



Focusing Road Safety Audits on the Intersection: An Effective Tool for Improved Safety

The toll from intersection crashes remains an important health and economic issue in the United States. 8,061 fatal crashes and 767,000 injury crashes were considered intersection related in 2007. Every year, states, counties, regions and municipalities spend considerable resources trying to reduce crashes by redesigning, constructing and implementing operational changes to improve intersection safety. This work—crash reduction—remains necessary and should continue to be of high priority for transportation agencies. However, these activities tend to be reactive in nature, and this leaves an opening for a proactive, programmatic approach to intersection safety—focusing the road safety audit (RSA) on the intersection.

What is a Road Safety Audit?

In recent years, road safety audits have been embraced by transportation agencies as a means of proactively identifying opportunities for reducing crash risk. An RSA is the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. The aim of an RSA is to answer the following questions:



Figure 1: Road safety audit team

- What elements of the road may present a safety concern: to what extent, to which road users, and under what circumstances?
- What opportunities exist to eliminate or mitigate identified safety concerns?

Public agencies with a desire to improve the overall safety performance of roadways under their jurisdiction have been excited about the concept of RSAs. RSAs can be used in any phase of project development—from planning and preliminary engineering to design and construction—or as a tool within an overall asset management program. RSAs can also be used on any sized project, from minor intersection and roadway retrofits to mega-projects.

RSAs represent an additional tool within the suite of tools that currently make up a multidisciplinary safety management system. RSAs build on other road safety improvement strategies and techniques already in place and do not replace them. RSAs are:

- Focused on road safety.
- A formal examination.
- Proactive in nature.
- Conducted by a multidisciplinary team of three to five auditors.
- Conducted by an audit team that is independent of the design team.
- Conducted by an audit team that is adequately qualified both individually and as a team.
- Broad enough to consider the safety of all road users and road facilities.
- Qualitative in nature.



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It is important to note that confusing RSAs with the quality control of design is the most common misinterpretation of the role and nature of an RSA. Compliance with design standards, while important, does not necessarily result in an optimally safe road design and, conversely, failure to achieve compliance with standards does not necessarily result in a design that is unacceptable from a safety perspective.

Two key resources are available:

- *FHWA Road Safety Audit Guidelines* (Publication FHWA-SA-06-06)
- *Pedestrian Road Safety Audit Guidelines and Prompt Lists* (Publication FHWA-SA-07-007)

What Are the Steps in an Intersection-Focused RSA?

Intersection-focused RSAs typically include the following steps.

- **Step 1: Identify the new project or existing intersection(s) to be audited.** The project or existing intersection(s) to be audited is determined, and the parameters for

an RSA are set. The intersection can be a single location or group in a network or corridor.

- **Step 2: Select an RSA team.** The project owner is responsible for selecting the RSA team leader. The project owner and the RSA team leader then select a set of qualified individuals from within the agency, from another public agency, or from outside sources to be the audit team. RSA team members should be a multidisciplinary group of experts with backgrounds in road safety, traffic engineering, and/or road design. In addition, other areas of specialty such as enforcement may also be considered depending on the type of project. Regardless of where they find the team members, the audit team itself must be independent of the project being audited.
- **Step 3: Conduct a pre-audit meeting to review intersection information.** This meeting brings together the project owner, the design team, and the audit team to discuss the context and scope of the RSA and to review all project information available.

- **Step 4: Conduct both a review of intersection data and a field review.** The objective of intersection data review is to gain insight into the project or existing intersection(s), prepare for the field visit, and identify areas of safety concern. The field visit is used to get further insight into the project or existing intersection and to further verify/identify areas of safety concern.
- **Step 5: Conduct an audit analysis and prepare report of findings.** The safety issues are identified and prioritized, and suggestions are made for reducing the degree of safety risk. The RSA results are then succinctly summarized in the formal RSA report.
- **Step 6: Present audit findings to the project owner and design team.** The audit team orally reports the key RSA findings to the project owner and design team in order to facilitate the understanding of the RSA findings.
- **Step 7: Prepare a formal response.** Once submitted, the formal response becomes an essential part of the documentation for a new project or the safety management of existing intersection assets. It outlines what actions the project owner and/or design team will take in response to each safety issue listed in the RSA report and explains why some of the RSA suggestions could not be implemented.
- **Step 8: Incorporate findings into the new project or existing intersection when appropriate.** This final step ensures that the corrective measures outlined in the response report are completed as described and in the timeframe documented.

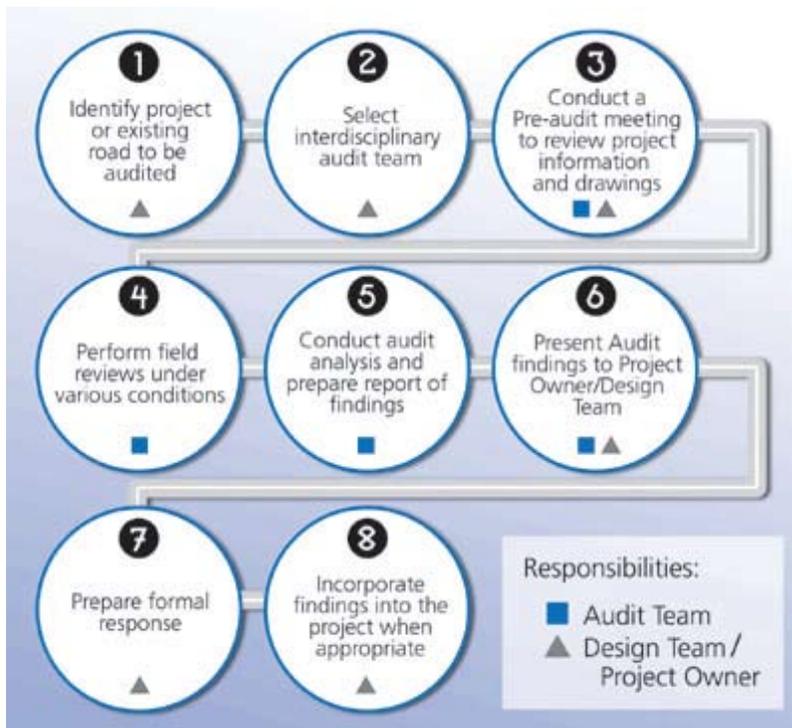


Figure 2: Flow chart for conducting an audit

What Should be Audited?

RSAs may be conducted during the regular process of system management and operations, and practically at every stage in the infrastructure

lifecycle at intersections. RSAs applied early in the planning and preliminary (functional) design of intersections offer the greatest opportunities for beneficial influence. As a design progresses into detailed design and construction, changes that may improve safety performance typically become more difficult, costly, and time consuming to implement.

Preconstruction RSAs are performed at those points in the project lifecycle before the construction of the facility begins. In this phase, changes may still be made with limited delay to the project and with less expense. Preconstruction RSAs include the following:

- Planning (feasibility) RSAs.
- Preliminary design RSAs (functional design RSAs).
- Detailed design RSAs (final design RSAs).

Construction RSAs are generally performed during preparation for construction, during actual construction, and during the pre-opening period. In this phase, the audit team may actually view the project as built, along the final detailed plans, so that their review may be more comprehensive. There are three RSAs that may be conducted during this phase, as follows:

- Work zone traffic control plan RSAs.
- Changes in design during construction RSAs.
- Pre-opening RSAs.

Postconstruction phase RSAs are conducted on existing intersections. This type of RSA is somewhat different from those conducted during the preconstruction or construction phases. The procedure used for conducting an RSA of an existing intersection allows the audit team to observe firsthand how all road users are interacting with the intersection and allows operation and crash data to be examined.

What Resources are Needed?

RSAs require the assembly of an RSA team consisting of representatives with a variety of experiences and expertise (e.g., design, traffic, maintenance, construction, safety, local officials, enforcement personnel, first responders, human factors) specifically tailored to the intersection(s) under study. The owner must manage the RSA process and ensure that the suggestions for the intersection(s) in the audit report are properly addressed. The design team must provide enough information to the RSA team to allow them to conduct the RSA properly.

The cost of a road safety audit is often an insignificant amount compared to the overall intersection project development or improvement costs. In the United States, highly complex RSAs for major projects (with a capital cost in the hundreds of millions of dollars) have been conducted at a cost of \$30,000 to \$40,000. Small audits for relatively minor projects can be com-

pleted for a cost of \$15,000 or less. Audits can be conducted by in-house transportation department staff or by a consulting organization.

The cost of implementing the acceptable suggestions from the RSA (including redesign) may be relatively low and manageable, since by definition RSA suggestions need to be compatible and cost-efficient relative to the phase of the project. Allowance should be made in the original design cost projections and time schedule of projects for both audit and possible redesign.

What are the Benefits of Intersection-Focused RSAs?

A number of reports suggest that the RSA process is cost-effective, although most reference qualitative rather than quantitative benefits. The major quantifiable benefits of RSAs at intersections can be identified in the following areas:

- Throwing away costs and reconstruction costs to correct safety deficiencies are identified once roads are in-service are either avoided or substantially reduced.
- Lifecycle costs are reduced, since safer designs often carry lower maintenance costs (e.g. traffic signal pole placement relative to the travelway).
- Societal costs of crashes are reduced by safer intersections and fewer, less severe crashes.
- Liability claims, a component of both agency and societal costs, are reduced.

With the low cost of conducting road safety audits, it is fair to say that audits need only to prevent a very low number of crashes, injuries, and fatalities over the life of the project to provide a high benefit-to-cost ratio. A wide range of studies into the benefits of RSAs have found significant benefits in collision reductions.



Figure 3: Pre-audit meeting.

Who is Now Using or Planning to Use Road Safety Audits?

The RSA concept was originally developed and introduced in the United Kingdom in 1989. The benefits of such systematic checking were soon recognized by many safety professionals around the world and the following countries, among many others, are actively conducting RSAs: the United States, Canada, the United Kingdom, Australia, New Zealand, Denmark, Norway, Ireland, Singapore, India, Italy, and Malaysia.

Road Safety Audits in the United States

There are many successful ongoing RSA programs in the United States. The following Web sites contain information on how to implement an RSA program and offer prompt lists that may be used for conducting an RSA.

<http://safety.fhwa.dot.gov/rsa>.

RSA training is available through the National Highway Institute (NHI).

Road Safety Audit Training
Road Safety Audit and Road Safety Audit Reviews
(course FHWA-NHI-380069)
http://www.nhi.fhwa.dot.gov/training/course_detail.aspx?num=FHWA-NHI-380069&num=
National Highway Institute (NHI)
<http://www.nhi.fhwa.dot.gov>
703-235-0528.

Resources

Federal Highway Administration. *Road Safety Audit Guidelines*. FHWA-SA-06-06, 2005.
<http://safety.fhwa.dot.gov/rsa/guidelines>.

Transportation Research Board. *Road Safety Audits: A Synthesis of Highway Practice*. NCHRP Synthesis Report 336, Washington, DC: TRB, 2004.
http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_syn_336.pdf.

Transportation Research Board. *Roadway Safety Tools for Local Agencies*, NCHRP Synthesis Report 321. Washington, DC: TRB, 2003.
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FHWA, Pedestrian Road Safety Audit Guidelines and Prompt Lists. FHWA-SA-07-007.
<http://drusilla.hsrc.unc.edu/cms/downloads/PedRSA.reduced.pdf>.

Austrroads. *Road Safety Audit, 2nd Edition*.
<http://www.rsatoolkit.com.au/>.

Road Safety Audit Guidelines, University of New Brunswick Transportation Group, Department of Civil Engineering, Fredericton, New Brunswick. Sponsored by: Maritime Road Development Corporation and the National Research Council's Industrial Research Assistance Program.

"NEW Guidelines and Training for Road Safety Audits," Transportation Safety Planning newsletter: January 2007 issue; page 3.
http://tsp.trb.org/assets/January%20FHWA%20newsletter_V2.pdf.

Safety Check, by Louisa Ward and Margaret Gibbs, *Roads & Bridges* magazine, June 2006
<http://www.roadsbridges.com/Safety-Check-article7071>

Being Proactive, by Chris Brown and Tricia Williams, *Roads & Bridges* magazine, June 2006.
<http://www.roadsbridges.com/Being-Proactive-article7074>.

RSAs For Safety.
<http://www.tfhr.gov/pubrds/06nov/05.htm>.