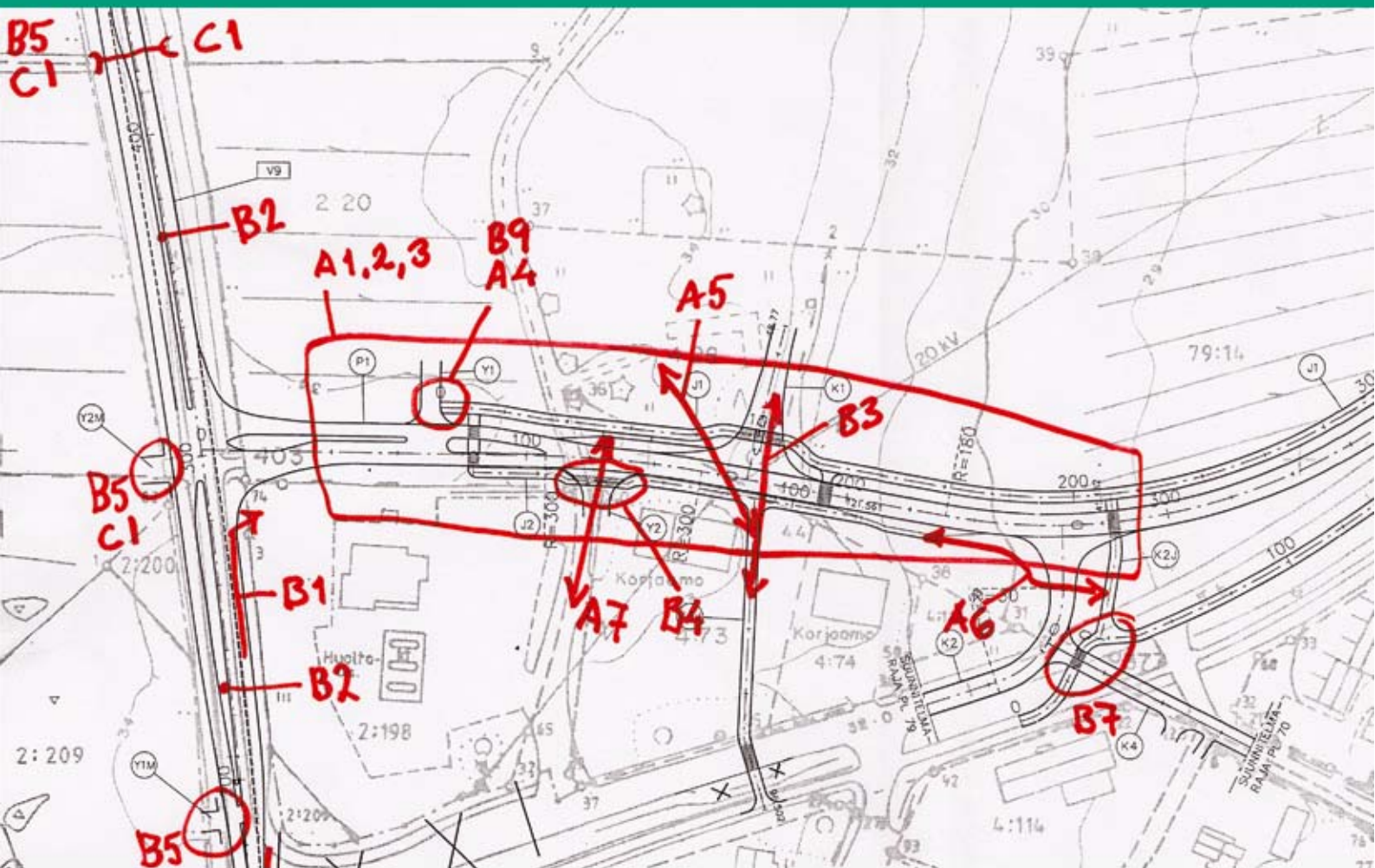


Safety audit of road designs



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Guidelines for design and implementation

Finnish Road Administration

Helsinki 2002

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This publication, Safety audit of road designs, is intended to serve as a guideline for safety audits of road designs, conducted by the client, the designer and the auditor specified in the publication. This guideline may also be applied to road safety audit of traffic arrangements at road work sites and new roads.

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FOREWORD

The purpose of road safety audits is to ensure the best possible quality of the plans from the standpoint of road safety. This publication is intended to serve as a guideline for road safety audit of different types of road design projects.

This guideline may be used by the party responsible for procurement of design and other parties involved in audits. This guideline focuses on describing the auditing process and does not attempt to answer questions regarding what is good or bad from the standpoint of road safety.

This guideline may be applied to different types of projects and their design phases. This guideline describes the principles of the auditing procedure, which are applied in a suitable manner in a design project. The purpose of this guideline is to establish road safety audit as a part of the design process. The auditing procedure should nevertheless be reviewed as road management procurement procedures are developed.

Development of road safety audit of traffic planning and town plans in Finland is included in the road safety program compiled by the Council of State in 2001.

The procedure presented in this guideline will be supplemented later with instructions for the inspector.

This guideline has been compiled by the central administration of the Finnish Road Administration. Preparation of this guideline was steered by a team consisting of Saara Toivonen, Matti Hämäläinen, Leo Koivula, Seppo Anttonoja, Matti Lahti, Pauli Velhonoja, Ari Liimatainen and Jukka Lehtinen.

Helsinki, November 2002

Finnish Road Administration
Traffic Engineering

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1 GOAL OF A ROAD SAFETY AUDIT

A road safety audit is a specified procedure in which a plan is reviewed from the standpoint of road safety, with the objective of influencing the plan's impact on road safety. The audit is part of the procedure used to commission planning and construction. The audit is conducted by a road safety expert outside the project's design team.

Road safety audits do not take a stand on the necessity of a project. The goal of auditing is to find aspects of a project essential to road safety already during the design phase and ensure that they are taken into consideration in planning and construction.

A road safety audit is conducted by design phase. The best results are attained if the audit is conducted in all phases of design. The manner of conducting an audit and the scope of an audit may vary in different phases. An audit does not take a stand on previous phases or possible safety audits of a plan.

This guideline focuses on describing the procedure for conducting a road safety audit of designs, but the procedure described in this guideline may be applied to road safety audits of an existing road or area.

2 WHICH PROJECTS ARE AUDITED?

The decision to conduct a road safety audit and the manner in which it is conducted is made by the client. The basic principle is that an auditing procedure is conducted for all designs. The manner of conducting and the scope of an audit depend on the features of the plan.

Special attention should be given to road safety audits if a project has the following features:

- The project has a significant impact on an area's road network, e.g., by changing speed limits, road types, junction arrangements or land use.
- The project affects a nationally significant part of the road network.
- The project affects an area where
 - there are conflicts between different road users, particularly between pedestrians and bikers and motor vehicles or
 - the traffic surroundings viewed from the road change, making it necessary for road users to adapt their behavior to comply with the surroundings.
- The project employs solutions whose impact on road safety is not known in Finland or very little prior experience has been obtained.
- The project employs a solution for which no guidelines have been given.

It is essential to review plans from the viewpoint of road safety and intervene at the right time if problems are detected. It is not meaningful to conduct a road safety audit of designs that do not influence the road safety of an existing solution. An example of such a project is a minor improvement of a structure in which the status of the road is unchanged.

3 ORGANIZATION OF AUDITS

3.1 Organization

Road safety audits are conducted in different types of projects that differ in size and history. The decision to conduct an audit and the manner of ordering and auditing is made case by case. An audit can be organized in two ways.

A. External audit

An external audit refers to a procedure in which the client has separate contracts with the designer and the auditor.

An external audit is recommended in the following cases:

- Projects with a broad impact.
- Designs that are part of a larger entity (e.g., construction in phases).
- Designs that include new technical solutions (e.g., new types of cross sections and new traffic control solutions).
- Audits of project packages. The client may write a letter of intent agreeing on a simultaneous audit of several small projects.

The plan order states that the plan will be audited by an auditor appointed by the client and that the designer must supply the auditor with necessary information.

The client takes the features of the project into consideration when selecting a suitable auditor. If members of the client's own staff participate in the audit, it is always considered to be an external audit.

B. Internal audit

An internal audit refers to a procedure in which the designer is responsible for conducting a road safety audit. Conducting an audit is included in the design commission. Unless otherwise agreed in a project, the audit is conducted according to this guideline. For example, in the case of a small project it may be agreed that an audit report is written but no meetings like those presented in this guideline are held.

If project design is subjected to bidding, the audit plan and the persons participating in auditing may participate in comparing bids and selecting a designer. If necessary, the client may set requirements for the auditor.

In an internal audit the auditor may represent the organization responsible for design. The auditor may also be from a different organization. The client's staff may not conduct the audit in an internal procedure.

3.2 Parties involved in an audit

Person in charge of a project (client)

The person in charge of a project is the client's representative in technical issues of a design project. He or she is responsible for the implementation of a road safety audit.

Designer's project manager

The designer's project manager is the consultant's person responsible for a design project. The project manager is responsible for road safety audit tasks belonging to the consultant. The primary task is to supply the auditor with necessary information.

Auditor, auditing team

An auditor is a person or team from outside the planning team, approved by the client. The auditor may be from the same organization as the designer or client.

An auditing team may consist of persons from different organizations, including the client's experts. Use of an auditing team is justified if the road safety audit of a project requires expertise from different areas. An auditing team consisting of several people should always be used in large projects that are significant from the standpoint of road safety. A team leader should be appointed who is responsible for communication between participating parties and completion of an audit report. The leader also participates in meetings during the audit. The other members of the team participate in meetings as necessary.

The client decides on requirements set for the auditor or auditing team. In deciding on requirements, the special features of the plan in question should be taken into consideration. The basic requirement is that the auditor understands the impact of the planned road solutions on traffic behavior and thereby road safety. Auditors should be familiar with current road design guidelines, but more important, they should be versed in road safety and road user behavior.

4 AUDITING PROCESS

This chapter presents a normative progression of an auditing process. Implementation of some phases differs depending on whether the audit is external or internal.

Figure 1 presents the principle of progression of an auditing process.

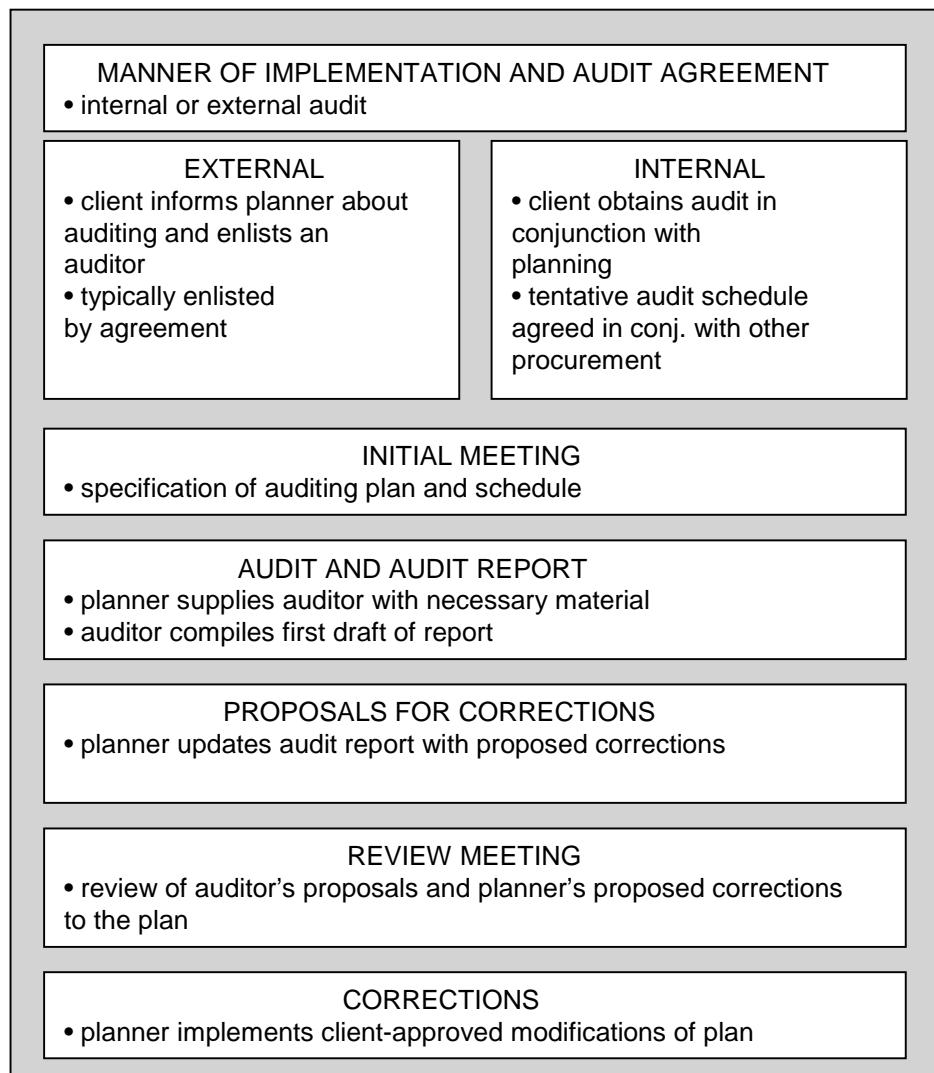


Figure 1. Normative progress of a road safety audit of a plan.

Decision on the manner of implementation and agreement on auditing

The client decides if the audit is external or internal and specifies the scope of the audit.

Based on the type of audit selected (internal or external), the client obtains an audit of appropriate scope.

Initial meeting

The objective of the initial meeting is to familiarize the auditor with the design work, establish initial information and agree on the progression of the audit in practice. The issues of the initial meeting may be handled during a work committee meeting dealing with project goals and principles. The initial meeting is held after the design work has been started. All the parties involved in the audit participate in the initial meeting.

The initial meeting makes a note of a possible audit conducted during the previous design phase, any proposals that were made and corrections made on the basis of the proposals.

It is not necessary to hold an initial meeting if the flow of information between participating parties is guaranteed otherwise and the parties have sufficient initial information about the project.

Audit and audit report

The designer supplies the auditor with necessary information by the date agreed on at the initial meeting. In selecting the date of the audit, time should be allowed to make corrections within the framework of the schedule. On the other hand, the plan should have progressed far enough to give a sufficiently accurate picture of the solution presented in the design phase in question. If the design phase comprises partial phases, the audit may be conducted by partial phase.

The auditor's task is to bring up the disadvantages of a plan from the standpoint of road safety. The auditor may propose suggestive improvements, but does not present any designs.

The auditor should conduct a comprehensive audit of the road safety of the plan from the viewpoint of different types of users. The plan should be assessed with two basic principles in mind: Does the plan:

1. reduce the number of accidents resulting from road user errors?
2. lessen the consequences of accidents?

The auditor writes an audit report containing observations made during the audit. The report functions as a common tool for all parties during the audit. During the course of the audit the report becomes a document that is appended to the design material. It indicates the road safety aspects that surfaced during the design phase.

Observations are categorized according to their "importance" to indicate the auditor's view of the priority of the problems. The report may contain photos and drawings that illustrate the issues.

A template for an audit report is given in *appendix 1*.

An audit report does not include

- design documents,
- excerpts from norms or directives,
- initial information presented in the plan,

- audit lists,
- extensive project information.

The report does not interpret plan agreement issues and it does not take a stand on the necessity or principles of a project. The report should be concise and easy to understand. The auditor submits the report to the designer for compilation of corrections and to the person in charge of the project.

The auditor may compare solutions presented in the plan to design guidelines. Systematic, groundless deviation from the guidelines should be mentioned in the audit report.

Audit lists may be used as an aid during auditing. The use of lists compiled in other countries may also be considered. The use of audit lists and other aids is primarily decided by the auditor. The danger in using audit lists is that the auditor concentrates on the details of a design. The main objective is to assess the road safety of the entity formed by individual parts.

If there are several auditors, the audit may be started on a distributed basis and concluded with a mutual meeting of all the auditors, where all observations are gathered and a common understanding is reached regarding their order of importance. This way different viewpoints are taken into consideration. The auditing team may conduct the audit by partial areas according to the expertise of the auditors or the auditors may audit the entire plan together.

If alternative solutions are compiled in the plan, either all the alternatives are audited or only the alternative chosen for further design. It is not worth auditing alternatives that most likely will not be implemented.

The audit should take the goals of the plan into consideration, especially if they differ from the ordinary objectives of the design phase. For example, the objective of a road plan may be to study the implementability of the results of previous design phases and prepare a project for processing according to the Road Act. More detailed technical design is done in conjunction with supplementary road planning and construction design.

Proposals for corrections

The designer reviews the audit report and proposes how the faults presented in the report can be corrected. If the designer decides the auditor's comments are groundless or the faults cannot be corrected, the designer must state the reasons.

Based on the audit report, the designer compiles proposals for correcting the observed deficiencies in safety and specifies their effect on costs.

Review meeting

A review meeting goes over the auditor's comments and the comments and improvement proposals prepared by the designer. The goal is to promote awareness of the issues observed in the audit during further design phases.

All the parties involved in the audit attend the meeting.

If the audit uncovers issues that are easy to correct, a review meeting is not absolutely necessary. Especially in that case, the audit documents must be completed and appended to the design material.

Corrections

The designer implements the changes resulting from the audit and approved by the client into the design. The audit report is appended to the design material.

5 AUDIT IN DIFFERENT SITUATIONS

5.1 Phased road design process

As a project progresses through all the design phases, the planning process may last years due to many factors. As the process progresses, the initial information, content and even the possibilities of implementing a project may change considerably.

At times there are long pauses between design phases, during which designs do not progress. For this reason an audit must be well reported in each design phase. As much as possible, faults detected during an audit should be corrected already in the final plan of the design phase in question. Whenever a new design phase begins, the design history must also be examined from the standpoint of the road safety audit.

During the first design phases the focus of the audit is on the impact that coordinating land use and a road has on safety. As the plan progresses, attention is focused more on the details of the road and its surroundings.

Feasibility studies and preliminary engineering

An audit of the feasibility study phase places the most emphasis on the impact on road safety of the status of the project in the road network, the type of road and the types of junctions. The feasibility study phase is audited if a study is made of needs or proceedings and if the project otherwise has the characteristics of an audited project.

The person auditing the feasibility study phase must have a good understanding of the long-term goals and strategies of road management. The auditor must assess how a plan supports implementation of the goals and indicate where it does not do so. Expertise in coordinating land use and traffic is beneficial. An audit does not question the grounds for a project and it is not a reassessment of strategic questions.

Many basic decisions with significant impact on road safety are typically made during the feasibility study phase, which are difficult to change during later design phases. Examples are the significance of a road in the road

network and decisions involving the separation of pedestrian and bicycle traffic and motor vehicle traffic.

The main attention of the preliminary engineering phase is on road geometry, cross-section, junction arrangements, bicycle and pedestrian path arrangements and design of the immediate surroundings.

If preliminary designs are made for several alternatives during the preliminary engineering phase, but only one is selected as the basis for further design, it is possible to audit only the alternative selected for further design.

Final engineering

As a design is specified in more detail during the last design phases, the audit should examine the effects the details of the plan have on road safety. Examples are traffic directing, detailed design of junctions and pedestrian crossing arrangements.

Audits of the last design phases emphasize analyses of the interaction of road users and the traffic environment and consequential road user errors.

Construction and a completed road

Audits conducted during construction and audits of completed roads should pay particular attention to traffic directing and how well traffic signals and road equipment can be seen and how they affect sight distance. Audits are conducted in different lighting conditions. Depending on the nature of the project, the road should be audited by car, by bicycle or on foot.

It is recommended that a completed road is audited before the new connection or new road arrangement is opened for traffic. An audit of a completed road ensures that a road constructed on the basis of only plans and their audits is truly safe.

It may be justifiable to conduct audits during construction and upon completion of a road using a simpler procedure than the ones presented for earlier design phases.

Auditing road performance

The audit examines whether the traffic behavior of road users has traits that can be considered road safety risks and if so, what the road owner can do to influence the matter.

Auditing of an existing road is conducted when the road has been open for traffic long enough so road user behavior has become established. If possible, separate audits should be conducted during the day and at night, and in winter and summer.

It may be justifiable to audit road performance using a simpler procedure than the ones presented for earlier design phases.

5.2 Projects containing new solutions

Projects containing new solutions, such as projects containing new roadside technology, do not actually change the road or its surroundings. Designing may only aim at changing traffic control to improve capacity and smoothness of traffic flow.

Projects containing new technology are a new type of project, and their impact is not known very well. Nevertheless, the use of new technology is increasing, and it is used to postpone more expensive traditional road projects. For this reason, it is very important to pay particular attention to the impact of these solutions on road safety.

Special attention should be paid to the expertise of the auditor when auditing plans containing new solutions.

5.3 Design during construction

In the case of design during construction, the client expresses the desired level of quality of the final product in the product requirements. The contractor constructs the site according to earlier plans (e.g., a road plan) and product requirements belonging to the contract agreement of the site. In such a case, product requirements have a major role from the standpoint of the final result. For this reason, the safety audit should focus on contract-specific product requirements during their specification phase.

In design and build contracts the implementer of a project can be required to conduct an internal audit.

TEMPLATE FOR AN AUDIT REPORT

An audit report may be compiled using a template like the following.

Project name, design phase

Client's contact person

Designer

Auditor(s)

<If there are several auditors, the one responsible for the team's work should be named.>

Brief description of the project

<Brief description of the location and goals of the project.>

Observations, comments and decisions on further actions

<The auditor records his or her observations. The observations are placed in order of priority according to the model below. The priority of the observations should not take into consideration the implementability of the changes. The designer should comment on their implementability.>

1. The plan should be examined.

<Issues that the auditor feels should definitely be re-examined. Leaving the solution as it was when audited requires good reasons from the designer and client.>

2. Actions should be considered.

<Viewpoints that should be examined during the ongoing design phase. The designer. >

3. Should be taken into consideration during the next design phase / construction.

<Requirements placed on coming design phases by solutions made in the present or prior design phases in order to produce a good end result from the standpoint of safety. Example: a plan is made to change the current four-way junction of a main road into two three-way junctions instead of a presented interchange in the basic road network. An interchange in the basic road network would be a significantly better solution from the standpoint of pedestrian and bicycle traffic. The auditor's comment here might be that a pedestrian and bicycle overpass/underpass should be added during a later design phase.>

Appendices

<Necessary maps, photos and drawings that illustrate the comments and proposed corrections resulting from the audit.>



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