



Intersection Control Evaluation (ICE) FAQs

Design Division – Innovative Intersections Program

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General Information

Question

What is ICE?

Answer

Intersection Control Evaluation (ICE) is the process for evaluating and selecting intersection and interchange control. The process promotes transparent and defensible decision making by evaluating performance measures such as safety, operations, cost and impacts.

Question

Where can I find more information on when ICE is required and how to do it?

Answer

The Traffic and Safety Analysis Procedures (TSAP) Manual, Chapter 10 contains information on ICE applicability and process. For additional information, see subsequent sections below.

Applicability

Question:

How do I know if my project requires an ICE?

Answer:

An ICE report is required for projects that create, modify, or provide an opportunity to change an intersection control. See TSAP 10.2.2 for more details on ICE Applicability.

Question:

For intersection improvements being proposed as tie-ins to a TxDOT facility by a developer, when should an ICE be completed?

Answer:

If the proposed improvements provide an opportunity to change the intersection control, or if a Traffic Impact Analysis (TIA) is being completed at the discretion of the District, then an ICE should be completed as well. The TIA will provide the traffic data needed for completing an ICE. An ICE should be completed at the preliminary stages of a project, around the 30-60% schematic phase.

Question:

If an engineering study recommends a change in intersection control type, should an ICE be completed?

Answer:

Yes, an ICE should be completed. When changing an intersection control type, per the memo that established the ICE process (see the last page of these FAQs), the selected intersection control type should be the operationally viable intersection with the least predicted fatal and serious injury crashes.

Question:

Can I use a signalized innovative intersection if a signal is not warranted?

Answer:

It depends. As per the TMUTCD (Texas Manual on Uniform Traffic Control Devices), “The purpose of the engineering study is to evaluate all of the factors that are relevant to a specific location. The satisfaction of a warrant (or warrants) is one of the relevant factors in the engineering study, but it is not intended to be the only factor or even the overriding consideration. Agencies can install a traffic control signal at a location where no warrants are met, but only after conducting an engineering study that documents the rationale for deciding that the installation of a traffic control signal is the best solution for improving the overall safety and/or operation at the location.” In short, while signal warrants are an important consideration, the TMUTCD allows the use of a signalized innovative intersection when an engineering study demonstrates that a signal is the most effective option to improve safety or operations, even if warrants are not met.

Question:

For a corridor project, should ICE be completed on every single intersection?

Answer:

An ICE should be conducted for every intersection undergoing reconstruction unless otherwise not needed per TSAP 10.2 (such as right-in/right-out only intersections). A single ICE report should be prepared for the entire project corridor to ensure that each intersection alternative is evaluated within the broader corridor context.

Question:

Where can I find example ICE reports?

Answer:

Appendix K of the TSAP provides an example Stage 1 report and an outline for a Stage 2 report. For more examples, contact innovative.intersections@txdot.gov.

Question:

Do I have to analyze every intersection type?

Answer:

You should analyze every feasible intersection or interchange type for the context. For example, you would not include a Continuous Green-T at a four-leg intersection, or interchange options like DDIs or SPUIs at an at-grade intersection, but Roundabouts, Reduced Conflict U-Turns and Displaced Left Turns are feasible in nearly all locations. After establishing the design year traffic data in Stage 1, use the CAP-X tool to diagnose which intersection control types are feasible from an operations standpoint. Within Worksheet 2 (CAP-X) - Base and Alt Sel, toggle the Rankings Inclusion options to choose either at-grade, grade separated, and roundabout options. Example: If the proposed intersection is at grade, a grade separated intersection, or interchange should not be used in the analysis.

Question:

Can the final selected intersection control differ from the ICE's recommended alternative, and how should that be documented?

Answer:

The purpose of the Intersection Control Evaluation (ICE) process is to support and document a **transparent, defensible decision** regarding the selected intersection control type. The ICE is not merely an analysis exercise; it is the formal record of how and why a specific intersection control is chosen.

A final intersection control may differ from the option that is operationally viable and has the lowest predicted fatal and serious injury crashes; however, **the rationale for that decision must be clearly documented in the ICE Report**. This documentation is essential to maintain transparency, support professional judgment, and ensure the decision is defensible.

The intersection control type identified in the conclusion of the ICE Report should reflect the control that will ultimately be built. When the selected control differs from the safety-preferred option, the ICE Report should clearly explain why. Generally, this will require a Stage 2 analysis to

document additional considerations such as more detailed operational analysis, cost, or other project impacts.

Correlation to the Safer by Design Scoring Tool

Question:

Is this the same process that's done by the Intersection Safety Scoring Tool (now known as the Safer by Design Scoring tool)?

Answer:

No. The Intersection Safety Scoring Tool/Safer by Design tool is a safety analysis that is on a design-element-level that maximizes safety for a chosen design. The Safety Scoring Tool is used after the ICE study generates a recommended intersection type. The tool helps to optimize the selected design to be the safest version of it. Conversely, the ICE process is a study that considers operations, safety, cost, and impacts for multiple intersection control types to select the safest intersection control type that is operationally viable. Both processes should be done early in schematic or PS&E development, before the ROW footprint is set.

Documentation

Question:

What are the current requirements for ICE documentation?

Answer:

Form 1002 Item K – Shown below

K. Are Intersection Control Evaluations (ICE) required (as per TSAP Manual Chapter 10.2.2)? ☐ Yes ☐ No
If yes, has ICE been completed? ☐ Yes ☐ No ☐ Completed ICE documentation attached and in TxC.
For additional information, see: https://www.txdot.gov/about/programs/innovative-transportation/innovative-intersections.html

Figure 1: Form 1002 Item K

DES review of ICE documentation as submitted with Form 1002:

- High-level (Is it complete? Assumptions? Reasoning?)
- Looking at what tools and inputs were used
- Checking for a completed safety analysis at Stage 1
- ***DES does NOT approve the ICE*** - approval rests with the District

Design Summary Report (DSR):

Intersection Control Evaluation					
Stage 1					
Location (list all individual intersections)	Safety Analysis Tools	Operations Analysis Tools	Is Stage 2 ICE needed?	Selected Intersection Type	Next Steps
Stage 2					
Location	Type of Intersections for Further Evaluation	MOEs to be Analyzed	Selected Intersection Type		
	☐ 1-lane Roundabout ☐ 2-lane Roundabout ☐ Minor road stop ☐ Traffic Signal ☐ DLT ☐ MUT ☐ Signalized RCUT ☐ Unsignalized RCUT ☐ Diamond Interchange ☐ Partial Cloverleaf A & B ☐ Displaced Left Turn ☐ Contraflow Left ☐ DDI ☐ SPUI ☐ Single Point Roundabout ☐ Other:	☐ Traffic ☐ Safety ☐ Cost ☐ Impacts (Utilities, ENV, ROW, etc) ☐ Other:			

Figure 2: Design Summary Report

Question:

What should be included in an ICE Report?

Answer:

Please see Appendix K in TxDOT's TSAP Manual for an ICE Report example. Below are some components that should be provided in an ICE Report

- Narrative on the project scope
- Screen shots of the inputs and results of CAP-X and SPICE tools
- Discussion on the selected intersection and why it was selected.

- Optional Stage 2 analysis as needed such as more detailed operational analysis (HCM, Synchro, etc.), cost estimates, cost benefit analysis, concept sketches

Operational Analysis

Question:

Which programs may I use for my operational analysis?

Answer:

Chapter 12, Table 12-2 of the TSAP manual has a list of the operational analysis tools that may be used for roundabouts. Chapter 10, Table 10-2 has various operation tools that can be used for other intersection controls.

Question:

What makes an intersection operationally viable within the Stage 1 CAP-X analysis?

Answer:

Typically, a volume to capacity (V/C) ratio under 1 is viable. However, some intersections may be over but close to 1.0 (such as 1.1 and 1.2) and may warrant further analysis in Stage 2 such as roundabouts that could utilize bypass lanes that are not considered in CAP-X.

Question:

What if I don't have a viable intersection after Stage 1 CAP-X analysis, example: no intersections with a V/C ratio under 1?

Answer:

First, re-visit the CAP-X worksheet 3 – *Alt Num Lanes Input* to determine if the appropriate number of lanes has been included for the proposed types of intersections. Test reasonable varying lane configurations for each type of intersection before concluding that none of the intersections are viable. Then, select intersections with the lowest V/C ratios that are roughly around the same number to progress to the safety evaluation. If analyzing for at-grade intersection types and there is not a viable solution, it can be an

indicator that a proposed grade separation intersection or interchange may be needed to accommodate the design year traffic. Additional operational analysis may be needed beyond the CAP-X tool based on the tools listed in TSAP Table 10-2 and Table 12-2.

Question:

In CAP-X, what is N-S/E-W referring to for the two-way stop control selection?

Answer:

When selecting N-S, it refers to the north and south movements having a free flow movement, while the E-W movement has a stop condition. When selecting E-W, it refers to the east and west movements being free flow, while the N-S movement has a stop condition.

Safety Evaluation

Question:

Which programs may I use for my Safety Evaluation?

Answer:

Chapter 10, Table 10-8 of the TSAP manual has a list of the safety analysis tools that may be used.

Question:

When using the SPICE tool, I got a No SPF as a result (Shown in the Picture below). What should I do?

Answer:

As of April 2026, the current SPICE tool does not have a Safety Performance Function (SPF) or Crash Modification Factor (CMF) for every intersection control type for every facility type. For example, there is not an SPF or CMF for rural 2 lane roundabout in the SPICE tool (likely because a roundabout in a rural setting rarely needs more than a single lane). However, you can change the facility type for a rural 2 lane roundabout to an urban 2 lane roundabout to get a result that can be used in the safety evaluation (as a roundabout requiring two lanes due to traffic volumes is more directly correlated with an urban setting than a rural). You may also research and utilize more applicable SPFs and CMFs specific to certain geographical locations, traffic volumes, and other context. **We recommend using only 4 stars and up CMFs from the [CMF Clearing House](#).** Please note in the ICE report if you do use a SPF or CMF that's not already included in the SPICE tool.

3	Results					
4	Summary of crash prediction results for each alternative					
5	Project Information					
6	Project Name:			Intersection Type	Ramp-Terminal Intersections	
7	Intersection:			Opening Year	2020	
8	Agency:			Design Year	2050	
9	Project Reference:			Facility Type	On Rural Multilane Highway	
10	City:			Number of Legs	4-leg	
11	State:					
12	Date:					
13	Analyst:					
14	Crash Prediction Summary					
15	Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	AADT Within Prediction Range?
16	1-lane Roundabout	Total	0.30	0.53	12.84	N/A
17		Fatal & Injury	0.06	0.11	2.58	
18	2-lane Roundabout	Total	No SPF	No SPF	No SPF	N/A
19		Fatal & Injury	No SPF	No SPF	No SPF	
20	Minor Road Stop	Total	1.03	1.84	44.28	Yes
21		Fatal & Injury	0.45	0.84	19.83	
24	Traffic Signal	Total	4.61	7.43	186.43	Yes
25		Fatal & Injury	2.24	3.31	86.18	
26	Traffic Signal (Alt)	Total	4.61	7.43	186.43	Yes
27		Fatal & Injury	2.24	3.31	86.18	

Figure 3: SPICE Tool

Question:

SPICE does not have a CMF for SPUI's, what do I use instead?

Answer:

SUPI's are similar to a traditional signalized intersection and have more crossing conflict points than a conventional diamond interchange (See the link below). Due to lack of referenceable research on any quantifiable crash reductions associated with SPUIs, we recommend categorizing them with conventional diamond interchanges. [Single-Point Urban Interchange \(SPUI\) - Interchange | Virginia Department of Transportation](#).

Question:

What if one intersection has the least amount of predicted total crashes, but another has the least amount of predicted fatal and serious injury crashes. Which intersection should be selected as the safest?

Answer:

The intersection with the least amount of predicted fatal and serious injury crashes should be selected per the memo issued to establish the ICE process dated June 24, 2024 by Lance Simmons, P.E. See the memo below.

Question:

May I use the TxDOT Pre-Approved Statewide Crash Modification Factor Clearinghouse list?

Answer:

Yes, you may, however, the pre-approved CMF list is primarily applicable for the safety analysis used in Interstate Access Justification Reports (IAJR), so it is specific to interstate interchanges.

Question:

Should I enter the existing or proposed lane information in the "At-Grade-Inputs" Tab?

Answer:

For more accurate innovative intersection crash prediction using crash modification factors, consider inputting the existing lane configuration. The proposed conventional alternatives can be modeled in a separate spreadsheet. You may also use one SPICE spreadsheet and enter the proposed conventional intersection configuration. It will still provide valid crash comparison between alternatives.

Control Strategy						
	Traffic Signal	Minor Road Stop	2-lane Roundabout	Median U-Turn (MUT)	Signalized RCUT	
Additional Required Control Strategy Inputs	4					Do not include stop controlled approaches for minor stop
	4					
		1				
		1				

Figure 4: SPICE Tool; Control Strategy

Closing

Please reach out to the innovative intersection email if you have any further questions.

innovative.intersections@txdot.gov

TxDOT ICE Memo



MEMO

June 24, 2024

To: District Engineers

From: Lance Simmons, P.E.
Chief Engineer

A handwritten signature in blue ink, appearing to read "Lance Simmons".

Subject: Implementation of Intersection Control Evaluation (ICE) Process

Intersection Control Evaluation (ICE) is a transparent process for the selection of intersection control type and ensures that intersection investments are implemented with defensible benefits for safety and congestion relief.

The process as issued by this memo is defined in Chapters 10 and 11 in the [Traffic and Safety Analysis Procedures \(TSAP\) Manual](#). *This process shall apply to all highway and street projects for any major intersection improvement as defined in TSAP Section 10.2.2.* Please note:

- ◆ This includes, but is not limited to intersection reconstruction, realignment, relocation, or corridor improvement projects such as adding thru lanes.
- ◆ Intersection control selection must occur during planning, preliminary engineering, or the earliest stages of PS&E development.

The ICE process often produces a selection of intersection types with tradeoffs between performance measures such as operations, safety, cost, and impacts. Among the viable intersection types, the chosen control should be one with the highest expected safety performance that reduces fatal and serious injury crashes.

This process is in alignment with TxDOT policy and commitments, specifically the TxDOT 2022-2027 Strategic Highway Safety Plan, the Texas Transportation Plan 2040, the 2025-2029 TxDOT Strategic Plan, and the proposed Statewide Long-Range Transportation Plan.

Timeline: Implement this process on all projects in preliminary/schematic design immediately, where the following project stages have not, or will not be completed prior to June 30, 2025:

- ◆ Approved right-of-way footprint for schematic projects
- ◆ OR approved 30% plans for non-schematic projects.

TxDOT's Design Division is available to support implementation with resources for peer reviews, concept sketches, ICE reviews, training, and more. Please contact innovative.intersections@txdot.gov to request assistance or visit the [Innovative Intersections website](#) for further information on reporting and

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documentation, a link to the TSAP Manual, and ICE training opportunities over the next several months.

Please distribute this information to the appropriate District staff and Area Offices, as well as consulting engineers working on TxDOT projects.

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References

- [TxDOT Traffic Safety Analysis Procedures Manual](#)
- [TxDOT Roadway Design Manual](#)
- [Innovative Intersections Website](#)
- CAP-X & SPICE tools
 - [Guide for Intersection Control Evaluation | The National Academies Press](#)