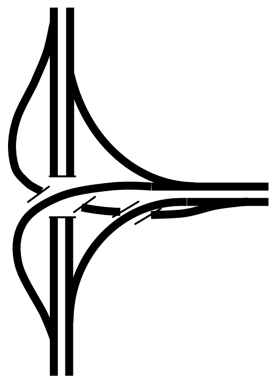
Figure 10-11 Directional Interchange



Directional Interchange: This type of interchange is more common in urban areas or at junctions of freeways or expressways with other freeways or expressways. An example would be I-5 at I-205. They are high speed high volume connections with all free flow movements. There are configurations with full or partial trumpet or flyover.

Chapter 12, Pages 12-7, 12.4.2 Traffic Narrative Report - Product

Changed:

. The major step to be completed with the Draft Traffic Narrative Report is to recommend the Preferred Alternative. The selection process should use the analytical evaluation outcomes, relative scoring evaluations to isolate one alternative, or a hybrid of several alternatives that best meet the study objectives. This is necessarily a collaborative process with established Project Management Team members and affected ODOT technical units.

Changed To:

The major step to be completed with the Draft Traffic Narrative Report is to provide conclusions of fact on the function of alternatives from a traffic analysis standpoint.

The project team selection process for a preferred alternative overall uses the analytical evaluation outcomes, relative scoring evaluations to isolate one alternative, or a hybrid of several alternatives that best meet the study objectives.

Chapter 12, Pages 12-7 and 12-8, 12.4.2 Traffic Narrative Report - Product

Deleted (3 instances):

…of fact…

Chapter 12, Pages 12-8, 12.4.2 Traffic Narrative Report - Product

Changed:

- ***Recommendation/Conclusion:*** The analyst should coordinate with the PT Leader to determine if a recommendation on a preferred alternative or a conclusion is more appropriate.

Changed To:

- ***Conclusions of Fact:*** The analyst should be careful to make conclusions of fact based on the traffic analysis, rather than recommendations on a preferred alternative, as the best alternative from a pure traffic standpoint may not be the best overall. The analyst should coordinate with the PT Leader if it is desired to also report the recommendation by the project team as to the overall preferred alternative.