Design Exception Request
For Interstate Highways
TxDOT Standard Operating Procedures

Texas Department of Transportation
Design Division

August 2024

Purpose
The purpose of this document is to provide the policy guidance for development, review and approval of design exception request for not meeting minimum controlling criteria of Interstate Highways.

Design Exception Methodology

The objective of this design exception methodology is to formulate a technical, data-driven approach when developing the design exception documentation to objectively weigh engineering, traffic and safety impacts for determining design exception acceptability.

Need for a Design Exception

According to 23 CFR 625.3(f), the need for a design exception can be justified for experimental features on a project and/or where conditions warrant that exception be made. The determination to approve a project design that does not conform to the minimum design criteria is to be made only after due consideration is given to all project conditions such as maximum service and safety benefits for the dollar invested, compatibility with adjacent sections of roadway and the probable time before reconstruction of the section due to increased traffic demands or changed conditions.

Design criteria for the proposed roadway should meet the highest criteria practical appropriate for the project for as much of the project as possible/practical. If there is a constraint to meeting the design criteria for one location/section, a design exception for that section can be submitted with reasons documented in a Request for Design Exception instead of lowering all design criteria to meet the lowest common denominator. This approach can also help with the designs of future reconstruction projects on the roadway by eliminating additional designs exceptions, if the opportunity comes about, as all remaining design elements will already have been designed to a higher standard if the roadway is ever reconstructed. Taking the approach to meet criteria for most of the project limits will also provide the roadway/ROW footprint to remove any remaining design exceptions more easily in the future if the opportunity presents itself. Otherwise, all future designs will be constrained to conform to insufficient design elements already in place. Design exception is required for existing conditions which do not meet current minimum criteria even if it was previously allowed.

Design exceptions are generally identified early in project development but can be identified at any time during a project's lifetime. Common factors that often drive the need for design exceptions include impacts to right of way, the human and natural environment, historic or cultural resources, the community, the needs of all facility users, project cost, compatibility with adjacent roadway sections, and future possibility of bringing the design element(s) into compliance with applicable standards.

A design exception would be needed if the respective 4R freeway minimum controlling criteria (nominal design values identified in RDM) and AASHTO are not met or not intended for be met. The controlling criteria for 4R Freeways are defined in the latest TxDOT Roadway Design Manual, and reiterated below:

Controlling Criteria for New Location and Reconstruction Projects (4R)

- Design Speed
- Lane Width
- Shoulder Width
- Horizontal Curve Radius
- Superelevation Rate
- Stopping Sight Distance (1)

- Maximum Grade
- Cross Slope
- Vertical Clearance
- Design Loading Structural Capacity
- Bridge Class Culvert Protection
- Bridge Rail
- Bike Lane [2]
- Shared Lane (Wide Outside Lane) [2]
- Bridge Deck Clear Space [2]

[1] applicable to horizontal alignments and crest vertical curves
[2] Though bicycles are generally not encouraged on Interstate Highways especially in urban areas due to safety reasons but may be allowed in rare instances such as along TxDOT Bicycle Tourism Trail Network.

Since Design Speed and Structural Capacity are fundamental criteria of project design, design exceptions for these elements should be extremely rare.

Documentation for design speed design exceptions should address:

- Length of section with reduced speed compared to overall length of project
- Measures used in transitions to adjacent sections with higher or lower design speeds

Exceptions to design loading structural capacity criteria can have an impact on freight, emergency, and military transport, as well as the traveling public. Documentation for design loading structural capacity design exceptions must address:

- Verification of safe load-carrying capacity (load rating) for all State unrestricted legal loads or routine permit loads, and all Federal legal loads.

Design exceptions are not needed for vertical clearances meeting the standard vertical clearance requirements of the respective roadway facility but do not meet the minimum vertical clearance requirements of the Texas Highway Freight Network (THFN). A THFN design deviation will be required in that situation. If neither the standard vertical clearance or THFN vertical clearance requirements are met, both a design exception and a THFN design deviation will be required.

Study Limits/Area of Influence

The area of influence is defined as the area that is anticipated to experience significant changes in traffic and safety as a result of the proposed design exception. The area of influence should be minimum of one mile and its limits should extend at least 0.25 mile beyond the approaches and departures of the design exception location(s) to evaluate any resulting traffic and safety impacts of the design exception. The safety analysis area of influence will generally match the traffic analysis area of influence.

Traffic and Safety Data

Traffic and safety analysis uses crash data, traffic volume, roadway geometrics, and traffic control data. The TxDOT Crash Records Information System (CRIS) generates detailed crash data which should be used to determine crash types, crash severities, crash locations, contributing factors, and crash rates. TxDOT Statewide Traffic Analysis and Reporting System (STARS) and the TxDOT Statewide Planning Map are good resources for traffic data. The design year daily traffic should match with the AADT shown on schematics.

Traffic Analysis

Generally, the traffic analysis required to support project design is sufficient to evaluate the effect of proposed design exception. Additional analysis if required, should include analysis for opening and design years for existing (no-build) and build with design exception. The traffic analysis methodology is based on project scope, area type, existing traffic conditions and analysis tools. The use of tools and analysis approach should be similar to the analysis for the overall project and match the complexity of the project. Please refer to Traffic and Safety Analysis Procedural Manual (TSAP) for additional guidance.

Traffic Forecasting

Future traffic volumes will be needed for the traffic and safety analysis. Generally, the forecast developed for overall project is sufficient for design exceptions. The TxDOT Transportation Planning and Programming (TPP) Division is responsible for the guidance and approval of traffic forecasts. Refer to latest TxDOT TPP Corridor Analysis SOP for current and additional guidance.

Safety Analysis

The Scope and Methodology for Safety Analysis will be based on project type, design exception type, location and complexity, crash history, and project objectives. TxDOT generally uses one of the following options:

- Option A – Historical Crash Analysis <u>and</u> AASHTO's Highway Safety Manual (HSM) Predictive Method
- Option B – Historical Crash Analysis <u>and</u> evaluation of Crash Modification Factors (CMFs)

Option A is the preferred methodology. If, however, the HSM predictive method cannot be used, Option B can be allowed. The selection of analysis tools and methodology should match the scope and complexity of project. Generally, the methodology used to support project schematics/design should be used for design exception request. Please refer to Traffic and Safety Analysis Procedural Manual (TSAP) for additional guidance.

<u>Crash Data</u>
Crash data involves review of the latest three to five full calendar years (January 1st to December 31st) of historic crash data with respect to crash characteristics such as severity, types, frequency, rates, patterns, clusters, and their relationship with crash contributing factors. The period can be reduced to two years, if there is a significant change in traffic and roadway conditions.

<u>Historical Crash Data Analysis</u>
The safety impacts of a design exception are some of the most important determinations that need to be made and justified. An analysis of historical crash history is first needed to identify any existing safety issues through the review of crash trends, patterns, and rates near the design exception location.

The data is first summarized into two tables showing crash frequency by severity and by manner of collision. Crash rates of the location are then compared to average statewide rates of similar facility types. The historical crash data analysis will be conducted for the latest three to five years for existing conditions. The results of the historical crash data analysis are used to identify or confirm safety problems within the project study area. The data analysis should include:

- Crash frequency by severity for each year
- Crash frequency by crash and severity types for each year
- Statewide crash frequencies by severity for similar interstate type for each year
- Crashes by manner of collision
- Crash rates (to be compared with statewide averages for similar interstates) for each year
- Crash diagrams such as heat maps, bar charts or other maps graphically showing the high crash locations along the study area roadways or at interchanges

The results of these data analysis should be used to evaluate safety of existing conditions and how they relate to the future design exception conditions. Special attention should be given to the effects the design exception condition will have on the number of fatal and suspected injury crashes.

Predictive Crash Analysis

Predictive, or quantitative safety analysis, involves using HSM-based methods that use safety performance functions (SPFs) and CMFs to estimate anticipated change in crashes from existing condition to the proposed design. If the design exception request involves safety related features that are adequately addressed in the AASHTO Highway Safety Manual, then documentation of the exception should include predictive safety analysis as described in the manual. The predictive analysis will be done for no-build and build conditions with and without design exceptions for the design year. Currently, TxDOT supports the use of the following analysis tools:

- For Urban Interchanges – Enhanced Interchange Safety Analysis Tools (ISATe)
- For Urban Corridors – Interactive Highway Safety Design Model (IHSDM)
- For Suburban/Rural Areas – Highway Safety Software (HSS)/IHSDM
- For all types of project area - TxDOT HSM Predictive Model Spreadsheet tools

The analysis approach and the analysis tools should be similar to the analysis for the overall project and match the complexity of the project. Please refer to TSAP manual for additional guidance.

A predictive analysis is used to estimate changes in crashes from existing conditions compared to the design exception conditions. It can also be used to compare safety performance of an alternative design considered as well as to estimate reductions in crashes by implementing mitigation measures. Special attention should be given to the effects the mitigation measure will have on the estimated number of fatal and suspected injury crashes over the analysis period of the design exception. However, predictive analysis may not apply to some design exceptions. Vertical clearance for example, is not considered by predictive analysis software and CMFs cannot be used/are not available to perform a predictive analysis. A qualitative assessment could then be provided based on an analysis of historical crash data for existing structures/conditions.

Crash Modification Factors (CMFs)

There are two types of CMFs (HSM Part C and Countermeasures CMFs). Countermeasure CMFs are used to estimate the impacts of countermeasures on safety. The CMFs should be selected based on the following:

- Study area context matches the context of CMF
- Quality of the study that developed CMF

The Crash Modification Factor Clearinghouse (www.cmfclearinghouse.org) offers a repository of CMFs. TxDOT Design Division has developed a guide to select the appropriate CMF. TxDOT Design Division also developed a suggested list of commonly used CMFs. Please refer to TSAP manual for additional guidance for safety analysis.

Analysis of Design Alternatives Considered

An analysis of design alternatives considered is necessary to show that alternative designs, their safety impacts and their costs were considered before deciding on the design exception alternative, as it aids with justifying the design exception need by comparing maximum benefits of the project to any associated safety and cost tradeoffs.

An alternative analysis needs to be performed during the project development. At a minimum, the following alternatives will be considered:

- No-build alternative
- Proposed build alternative
- Build alternative with no design exception

There are many approaches to this analysis that can be taken. One of the most common ones applicable to design exceptions is to compare the costs and benefits/impacts of each alternative.

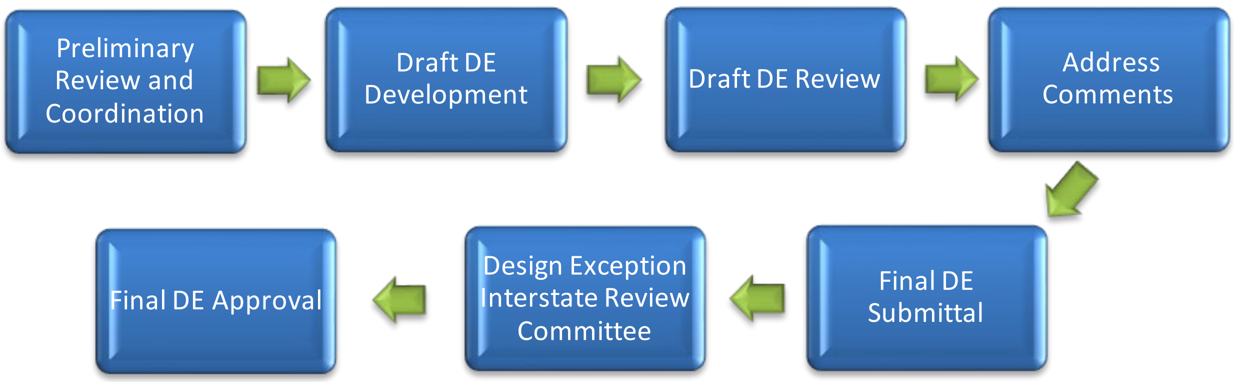
Analysis of Proposed Mitigation Measures

Practical mitigation measures should be considered to alleviate any anticipated adverse safety impacts attributed to design elements of controlling criteria with proposed values less than required minimum values. FHWA's Design Decision Documentation and Mitigation Strategies for Design Exceptions (March 2024) provides information on how design exceptions might impact safety and some suggested mitigation strategies when controlling criteria is not met. It suggests many practical measures, such as signing, rumble strips and delineation, that yield high benefits with minimal costs.

The application of CMFs and Crash Reduction Factors (CRFs) is one way to quantitatively analyze the effects of implemented mitigation measures in an effort to reduce the number and/or severity of crashes that may result from a proposed design exception. FHWA's CMF Clearinghouse provides CRFs and CMFs applicable to a wide array of countermeasures used for mitigation. CRFs and CMFs can be used to estimate how proposed mitigation measures are expected to impact safety after implementation. The CRF/CMF of the proposed mitigation measure can be applied to the predicted number of crashes resulting from the previous predictive analysis conducted, if the mitigation measure was not included in the original analysis, to predict how safety will be impacted by implementing the mitigation measure. Special attention should ibe given to the effects the mitigation measure will have on the estimated number of fatal and suspected injury crashes over the analysis period of the design exception. If multiple mitigation measures are proposed in conjunction with one another, the combined effects of their CRFs/CMFs can be applied as described in AASHTO's Highway Safety Manual.

Some mitigation measures, are more difficult to analyze quantitatively than others, such as overhead lighting and signing. Analyses for these types of mitigation measures that may not have defined CRFs/CMFs might be more subjective but can be just as important to help mitigate design exception conditions. They should also be included, and their benefits discussed.

Design Exception Process



1. District Designer/consultant will identify the need for design exception (DE) and request initial concurrence from Design Division (DES). If needed a coordination meeting may be held. DES may invite FHWA Area Engineer.

2. District designer/consultant will prepare the design exception request using TxDOT SOP and template.

3. District will submit the draft design exception request to DES. District to use the SOP checklist to conduct QC review and submit the checklist with the draft DE request.

4. DES will review the draft DE request and provide written comments to District.

5. District designer/consultant will address the comments and submit the final DE request to DES for approval. All comments should be addressed or resolved before final submittal. If needed a comments resolution meeting may be held. A concurrence from District Design Exception Committee should be provided to DES with the final submittal.

6. Final DE request will be presented to Design Exception Interstate Review Committee. The review committee members will include Interstate Team Lead, Director Project Delivery Section, Director Digital Delivery Section, and Director Bridge Design Section*.

7. DES Director will issue final approval letter.
TxDOT will submit annual report to FHWA. FHWA will perform annual audit and may also conduct spot check on some projects.

*Required only if the proposed design exception is bridge related.

Exception to Vertical Clearance

All exceptions to a 16' vertical clearance on the Interstate Highways will be coordinated with Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) of the Department of Defense. The coordination will be required for a new construction project, a project that does not provide for the correction of an existing substandard condition, or a project that creates a substandard condition at an existing structure. Following tasks will be performed:

- TxDOT Design Division will submit the SDDCTEA Form and copy to FHWA
- A response from SDDCTEA will be requested within 10 working days
- If no response is received from SDDCTEA within 10 working days, it will be determined that SDDCTEA does not have any concern for the exception.
- TxDOT Design Division will inform FHWA AE the final outcome of the SDDCTEA request

Quality Control and Quality Assurance

Districts are responsible for initial review and quality control (QC). DES will perform quality assurance (QA). A draft report should be provided for DES review. Detailed instructions for how to fill the Design Exception Form is provided in the following pages. Attachments to the Design Exception Request form also includes detailed checklist.

To ensure adequate time is incorporated into the project schedule, in addition to the district's review and addressing of any DES comments, the following should be considered:

- DES QA Review: allow 3 to 4 weeks
- Comments Resolution: allow 2 weeks
- Design Exception Review Committee: allow 2 to 4 weeks

Final design exception request should be submitted at least two months before the earliest letting date.

Request for Interstate Design Exception Form

Overview

As stated in 23 CFR 625.3(f)(2), *"the determination to approve a project design that does not conform to the minimum criteria is to be made only after due consideration is given to all project conditions such as maximum service and safety benefits for the dollar invested, compatibility with adjacent sections of roadway and the probable time before reconstruction of the section due to increased traffic demands or changed conditions."*

The Request for Interstate Design Exception form (see **Attachment D)** is designed to justify and expedite the approval process of a design exception based on the requirements set forth in the U.S. Code of Federal Regulations. The Request for Design Exception form provides opportunities to justify reasons for a design exception based on data. It also serves as a way to document the reasons why one design alternative was chosen over another if questioned at a later time.

The form should be completed and submitted for approval when minimum values of controlling criteria identified in TxDOT's Roadway Design Manual and AASHTO cannot be met. Requests for Design Exceptions on Interstate Highways must be submitted through TxDOT's Design Division's Project Delivery Section – Highway Safety & Operations for review and FHWA approval as further explained in the Design Exception Process of this SOP. Requests for Design Exceptions involving design loading structural capacity, bridge class culvert protection, or bridge rail shall be sent through TxDOT's Bridge Division for review and FHWA approval as also further explained in the Design Exception Process of this SOP. Complete the form for the Controlling project in contract and list all CSJs associated with the Request. The Design Exception Number must be unique for each CSJ listed on the request and must correspond to the Design Exception number listed on TxDOT's Form 1002.

All appendices included with this request should be referenced in the text where applicable.

Basic Request for Design Exception Form Information

The beginning of the DE form requires some basic information fields to be populated. These are needed mostly to understand the project's location, purpose and funding, and for filing and documentation purposes. The fields are listed with explanations and expectations as explained below.

Request for Design Exception No. – The number assigned to a Request for Design Exception is a unique number that is used to identify each design exception request submitted for a project. For example, one CSJ may have multiple DEs for the same design exception element, so by giving each DE a unique number, identifying each individual request becomes a less cumbersome task. The number assigned to the DE will then be used to associate that DE to the DE listed on Form 1002. The DE numbers for a project should be assigned sequentially, beginning with 1. If the same DE is submitted for multiple CSJs, the same DE number should be used for all CSJs listed on the request. In doing this, the numbering of DEs may occasionally result in some CSJs having to omit previous DE numbers if one CSJ has multiple DEs while another CSJ does not. If this occurs, Form 1002 will be used to document any unused DE numbers by showing those DEs as "Omitted."

Date – The date on the form represents the date the request was submitted for approval. It should be updated if the form is revised at any time.

District – The TxDOT district responsible for submitting the DE is shown here.

County – The county(ies) where the design exception is proposed should be listed here.

Letting Date – Planned Letting date of project as stated in TxDOTCONNECT

Highway – Principal Highway of Project
Limits - Project Limits as stated in TxDOTCONNECT
CCSJ - Controlling Control-Section-Job number of project
Subordinate CSJs Associated with DE: Subsidiary CSJs associated to CCSJ
Project No.
Proposed Work - Brief project description of work proposed

Section 1 — Type and Location of Design Exception

The purpose of this section is to clearly identify the design exception element(s), location(s) and values.

Table 1.1 is used to identify the design exception element(s) for the request. Options for all the controlling criteria of each category of construction project, as specified by the TxDOT Roadway Design Manual and in Chapter 2 above, are provided in the table. The design exception element(s) applicable to each request should be selected. Normally, only one design exception element should be submitted with each request, but there may be instances when analyzing multiple design exception elements together is a more logical approach. This approach is most often used when design elements are dependent upon one another. In other words, one design exception could not be approved/implemented without another. For example, if right-of-way is a constraint and lane and shoulder widths both need to be reduced, these elements can be combined into the same DE and the same predictive analysis applied to both. A Vertical Clearance design exception, on the other hand, would probably not be combined with a horizontal design element during analysis. In that situation, a DE for each design exception element would need to be submitted independently.

Another approach can be to group identical DE types into the same request, if reasons and analysis are similar/identical. A good example of this would be for short sections of reduced shoulders at multiple locations at sign bridge foundation locations or bridge column foundations. Traffic areas/behavior should be similar, etc. Historical and predictive analyses still need to be done for each location.
Design exceptions for the same design element at multiple locations should be able to be grouped into the same Design Exception request as long as the justification of the design exception is the same for all locations. Basically, the responses to all the questions in the template should be the same for all the locations included in the request. The roadway segments, cross sections, and traffic conditions should also be similar and in close proximity. The crash history and predictive analysis will still need to be performed for each location included in the request. This safety study needs to establish that there is no existing safety issue at each location and that there will be minimal or no safety impacts under the proposed conditions.

This approach may help reduce the number of requests for the same design element, but it should still be taken into consideration that combining them this way can carry some additional risk since if one or more locations is not justified for a design exception, all locations included in the request will be rejected together instead of just the ones in question.

Table 1.2 is used to document all the design exception location(s) and values for the request in an easy-to-reference table. Only one design exception location should be listed per row. The columns of the table represent the data that should be included for each design exception location. These column descriptions are listed below:

> **Interstate Number, Direction of Travel, Rd Part** – The interstate number identifies the interstate, its direction of travel and associated road part (mainlane, ramp, etc.).

Design Exception Element – The design exception element should be listed here. It should match Table 1.1 design exception element for clarity when multiple design elements are included in the same form.

Location(s), Beginning and Ending Milepoint (MP), Destination from Origin (DFO) and Station(Sta) – The beginning and ending limits, by MP, DFO, and Sta., for each design exception element should be listed to show the length and location of each design exception location. MP's, DFO, and Sta are needed and used when referencing plan sheets, crash data, and actual geospatial locations.

Minimum Design Value – The minimum design value of the controlling criteria, as required by the source referenced in the last column.

Proposed Value – The proposed value of the design exception element.

Existing Value – The existing value of the design element, if applicable.

Design Value Reference(s) – The specific reference from where the minimum design value of the controlling criteria that cannot be met, referencing any applicable sources, page numbers, tables, etc. The design value reference should fall under the design criteria specified on Form 1002 under the Proposed Basic Design Data. This normally references the Proposed Design Standards (Roadway) criteria, but for design exceptions for structural design elements, the Proposed Design Standards (Structures) may also be referenced.

Section 2 — Brief Project Description

The purpose of this section is to provide a brief project description with any applicable project information to assist the reader in becoming familiar with the project and its purpose. The description should include a regional vicinity map and project location map clearly identifying the project location (using milepost, DFO and station). Aerial views can also be included in the form to help support discussion in the document. Attaching a kmz file to the DE is also recommended to help the reader understand the project and location. Online maps will be used when reviewing design exceptions to help locate a project, studying the roadway and adjacent area and features, and measuring distances.

The project description in this section should include the project's scope and purpose. These are partly taken into consideration when justifying the need for a design exception. For example, a design exception for added capacity, or for a new location roadway. The latter would often require more justification for approval. If the project involves any special circumstances or considerations, these should be described in this section.

The length of the project might also be considered when justifying the need for a design exception, as the ratio of cost to fix the design exception compared to the total cost of the project might affect the benefit to cost ratio that can be considered having the greatest benefit to the community.

The description should include all design exception locations and reference them on plan sheets, including existing and proposed typical sections, plan and profile sheets, cross sections, aerial views, etc., as applicable, in the text and attachments. If the DE is for design speed, the description should include the length of the section with reduced speed compared to the overall length of the project. If the DE is for design loading structural capacity, the description must address the verification of safe load-carrying capacity (load rating) for all State unrestricted legal loads or routine permit loads, and in the case of bridges on the Interstate, all Federal legal loads.

Section 3 — Why Nominal Design Value Limits Cannot be Met

This section provides the opportunity to justify the need for the design exception by including an explanation and description of the reasons why the minimum values of the controlling criteria listed in Table 1.2 cannot be met. The explanation should address each location listed in Table 1.2.

Section 4 — Future Projects Programmed to Remove Design Exception

The purpose of this section is to describe any future projects programmed in the STIP (within the next 4 years) and/or any projects not programmed in the STIP that are planned to remove the design exception condition(s) and bring the design up to standard. Information should demonstrate if there are plans to eventually remove the design exception. Any commitment(s) made that those projects will be completed in the next few years should be described, as well as the length of time the design exception is anticipated to be in place**.** If a project is programmed in the STIP, this demonstrates a good level of commitment. However, if a design exception is not to be corrected within STIP time frame, than it should be considered as permanent for the analysis purposes. The length of time that a design exception is expected to be in place and the commitments made to upgrade the design to standard are taken into consideration when justifying the need for the design exception.

Section 5 — Compatibility of Proposed Design with Adjacent Roadway Sections

The adjacent roadway sections and how the corridor and proposed design exception condition relate to driver expectancy should be described in this section. Specific areas, their distances from the project, the existing design values in those areas and how those sections are currently operating should be described. This information is taken into consideration to justify the need for the design exception but should not be the only reason. Planning should consider how the corridor can meet criteria with future projects and not keep prolonging substandard designs.

If adjacent roadway sections are not compatible or consistent with the corridor and the proposed design exception condition, mitigation measures, at a minimum, should be taken to address driver expectancy and described in the subsequent Section 8.

Section 6 — Design Exception Condition Traffic and Safety Analysis

Crash History and Anticipated Changes to Crashes

The purpose of this section is to analyze historical crash data as well as the anticipated changes to safety with the implementation of the design exception (predictive safety analysis). A comparison of these analyses can then be done to quantitatively analyze the safety aspects of the project.

The study limits for the crash data analysis (existing conditions) and the predictive safety analysis (proposed design exception conditions) need to be identical for comparison.

Historical crash data for at least the three most current years of data available are analyzed to identify any existing safety issues in the area of the design exception.

The existing and design year AADT used for analysis should match the AADTs shown on schematics, Form 1002 and PS&Es.

The data is first summarized in three tables (6.1-6.3) by summarizing frequency of crash results by severity, by manner of collision and by total volumes of crashes. Comparison of results to statewide averages for a similar Interstate facility type must include crash rate comparison between the specific project vs. statewide average crash rates.

The similar Interstate facility type used should match the FUNC SYS ID field if CRIS data is used.

Table 6.3 is populated with the total crashes and AADT per year, for the same years included in Tables 6.1 and 6.2. The crash rate is then calculated and included for each year, and the average statewide crash rates for similar facility types are also included for each year, as reported from Traffic Safety Division (TRF's) website.

The crash rate per 100 million vehicle-miles of travel (HMVMT) for the design exception study area is calculated using the formula:

$$R = \frac{10^8 \times C}{365 \times N \times V \times L}$$

Where:

R = Crash rate for the road segment expressed as crashes per 100 million vehicle-miles of travel (HMVMT)

C = Total number of crashes in the study period

N = Number of years of data

V = Number of vehicles per day (both directions)

L = Length of the roadway segment in miles

There are certain instances when including crash history may not be applicable to a request. An example of this would be if there was no crash history available, such as a new location highway. In these instances, an explanation for not including the information should be included in this section. In some instances, the analysis limits may be short and would not provide reliable crash rate. The length of segment should not be less than one mile.

Discussion should be included in the form analyzing the results of the crash history. Trends and crash rates can be analyzed over time. If changes to the design were made at one time during the crash history, changes to crash history attributed to that change could be interpreted. Contributing factors from crash data can be summarized to determine possible causes of crashes.

Trends for severity of crashes can be analyzed. An increase in more severe crashes should especially be analyzed and discussed. Can they be attributed to speed or geometric designs?

Predictive analyses (if applicable) for the opening year and the design year are then performed to analyze the anticipated safety impacts if the design exception is implemented compared to existing conditions (the no-build alternative) and summarized in Table 6.4. The predictive analyses worksheets for the existing condition and design exception condition should be included in the attachments of the DE.

If adjacent roadway sections are compatible with the proposed design exception condition, the existing traffic and safety in those adjacent sections can also be discussed to anticipate the traffic and safety of the proposed design exception.

When CRFs/CMFs are used for this discussion, they should be cited with their corresponding ID number as shown in the CMF Clearinghouse.

Traffic analysis discussion should include comparison of existing condition (no-build) and build with design exception for opening and design year.

Section 7 — Comparison of Design Alternatives Considered

a. Description of Alternatives, and Alternative Quantitative Analysis

The purpose of this section is to describe alternatives including No-build, Build with design exception and Build meeting design criteria. This section will also include justification for selecting the alternative with design exception. A summary comparison of alternatives supported by data and/or cost comparison should be included.

A comparison of the predictive analyses of the alternative designs considered is a way to show that safety may be better for the design exception condition compared to the design alternatives considered. For example, a predictive analysis may demonstrate that safety may be better for an 8-lane section with a narrow inside shoulder instead of a 6-lane section with the 10' inside shoulder since the predictive analysis takes into account current and future AADT and number of lanes.

The design alternatives analysis and cost comparison provide ways to quantitatively justify reasons for design exceptions. The quantitative analysis under this section are critical to provide justification and documentation of design exception request.

b. Additional Discussion on the Proposed Design Exception's Impact to Project to Justify Not Selecting an Alternative Design.

The quantitative analyses included throughout the design exception request assist in comparing alternatives to justify the need for a design exception. However, sometimes these analyses will not apply to all design exceptions or other factors may be the main drivers for a design exception. Section 7.b. provides the opportunity to discuss other benefits and/or impacts of the proposed design compared those of the alternatives considered in Section 7.a. that should be considered in addition to other quantitative analyses for justifying the need for the design exception.

Additional discussion on other factors that will benefit from or be impacted by this design exception compared to the other alternatives considered should be included in section 7.b. These other factors might include project schedule, constructability, traffic control, operations, right-of-way, the community, environment, cost, usability by all modes of transportation, incident management, storm drainage, and/or other considerations that are not easily quantifiable or addressed in other sections of the form. Discussion should address how each of the other factors will be impacted by each alternative considered and how those impacts compare to those of the proposed design.

The results of Table 7.1 can be used in conjunction with the discussion in section 7.b. to quantitatively make an objective decision on which alternative is the preferred design, taking into consideration both safety and cost over the analysis period.

Section 8 — Proposed Practical Mitigation Measures, Their Costs and Impacts to Safety

The purpose of this section is to discuss any proposed mitigation measures, their costs, and their anticipated effects on safety. Mitigation measures should be taken whenever practical to alleviate safety impacts attributed to a design exception. This is especially imperative if the design exception condition is not consistent/compatible with adjacent sections of roadway. If adjacent roadway sections are not compatible or consistent with the corridor and the proposed design exception condition as discussed in Section 5, mitigation measures should be taken to address driver expectancy and described in this section. If the DE is for design speed, the measures used in transitions to adjacent sections with higher or lower design speeds need to be addressed in this section.

Each proposed mitigation measure should be described and its associated costs listed. A discussion on how each mitigation measure is anticipated to impact safety over the analysis period for the design exception must also be included. When CRFs and CMFs are used to quantitatively estimate how the proposed mitigation measures are expected to impact safety after implementation, they should be included and cited with their corresponding ID number, as identified in the CMF Clearinghouse.

Other proposed mitigation measures that cannot be analyzed quantitatively should still be discussed with their costs and anticipated benefits.

If no mitigations measures are to be implemented, justification should be provided as to why they are not proposed.

The inclusion of mitigation measures demonstrates an effort to mitigate the safety implications of design values that are less than minimum criteria. Proposing mitigation measures also provides additional reasons to justify a design exception over a design that does not.

Attachments
The last section on the form provides a location to list any documents that will be attached to the DE for supporting information. The title shown for each attachment listed should match that on the corresponding document.

All attachments should be labeled with an appropriate title and page number. Specific information applicable to the design exception in the attachments should be labeled and called-out accordingly for easy reference. Each attachment should be referenced within the text in the form where applicable.

The form lists some suggested attachments that are commonly applicable to most design exceptions, but is not a definitive list. However, regional vicinity maps, project location maps, native analysis files, and project layouts with project limits labeled by milepost, DFO and station should accompany every request.