September 2025

Texas Department of Transportation
Safer by Design (SBD) Tool

https://sbd.txdot.gov

Frequently Asked Questions (FAQ)

by Texas Department of Transportation

September 2025

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TxDOT updates this FAQ periodically

General Questions

Question G-0-1: During which stage should this tool be used?

The tool can and should be used for all phases of development, including planning, preliminary design (schematics), and final design (PS&E). The most value will be when using it during the initial project scoping.

Question G-0-2: Tool shows Error Message?

Please check the inputs, some required elements may be missing or incorrect. Alternatively, try opening a new tab and reassess the project. If the error persists, please make a screen print with the error message and inputs, and send it to the tool support team DES_SaferByDesign@txdot.gov. Although the tool has been tested, it is still possible to encounter some issues causing the calculation failure.

Question G-0-3: Does the SBD Tool consider crash severity?

Before March 31, 2025, the SBD Tool considered total crash number; Since March 31, 2025, crash severity has been incorporated into the scoring method in the form of equivalent property damage only (EPDO) crash.

Question G-0-4: Is the Safety Scoring Tool required if no federal money is included?

All applicable TxDOT statewide construction projects – regardless of funding – are required to be evaluated with the tool and to report safety scores. On-system locally let projects are also required to report safety scores. Off-system locally let projects are not required to report safety scores, but it is still recommended that the tool be used for local let projects. Please refer to the Eligibility Matrix for each facility type.

Question G-0-5: What are the references for SPFs and CMFs? Where can users find the calibrated SPFs/CMFs?

The safety performance functions (SPFs) and crash modification factors (CMFs) used in the SBD Tool are derived from published research reports, journal articles, and the CMF Clearinghouse. Users who are interested in more information of the SPFs and CMFs may contact the TxDOT Design Division to request a copy of the project Technical Memorandum, which documents the methodology, SPFs, and CMFs for assessing roadway safety.

Question G-0-6: Can the tool evaluate Design1 and Design 2 without an Existing configuration? Can the tool have more designs in addition to Design 1 and Design 2?

No, the Existing configuration is required for each segment or intersection. Both Standard and Optimal configurations are based on existing configurations, thus, Existing configurations must be completed. For a future project or new roadway alignments, users may use the proposed configuration and projected traffic volume (opening year recommended) as the existing configurations.

Based on the input and feedback, two design alternatives in addition to the Existing, Standard, and Optimum are considered enough. More designs make the tool too complicated. The user may use Design 1 and Design 2 to compare different configurations.

Question G-0-7: Not all elements are reflected in the vortex plot.

The current vortex plot only shows elements with CMFs. In the case that the safety effect is captured by an SPF (e.g., driveway number on urban 4-lane undivided), it is not shown in the plot. A mark has been added to those elements in the SBD Tool.

Question G-0-8: Is it possible to conduct sensitivity analyses using the tool? Can the tool show scores instantly?

The user may test sensitivity in Design1 or Design2 by changing their element values. The scores cannot be shown instantly as users change their values. The user needs to click the "Calculate" button after each change to update the scores.

Question G-0-9: Can the tool connect to TxDOT CONNECT, CRIS, RHiNO, etc.?

Currently, no, but we are exploring to integrate various TxDOT data in future update.

Question G-0-10: What is the project submission flow? Who has access to a project after it is submitted, and what happens if the project owner leaves TxDOT?

There are several types of user roles in the tool: general user (referred to as analyst), district-level manager (and assistant district-level manager), division reviewer, and TxDOT division-level administrator. The submit flow of a project is that an analyst completes the project safety assessment, then the corresponding district-level manager reviews it and makes modifications when needed, and finally submits it to the division for review. The Division reviewer may send

back a submitted project to the district-level manager and analyst if needed for revision. The district-level manager and analyst shall address comments and resubmit.

Once a project is submitted, division reviewers review/verify and make minor updates or corrections (with District's consent) if needed, and accept it for inclusion in the commission report.

If a project owner leaves TxDOT, district-level managers and assistant district-level managers have access to projects owned by the departing user and can transfer the project ownership to another user as needed.

Question G-0-11: What is the purpose of the Design Division review process?

The Design Division reviews the submitted projects to ensure they are evaluated appropriately. For minor issues, reviewers may make corrections directly. For major issues, reviewers send back the projects to their owners for corrections or concurrence. Once appropriately evaluated, the summary report is submitted to the Transportation Commission.

Question G-0-12: Can users/admins send back a project with attachments?

No, this tool is not for communication purposes. The user is encouraged to use email for sending attachments.

Question G-0-13: Can additional users be added to edit a project?

The current version of the SBD Tool does not support multiple users editing the same project simultaneously. Projects can, however, be transferred to another user. Adding a multi-user editing feature may be considered in a future version.

Question G-0-14: What should users enter for the CSJ number if they do not have one?

There is no restriction regarding the CSJ number. If a CSJ number is unavailable, users can input an arbitrary CSJ number to proceed with evaluating the roadway safety.

Question G-0-15: What are the differences between the web-based SBD Tool and the Excel-based rural tool?

The earlier Excel-based rural segment tool relied solely on crash modification factors (CMFs) and did not incorporate safety performance functions (SPFs). In contrast, the web-based SBD

Tool integrates SPFs, and CMFs have been reviewed and updated where possible. As a result, the safety score outcomes from the SBD Tool are not directly comparable to those from the Excel-based rural tool. In addition, the web-based SBD tool evaluates safety scores of rural intersections.

Question G-0-16: If the project has multiple CSJs? How should the scoring tool be submitted?

The user should submit a separate SBD project for each CSJ (or sub-CSJ). The Design Division is currently using the database to combine the scores of the multiple CSJs. In the future, the tool may be updated to include multiple CSJ scorings in one SBD file.

Question G-0-17: How do we classify the project area type to use the proper SBD tool?

The Statewide Planning Map and TxDOTCONNECT map can be used to identify area type, specifically:

- Use the statewide planning map and activate the Functional Classification & Urban Areas layer. If it cannot be used for a given CSJ, move to TxDOTCONNECT map.
- Use the TxDOTCONNECT map and activate the same layer (Functional Classification & Urban Areas layer).

Question G-0-18: If part of the project is urban and the other part is rural, how should the scoring tool be submitted for this project?

a. If an area type is dominant ($\geqslant$ 70% of project length), this area type is considered for the entire project, and only one safety scoring tool is required. This means to use the latest urban tool if the dominant area is Urban and the latest rural tool if it is Rural.

b. If the project length is partially (>30% and < 70%) located in both urban and rural areas, then both urban and rural tools are required to evaluate the urban/rural safety scores for the corresponding portions of the project in urban/rural areas.

c. The same concept above is applicable when a single project has multiple CSJs or Sub-CSJs, i.e., when some CSJs lie in urban areas, and others lie in rural areas.

d. The district may apply engineering judgment to adjust this classification if needed, especially in areas located within the rural city limits.

Question G-0-19: If the project lies on the boundary between urban and rural areas, which area type should we use for the SBD tool?

If the project lies on the boundary of an Urban Area, i.e., one side is urban and the other side is rural, the project should be considered as Urban because the adjacent rural area will soon change to an urbanized area.

Question G-0-20: How can we delete the input data of a given segment or intersection of Design 1, for example?

Next to the pencil icon, there is a reset icon. After users reset **all** the categories of Design 1 (or Design 2), the tool will not consider Design 1 (or Design 2). In other words, if there is any input in Design 1 (or Design 2), SBD considers that the users are working on it and checks its completeness.

Question G-0-21: What is the minimum length of the roadway segment?

There is no minimum length requirement for a roadway segment.

Question G-0-22: Do we have to consider all minor crossroads controlled by a stop sign as an intersection, even if crossroads have very low ADTs?

If these intersections are similar (number of legs, control type, major and minor traffic volumes, geometric, and traffic), users may select one or multiple representative intersections.

Question G-0-23: Why can some types of roadway segments or intersections not be configured in the SBD Tool?

The SBD Tool uses safety performance functions (SPFs) to evaluate the safety performance of roadway segments and intersections. If SPFs for certain types of roadways or intersections are not available, those types cannot be evaluated in the tool. Typically, these roadway and intersection types are rare, including but not limited to two-lane divided roadways and rural three-leg all-way stop intersections.

Rural Segments

Category 1: General Questions

Question RS-1-1: What rural segment projects are eligible for this Tool?

Please refer to SBD Exempt Project Matrix page (https://sbd.txdot.gov/em) for eligible projects.

Question RS-1-2: How to split segments?

Roadways should be split into segments at intersections. In addition, the segments need to be split at locations where there are any changes in the control elements, including median configuration, traffic volume, posted speed limit, and number of through lanes.

In the example below, the corridor is first divided into four segments by the intersections. On the fourth segment, the median configuration changes from divided to undivided, so it needs to be split into two sub-segments. As a result, the corridor ultimately contains five segments.

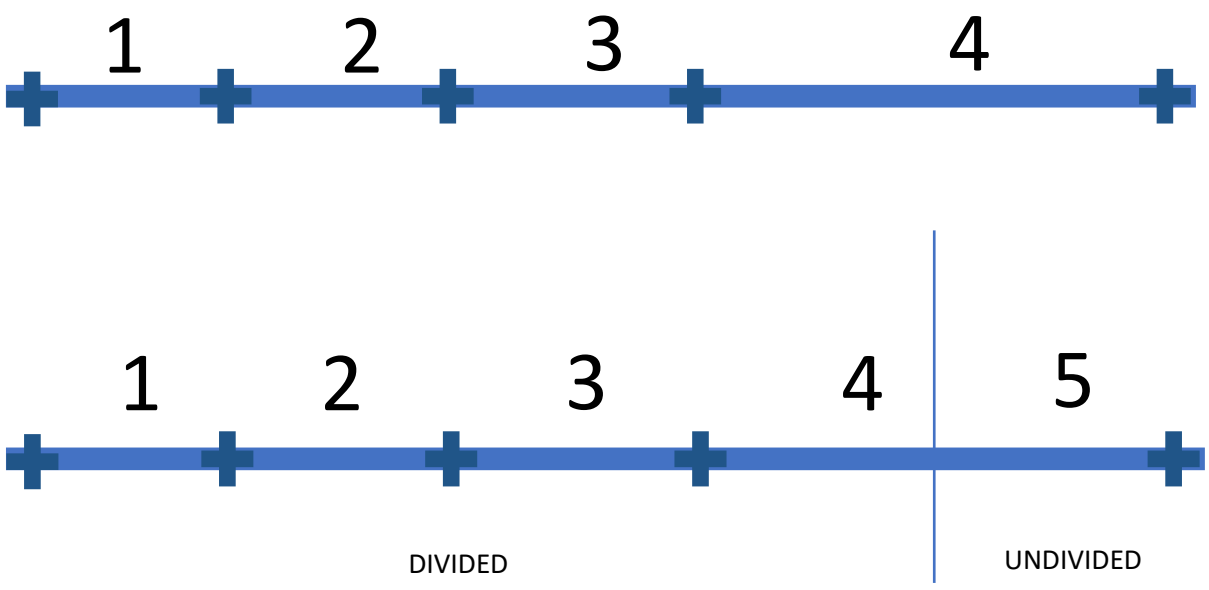
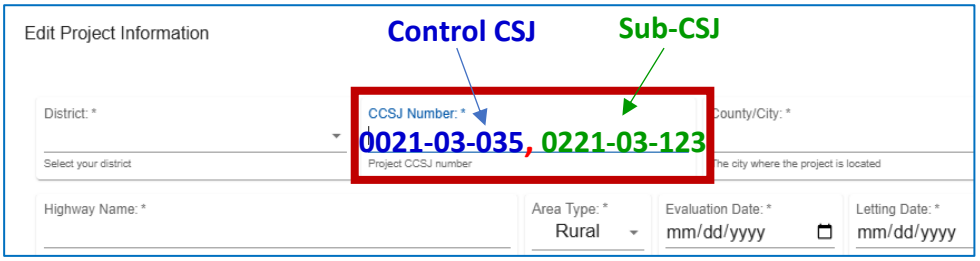


Figure 1-1 Splitting Segment Illustration

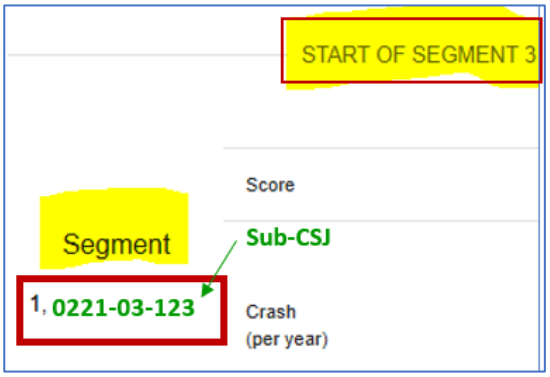
Speed transition zones shorter than 1 mile can be combined with adjacent segments.

Question RS-1-3: Seal coat projects typically cover relatively long sections, which can make evaluating the entire roadway time-consuming.

For districtwide seal coat projects that include multiple sub-CSJs, users must select at least one representative segment and one representative intersection for each roadway (i.e., highway). A single roadway may contain one or more sub-CSJs. If there is a significant change in AADT or a change in roadway cross-section (e.g., from two lanes to four lanes), an additional representative segment or intersection must be selected. A separate SBD file is required for each roadway (highway) included under the same control CSJ or project. In each SBD file, the control CSJ should be listed first, followed by a comma and the corresponding sub-CSJ(s), as illustrated in the provided screenshot.



Alternatively, and to reduce the level of effort, the user can enter all selected segments and intersections in one file under the control CSJ. In this case, the selected segments and intersections can have any numbering followed by a comma and the sub-CSJ, as shown in the opposite screenshot.



Given the time required to complete this task, it is recommended that districts begin preparing the SBD files well in advance of the letting month, particularly since seal coat projects are typically let only once per fiscal year.

Question RS-1-4: Can the SBD Tool evaluate segment configuration with different numbers of through lanes?

This is doable in the web-based SBD Tool; users can change the number of lanes in Design 1 and Design 2.

Question RS-1-5: If there is a driveway connected to the major road, shall users consider it as an intersection?

It requires engineering judgement. If the TxDOT roadway inventory data contains the crossing road, it should be considered as an intersection. If the analysts want to evaluate it as an intersection, the traffic volume and roadway characteristics (e.g., speed limit, number of lanes,

etc.) on the crossing roads are required to conduct the safety scoring analyses. In this case, it is considered an intersection, and re-segmentation is necessary.

Question RS-1-6: Do intersections always experience more crashes than segments, thus having higher weights on scores?

Not necessarily. This depends on various factors, including exposure (i.e., traffic volumes and segment length), intersection control type and configuration, as well as segment characteristics.

Question RS-1-7: Does the tool consider truck volumes?

As of now, the CMF for truck volumes is unavailable. The tool development team will consider incorporating truck volumes (or truck percentages) in the basic categories and integrating CMFs for truck volumes when they become available in the future.

Question RS-1-8: Is it possible to add a bypass to the existing design?

Bypasses are new alignments, and there is no existing condition. The proposed new alignment can be used as the existing design condition.

Category 2: Geometric, Traffic, and Roadside Elements

Question RS-2-1: If the shoulders are different on the two sides of the roadway segment, how can we use the shoulder width?

The shoulder width is determined by averaging the left and right shoulder widths. This is also explained in the question mark icon for shoulder width in the SBD Tool.

Question RS-2-2: Do the inputs have a range on the curve radius?

The lower bound for horizontal curve radius is 50 ft to accommodate the ranges of curve radii found in the roadway inventory data.

Question RS-2-3: How is vertical grade defined?

The vertical grade in the tool refers to the greatest absolute tangent grade (in percent). It does not account for vertical curve K values, length, or other vertical curve elements.

Question RS-2-4: Should non-traversable drainage structures and headwalls be considered in the tool?

Yes, these should be accounted for as roadside fixed objects, as applicable.

Question RS-2-5: What do we analyze if there are multiple horizontal curves along one segment?

If a segment contains multiple horizontal curves, use the worst case (i.e., the sharpest curve). This will be further clarified in the question mark icon for horizontal curve input in the SBD Tool. In other words, always use the worst-case curve in the design configurations.

Question RS-2-6: For roadway fixed objects, should guardrails or median barriers of any type be considered as objects?

No, these appurtenances reduce crash severity, although some studies have shown that the total number of crashes increases, they should not be considered as fixed objects. Any fixed object behind it should not be considered in the total number of fixed objects.

Category 3: Pedestrian and Bicyclist Elements

Question RS-3-1: How can we obtain pedestrian and bicyclist volume data?

Currently, there is no state-level pedestrian or bicyclist volume database. They must be counted or estimated. TTI has developed a pedestrian volume estimation tool (https://cts.tti.tamu.edu/project/list-of-safety-tools/), which can be used.

Question RS-3-2: Can we apply the school zone to a city center or parks?

No. A school zone has different traffic characteristics from streets in city centers or adjacent to parks. Users should select the appropriate area type, speed limit, and pedestrian level for the project in the SBD Tool.

Question RS-3-3: Why speed element appears in pedestrian and bicyclist categories, but not in the vehicular categories?

Numerous studies have analyzed the relationship between speed measurements and crashes, but the results are mixed. Some studies found that higher speeds are associated with more crashes, while others reported the opposite. Including a crash modification factor (CMF) for speeds in vehicular crash analyses is challenging due to these inconsistencies.

Question RS-3-4: How are the left and right sides defined?

The left and right sides are defined based on the driving direction from the smaller DFO to the larger DFO. Clarifications have been added to the question mark tooltips where needed in the SBD Tool.

Question RS-3-5: For a Separate Bike path, what is considered a barrier?

Barriers are those that prevent vehicles from encroaching on the bike path. Curbs or fences should not be considered as barriers.

Rural Intersections

Category 1: General Questions

Question RI-1-1: What rural intersection projects are eligible for this Tool?

Please refer to SBD Exempt Project Matrix page (https://sbd.txdot.gov/em) for eligible projects.

Question RI-1-2: Some driveways and intersections are similar; how to differentiate them?

This requires engineering judgments. If the TxDOT roadway inventory data contains the crossing road, it should be considered as an intersection. If the analyst decides to evaluate it as an intersection, the traffic volume and roadway characteristics (e.g., speed limit, number of lanes, etc.) on the crossing roads are required to conduct the safety scoring analyses. The number of segments should be adjusted in this case.

Question RI-1-3: Why does the roundabout often appear as the optimal control type in many projects? Where does the data for the roundabout come from?

In the current version of the SBD Tool, the optimal intersection configuration is determined based on baseline safety performance functions (SPFs) and crash modification factors (CMFs). The updated SBD tool integrates ICE (Intersection Control Evaluation). It asks whether the intersection has been evaluated by the ICE. If yes, then it asks about the ICE-recommended control type. The Optimal configuration will be based on the ICE-recommended control type (unless the safety performance of the control type is not available in the SBD, signal control will be used as the optimal configuration). If not, the roundabout will be compared with stop-controlled and signalized intersections (when the intersection meets signal warrants or is already signalized). It will be considered the optimal configuration if it has the lowest EDPO. In many cases, roundabouts result in the lowest EDPO due to their lower proportion of K and A crashes.

The current predictive methodology for roundabouts is based on the AASHTO Highway Safety Manual and a Florida Research Report. At present, there is not a sufficient number of roundabouts to calibrate or develop Texas-specific roundabout SPFs.

Question RI-1-4: If a project starts adjacent to an intersection but does not include it, should the intersection be included in the analysis?

In the safety assessment, the segments and intersections should align with the project scope. In this case, since the project does not include the intersection, it is not required to include it in the analysis. However, it is advisable to analyze adjacent intersections to determine if they should be included in the project to improve safety.

Urban Segments

Category 1: General Questions

Question US-1-1: What urban segment projects are eligible for this Tool?

Please refer to SBD Exempt Project Matrix page (https://sbd.txdot.gov/em) for eligible projects.

Question US-1-2: Can the tool be used on suburban projects?

Yes, Urban SBD Tool applies to both urban and suburban highways. Note that on suburban highways, posted speed limits (PSLs) are relatively higher, SPFs and CMFs in the tool have considered the PSLs when applicable.

Question US-1-3: Can the tool be used for 8-lane undivided roadways?

No, this type of roadway is rare, and SPFs or CMFs are not available. For other types of rare roadways (e.g., 2-lane divided, uneven lane number roadways), SPFs and CMFs are not available either. Currently, the tool cannot assess safety levels for those types of highways.

Question US-1-4: Some driveways have high volumes (e.g., a restaurant), should they be considered as intersections?

Usually, those driveways count as a major driveway. The user may consider it as an intersection and split the segment at that location. Engineering judgments should be used based on specific driveway situations.

Question US-1-5: What to do if there is a lane drop on the segment?

Need to split the segment at the lane drop location.

Question US-1-6: What if the sidewalk stops/changes in a segment?

No need to split the segment. The user may examine the proportion of the segment with sidewalk/pedestrian facility, and fill in the tool based on the majority of the segment.

Question US-1-7: How to enter the sidewalk if it is located on only one side of the roadway segment?

If only one side has a sidewalk, or if the sidewalks are not complete on both sides for the entire segment, then the user should select “no sidewalk”.

Question US-1-8: Is there an ability to account for the railroad crossing?

No. Highway-railroad grade crossing or intersection SPFs are unavailable. The tool development team will incorporate it in future updates when research is available.

Question US-1-9: Does the turning lane count?

No, only Two-Way Left-Turn Lane (TWLTL) counts. CMF for the turning lane on urban segments is not available. This will be incorporated in future updates when research is available.

Category 2: Basic

Question US-2-1: Should a segment exclude the intersection influence area?

Yes, if the segment begins with an intersection, the from DFO should add 0.047 (i.e., 250 ft); likewise, if it ends with an intersection, the to-DFO should deduct 0.047.

Question US-2-2: Is ADT the existing or projected ADT? Which year of ADT should be used? Opening, existing, or design year?

It should be the existing ADT. For future/new roadways, the user needs to use the projected ADT of the opening year. The user should use the same ADT for all the designs (i.e., columns of Existing, Design1, and Design2).

Question US-2-3: Is truck ADT or truck ADT percentage considered?

No, the CMF of truck ADT/percentage in the urban environment is not available. This will be incorporated in future versions when research is available.

Category 3: Geometric

Question US-3-1: Options for median width on divided roadways are 10, 15, etc. There are some roadways with median widths less than 10 ft.

CMFs for median widths less than 10 ft are not available. The user needs to select 10 ft if it is less than 10 ft (i.e., the closest in the option list).

Question US-3-2: There are grass medians. Should they be considered as divided or undivided?

Divided, whether there is a curb or not.

Question US-3-3: If there are multiple horizontal curves along one segment, i.e., one element has multiple super-elevations, how to fill in the number?

Use the worst case with the highest superelevation value (i.e., the sharpest curve).

Category 4: Roadside

Question US-4-1: How to measure the parking length for the segment analysis? Is it the single parking lot length or the whole length?

The parking length refers to the total length of the designated parking area along a roadway segment. It is not just the length of a single parking space but rather the combined length of all contiguous parking spaces in the measured section.

Question US-4-2: Does it matter if you have a barrier curb? Is a vertical curb counted as a fixed object?

No, a curb does not prevent a vehicle from departing the roadway. The vertical curb should not be considered a fixed object on lower speed roadways (PSL <= 45 mph); it should be considered as a fixed object on higher speed roadways (PSL > 45 mph).

Category 5: Pedestrians

Question US-5-1: Is the shared path only for designated pedestrians?

Shared-use paths are for any non-motorized modes (e.g., walking and cycling, and likely roller blading, skateboarding, and scooters)

Question US-5-2: Does the side (i.e., left or right) sidewalk matter?

Yes, the sidewalk should be considered by the side, as for the pedestrian flow level. The current version of the tool does not differentiate sidewalks by side due to the pedestrian crash prediction methodology. It will be updated in the future.

Category 6: Bicyclists

Question US-6-1: What shoulder width is necessary for a shoulder to be considered bikeable?

A 5-ft or wider paved shoulder may serve as a bike lane.

Urban Intersections

Category 1: General Questions

Question UI-1-1: What urban intersection projects are eligible for this Tool?

Please refer to SBD Exempt Project Matrix page (https://sbd.txdot.gov/em) for eligible projects.

Question UI-1-2: Can the intersection tool be used for suburban or rural town intersections within the urbanized boundary?

Yes, the tool should be used for all intersections classified as urban and suburban. The tool can also be used for rural town intersections.

Question UI-1-3: If the recommendations from the tool are not implemented, do we need to justify?

This tool is not intended to mandate intersection configuration selection or the implementation of other intersection characteristics. This is a scoping tool focused on how much we can improve safety on each project. However, the primary constraints preventing a project from achieving an optimal score should be documented on the "Reporting" tab. We understand scoping decisions may impact project cost and overall District programming. The goal is for the tool to assist in design discussions and help Districts maximize the safety achieved in each project.

Question UI-1-4: What if the crossing streets/roadways have major changes? Examples:

1. *How do we evaluate the proposed intersection configuration from 3-leg to 4-leg or from 4-leg to 3-leg?*
2. *How do you fill out the scoring tool as the intersecting street is being widened?*

1. The current version of the intersection scoring tool assumes no significant changes at the intersections, i.e., number of legs, crossing streets (one-way/two-way, speed limit, number of through lanes).

   However, depending on what users are analyzing, then users can do one of the following.

   A. If users have already decided to change from 3 to 4, or 4 to 3 legs, then users can just enter that configuration as the existing condition and use the tool to make that configuration as safe as possible.

B. If users are evaluating whether the change of the intersection from 4 to 3, or 3 to 4 based on safety performance, users can set up a separate SBD analysis where users look at the two configurations as two separate intersections with the same basic information except for the number of legs. Then users can compare the EPDO crashes between the best practical alternative for each intersection and choose the best one. Then in the formal analysis, just input the intersection with the chosen number of legs as the based condition.

2. Similar procedure can be applied to the changes of crossing streets (e.g., widening streets, increasing through lane numbers).

Question UI-1-5: How are frontage road intersections handled?

Currently frontage road intersections are included in SBD tool as urban/rural intersections. The SBD Tool is expected to be updated in the future to incorporate findings from an ongoing RTI project focused on the safety performance of frontage roads and ramp terminals.

Category 2: Intersection Basic Information and Safety Performance Functions (SPFs)

Question UI-2-1: How recent were the SPFs developed?

While developing the intersection scoring tool, the team referred to a wide variety of literature and identified many state-of-the-art research reports (see references at the end of this document) that focused on modeling intersection crashes. All of them were developed in the past 5 years. It is worth mentioning that previous studies have shown that most of the SPFs for roadway entities remain relatively stable over the years. The reference sources provided most of the safety performance functions. As new research, including Texas-specific research, develops new SPFs, they will be incorporated into the tool.

Question UI-2-2: Is SPUI considered in the tool

The Single-Point Urban Interchange (SPUI) is not considered in the intersection scoring tool because the safety performance or crash modification factor for SPUI is still unknown. This item will be incorporated in a future update to the tool if the research is available.

Question UI-2-3: Does the tool distinguish between truck and car traffic?

No difference between trucks and passenger cars in the tool. The tool uses average daily traffic (ADT), which is consistent with the way the SPFs were developed.

Question UI-2-4: Can the tool analyze 5-leg intersections?

For 5-leg intersections, the tool can only analyze the 'signal' control type since the SPF is available only for signalized intersections. As further research becomes available, particularly on 5-leg roundabouts, additional analysis options will be introduced to the tool.

Question UI-2-5: If the intersection has two roadways with the same classification, how are the major and minor roadways identified?

The roadway with the higher traffic volume (ADT) should be considered the major roadway, and the roadway with the lower traffic volume is considered as minor. Both roadways may also have the same classification and similar elements.

Question UI-2-6: What is the effect of the speed limit?

The speed limit affects the safety analyses in two ways: (1) the base SPF varies depending on the speed limit. Two identical intersections may have different safety scores if they have different speed limits. (2) The speed limit influences the pedestrian and bicyclist safety. The tool automatically selects the appropriate SPF based on the entered speed limit information.

Question UI-2-7: Why does the tool ask for crashes within 250 feet of the intersection? What if I want to extend to 500 feet?

Only crashes within 250 feet of the center point of an intersection should be counted as intersection crashes. The distance of 250 feet is consistent with how SPFs are utilized in the tool.

Question UI-2-8: How does the tool use observed crashes at intersections? What is the relationship between the observed crash number and the safety score for an intersection?

The tool uses observed crash numbers when determining the standard and optimal configurations. It uses observed crash numbers and other characteristics (i.e., ADT, speed limit) to examine if the intersection meets the signal warrants. In addition, the predicted crash number and observed crash number are independent. The tool does not utilize the empirical Bayes (EB) method to combine the two, because multiple safety performance functions are used when predicting the number of crashes, and the commonly used EB method cannot be applied directly.

Question UI-2-9: How do we obtain NCHRP reports for the SPFs and CMFs?

The NCHRP 17-68, 17-70, and 17-84 reports are publicly available from the National Academy of Sciences website (https://trid.trb.org/view/1847942, https://trid.trb.org/view/1580387, https://nap.nationalacademies.org/catalog/27294/pedestrian-and-bicycle-safety-performance-functions, and https://www.trb.org/Publications/Blurbs/182691.aspx.respectively); More details of these studies can be found in the Reference section at the end of this FAQ.

Category 3: Elements and Crash Modification Factors (CMFs)

Question UI-3-1: Are peaking characteristics of the facility (such as peak hour) considered in the safety evaluation of the signalized intersection?

Peaking characteristics are not considered in the intersection scoring tool because the tool mainly focuses on safety performance rather than capacity. In almost all intersection SPF and CMF developments, peak hour characteristics are not analyzed.

Question UI-3-2: For the left-turn lane, does it matter whether the left turn lanes are on the major or minor approaches? Why are the selections for stop-controlled intersections limited to two approaches?

The reviewed studies have limited information on the element options and CMFs for left-turn lanes. They do not distinguish whether the left-turn lanes are on major or minor roadways. Thus, left-turn lanes are treated equally on major and minor approaches in the tool. In addition, any left turn lane counts, whether on the major or minor approach. The options are based on available CMFs. For example, if a 3-leg intersection shows only three options 0, 1, and 2, for the number of approaches with left-turn lanes, that means the CMF for 3 is not available.

Regarding Offset Left-Turn Lanes, if it is present on any leg, users need to select "Yes" for the intersection.

Question UI-3-3: I am working on HSIP projects where a free intersection is proposed to restrict to LTL from major road only. How can I evaluate the intersection safety score?

There are two elements related to left-turn in the SBD: (1) Number of Approaches with Exclusive Left-Turn Lanes. the options are 0 to 2, 3, or 4 (depending on leg number and available CMFs). The options are based on available CMFs. and (2) Offset Left-Turn Lanes. It is "Yes" or "No". If any left-turn lanes are offset on any leg, users need to select "Yes". There is no element regarding "Restrict LTL". In addition, the research studies did not distinguish between major and minor roads regarding left-turn lanes.

Question UI-3-4: Why is sight distance only required for an unsignalized condition? Why is sight distance not considered for signalized intersections?

The safety impacts of sight distance are most critical for unsignalized operations. The CMF for sight distance (http://www.cmfclearinghouse.org/detail.cfm?facid=9656) was developed for stop-controlled intersections. For signalized intersections, the primary sight distance issue is for right-turns-on-red. We suggest that the analyst determines if AASHTO Green Book criteria are met for the right turns, and that right-turns-on-red prohibitions should be considered if the AASHTO Green Book sight distance cannot be achieved.

Category 4: Pedestrian and Bike

Question UI-4-1: How does the tool use bike and pedestrian data?

The tool considers peak hour ped & bicycle flow and annual pedestrian & bicycle crashes in both directions of the roadway.

Question UI-4-2: How do I determine the pedestrian and bike demand for future conditions if there is no existing bike/ped facilities?

TTI researchers have developed models and tools to estimate the pedestrian volume at intersections (https://cts.tti.tamu.edu/project/list-of-safety-tools/). Users may refer to the tool to estimate the pedestrian volume for the future. The tool needs a few inputs, including intersection control type, number of schools within 1 mile, commercial and multifamily proportion, posted speed limit (mph), and CBD indicator.

Category 5: Others

Question UI-5-1: Can you provide a link to CRIS to obtain crash data?

Users (both internal and external to TxDOT) can use the TxDOT crash query tool (https://cris.dot.state.tx.us/public/Query/app/home) to obtain crash data at an intersection.

The tool development team has prepared a step-by-step (https://sbd.txdot.gov/cris-instruction) instruction detailing how to obtain intersection crashes within 250 feet of the intersection specifically for the tool.

Question UI-5-3: If at an existing railroad highway grade crossing, an elevated intersection is proposed, how do I use the tool to evaluate that intersection?

The current version of the tool is only applicable to highway intersections. Railroad- highway grade crossing or interchanges cannot be evaluated using the tool.

Question UI-5-4: If the project limits have five intersections but only three of the 5 intersections are to be improved, should we include 3 or 5?

Users are encouraged to include all 5 intersections in the tool. All the intersections within the project limits should be analyzed and included in the scoring.

Question UI-5-5: In metro areas, intersections will often already have all the options built out that are optimal in the tool. Are there other design options that can be included to help hone in on available improvements (type of right turn channelization - smart right, etc.)

The tool can only evaluate options where the safety effects are known. The future version of the tool will consider other options if the research becomes available.

Question UI-5-6: Is the selection of the alternative configuration based on ADT?

The tool does not automatically select an alternative intersection. Alternative intersections are evaluated only if the analyst selects them as an option. Specifically, the selection of alternative intersections (DDI, DLT, MUT, and RCUT) is based on two situations: (1) the predicted number of crashes, which is related to various factors, e.g., ADT, number of lanes, speed limit, etc., and (2) if the alternative intersection has been selected in existing, design 1 or design 2. In other words, if the existing is not an alternative, and the user does not consider any of them in design 1 or design 2, the tool will not consider alternatives in the optimal configuration. If at least one of the existing, design 1, and design 2 is an alternative, the optimal configuration would possibly be an alternative intersection. TxDOT developed intersection control evaluation (ICE) process to assist designers in selecting the type of control needed to accommodate traffic demands. The SBD Tool evaluates the safety effects of different design controls and configurations.

Question UI-5-7: Can an alternative intersection be considered for a 3-leg

The tool currently considers only a 4-leg intersection as an alternative intersection.

Question UI-5-8: How do these tools apply to Preventive Maintenance Projects?

TxDOT policy is to consider every project as safety project with few exceptions. Just like the rural tools, the urban intersection tool will be required for urban PM, 2R, 3R, and 4R projects. See the eligibility matrix for additional details on when the tool is required. Addressing safety needs in every project is critical. In the past, Cat. 1 project scopes may have been limited. But to improve system safety performance, every project (including Cat. 1) needs to be considered, including safety elements that might have previously been thought of as "out of scope". If we're thinking about safety in every project, there will be fewer missed opportunities for improvement.

Question UI-5-9: What are the permissive, protected, and Protected-permissive signal phases?

a. Permissive-only (also known as "permitted-only") phasing allows left turns after yielding to conflicting traffic and pedestrians.
b. Protected-only" phasing consists of providing a separate phase for left-turning traffic and allowing left turns to be made only on a green left arrow signal indication, with no pedestrian movement or vehicular traffic conflicting with the left turn.
c. Protected/Permissive (P/P) left-turn signal phasing is a combination of a protected phase, in which a green arrow indicates a protected turn, and a permissive phase, in which the left-turning vehicles must yield to the opposing traffic during the green indication.

Category 6: Visual Representations

This category provides visual presentations of a few intersection elements and alternative intersection examples included in the scoring tool.

6-1: Figure 6-1 illustrates negative offset left-turn lanes, no offset left-turn lanes, and positive offset left-turn lanes.

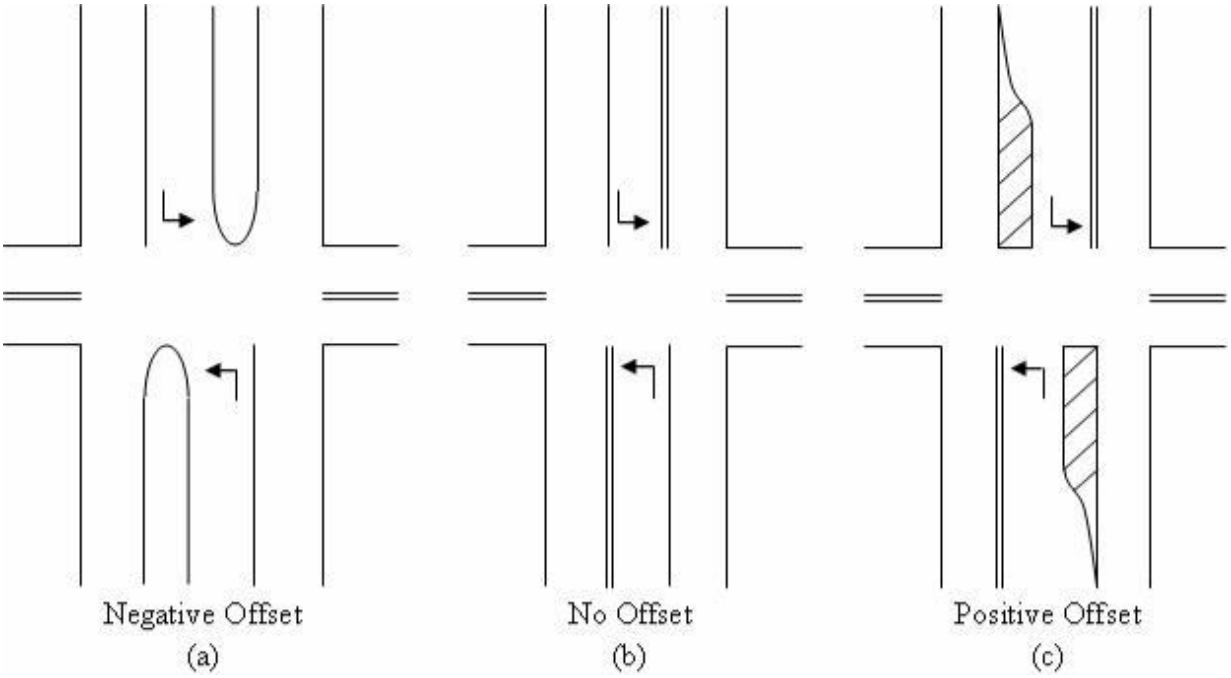
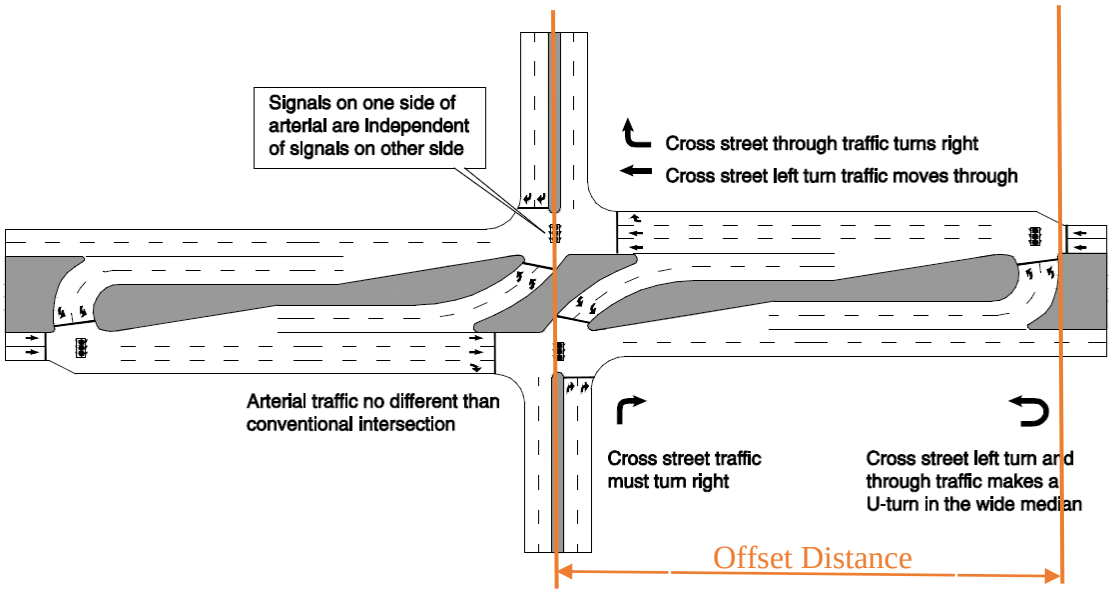
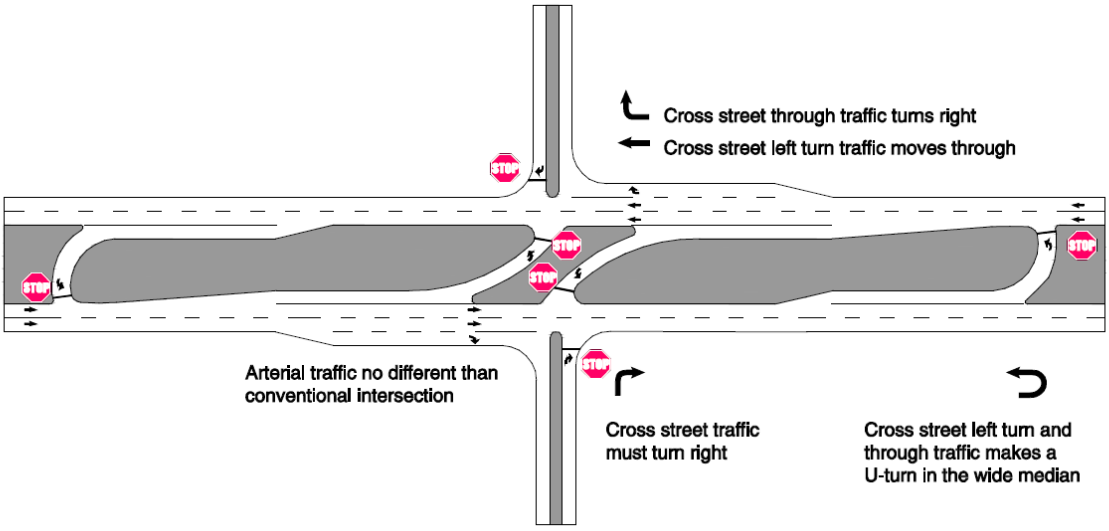


Figure 6-1 Left-Turn Lane Offset
Source: FHWA-HRT-09-035

6-2: Figure 6-2. illustrates RCUT intersections and their features.



(a) Example of an RCUT Intersection with a signal



(b) Example of an RCUT Intersection with stop control

Figure 6-2. Example of RCUT Intersections
Source: FHWA-SA-14-070

6-3: Figure 6-3 illustrates a right-turn bypass lane at a roundabout.

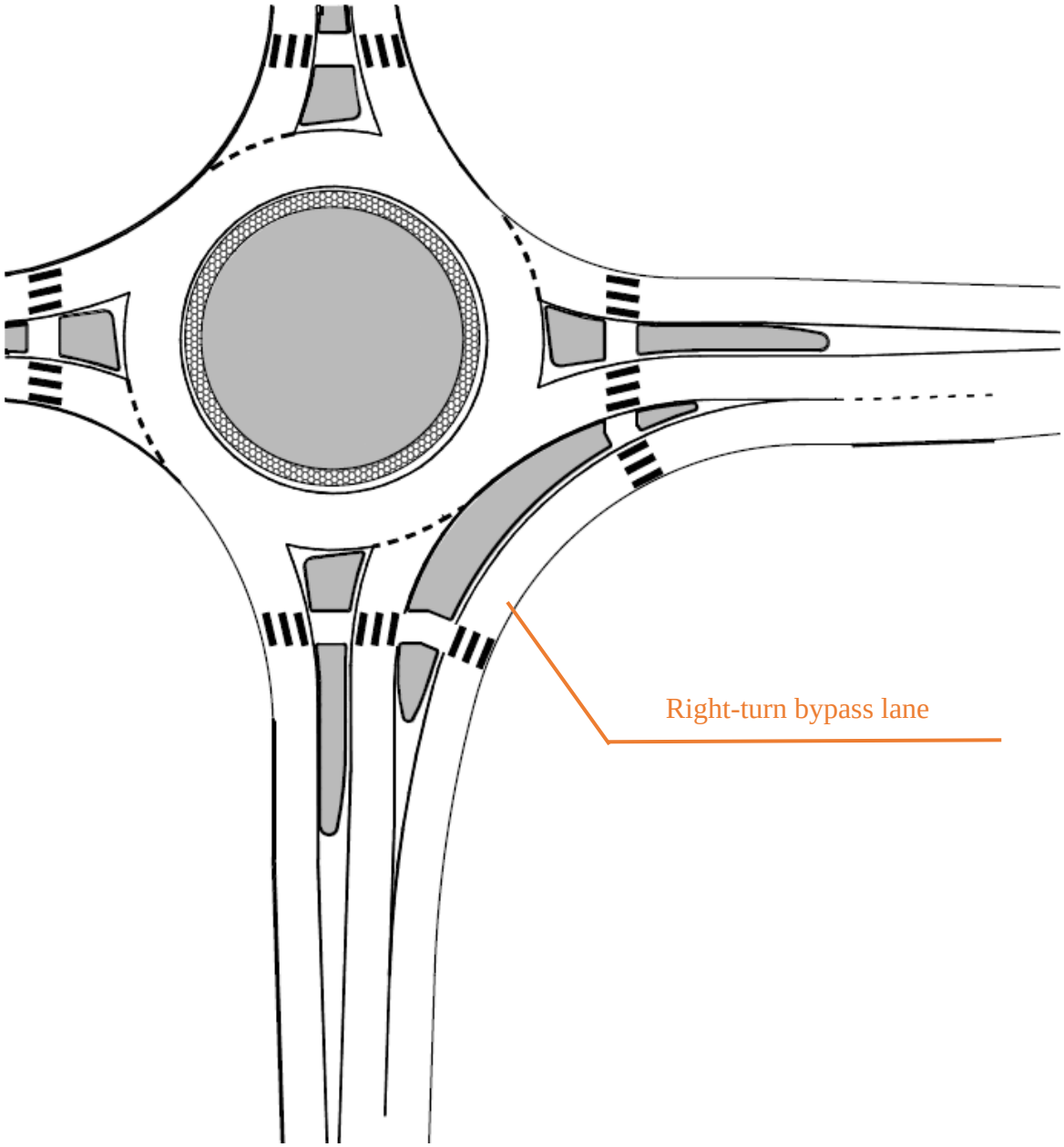


Figure 6-3. Example of right-turn bypass lane at a roundabout
Source: NCHRP Report 672

6-4: Figure 6-4. Illustrates DDI intersection design sketch and its key characteristics

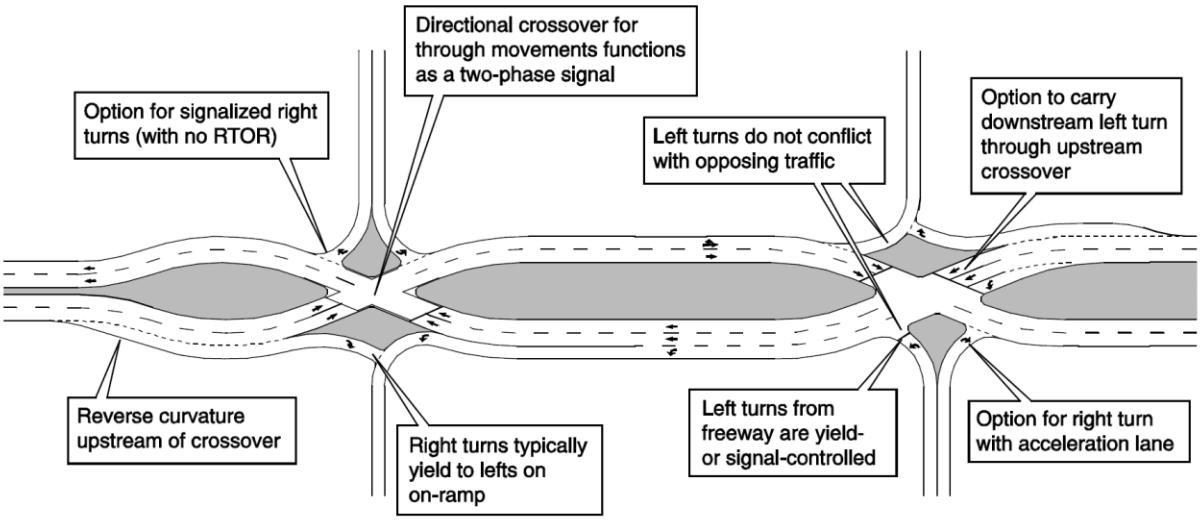


Figure 6-4. Example of a DDI intersection and its key characteristics
Source: FHWA-SA-14-067

6-5: Figure 6-5. illustrates a typical 4-leg DLT intersection design sketch

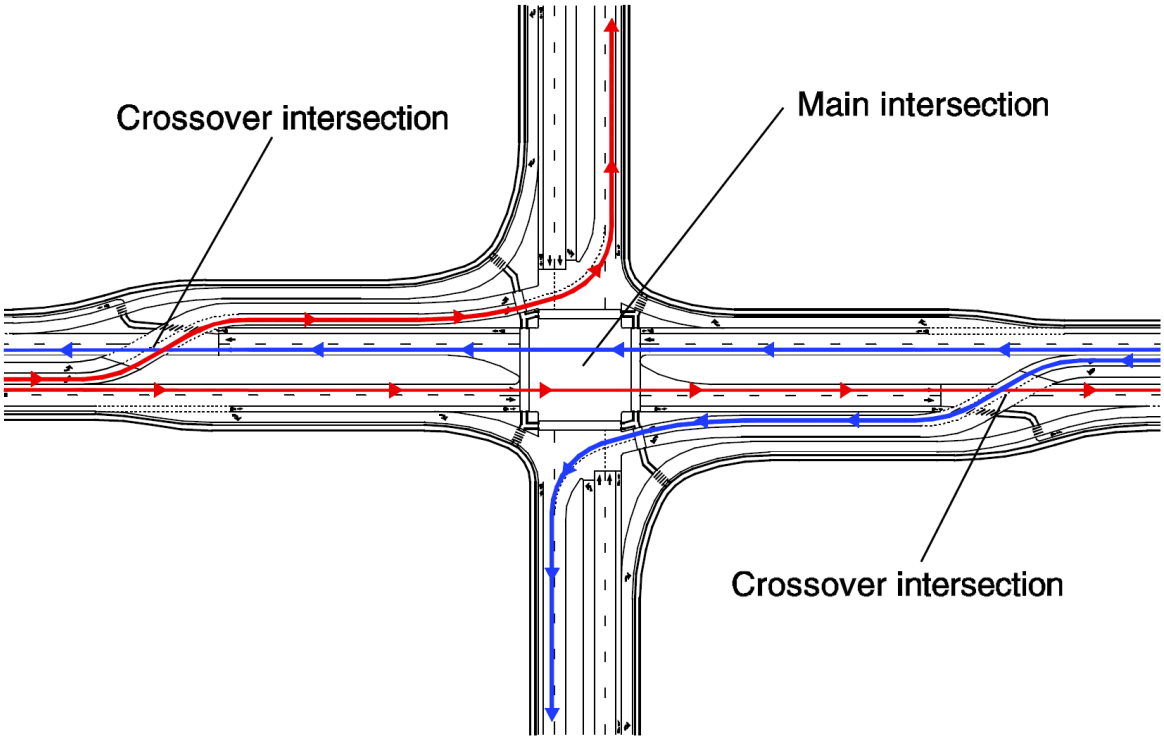


Figure 6-5. Example of a DLT intersection design sketch
Source: FHWA-SA-14-068

6-6: Figure 6-6 illustrates a typical MUT intersection design sketch

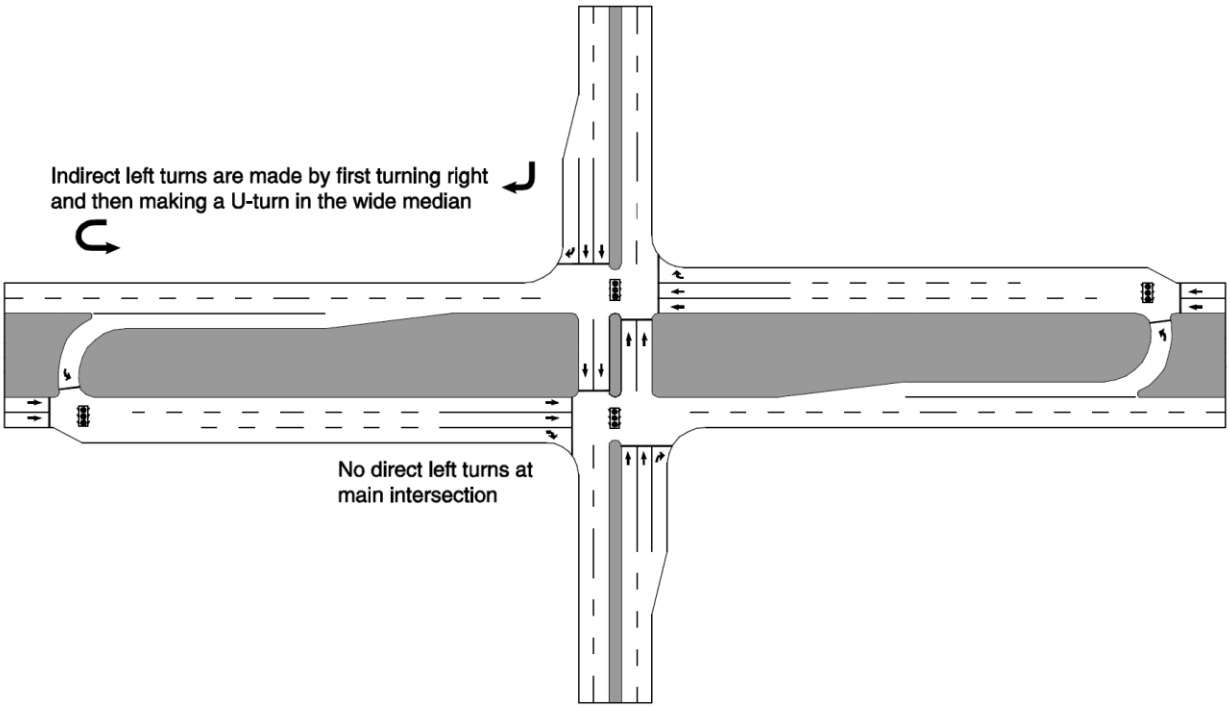


Figure 6-6. Example of a MUT intersection
Source: FHWA-SA-14-069

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