GIORNATA di STUDIO S.I.I.V.

La Sicurezza Stradale nell'Adeguamento della Viabilità Esistente

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Procedure di analisi di sicurezza delle strade esistenti
Road Safety Review

Alfonso Montella

Università degli Studi di Napoli Federico II - Dipartimento di Ingegneria dei Trasporti "Luigi Tocchetti"

Via Claudio, 21 - 80125 Napoli

Ph +39 081 7683941 Fax +39 081 2390366 Mobile +39 338 3300236

E-mail alfonso.montella@unina.it

Outline of the presentation

- Definition of safety review
- Relationship between safety reviews and accident investigation studies
- Benefits of the procedure
- Main steps of the procedure
- International experience
- Italian experience
- The way ahead

Definition

- A safety review is a formal examination of an existing road, in which an independent, qualified team reports on the road's crash potential and safety performance

Definition

- Road safety review is:
  - formal because must follow certain procedures, and these procedures result in formal documents
  - independent because individuals who are detached from the project design team and road management undertake the review
  - conducted to assess the safety of all road users, including pedestrians, cyclists, motorcycles, trucks, buses, and automobiles

Definition

- Different names are used to indicate the same procedure
  - Safety reviews
  - In-service safety reviews
  - Safety audits of existing roads
  - Safety inspections
  - Road safety impact assessments

Safety reviews and accident investigation studies

- Safety reviews are complementary and not alternative to accident investigation studies
- Accident investigation is a “reactive programme”, it examines past accidents and aims to remove or change the features that contributed to those past crashes
- Safety review is a “proactive programme”, aimed at reducing road accidents before they occur

Reasons to complement accident ivestigation

- While accident data analysis is essential, it is well recognized that accident data suffer from a number of shortcomings and that there are clues to hazardousness other than accident occurrence

Some accident data shortcomings

- Accidents are a casual and rare event
  - if one site does not have experienced high accident history or if there are not abnormal accident patterns it does not mean that safety improvements can't be reached in a cost-effective manner
- There are important accident contributory factors that cannot be extracted from the collision statistics
- The success of the accident based reactive programs relies on the quality of accident data. Unfortunately, the quantity and quality of accident data is often very poor and the reporting of injuries in official accident statistics is incomplete at all levels of injury severity

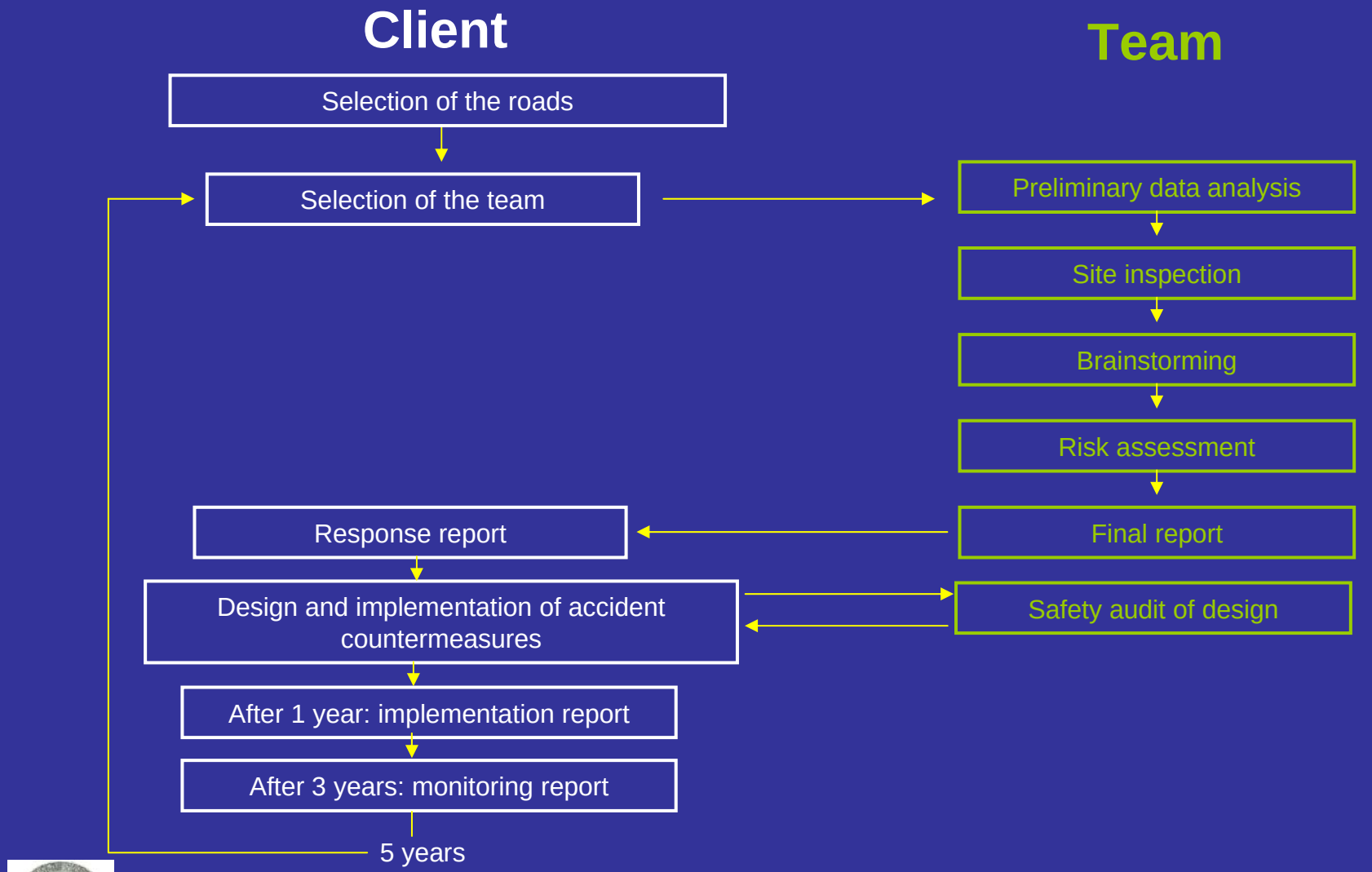
Other clues

- Safety reviews are helpful in identify mass action programs
  - This involves applying a particular, well tried remedy to address an hazardous feature, at locations where the feature is present, irrespective of whether accidents have yet occurred

Benefits of the procedure

- Safety reviews may be high cost-effective
- An Austroads research study (*Austroads Publication AP-R209/02)* reports that
  - the analysis of a range of existing roads reviews indicated benefit/cost ratios (BCR_s) between 2.4:1 and 84:1, when considering the value of completing the proposed actions identified in response to the review findings
  - the BCR_s of individual proposed actions within existing road audits ranged between 0.003:1 and 460:1
  - over 78% of all proposed actions had $BCR_s > 1$
  - approximately 47% of all proposed actions had $BCR_s > 5$

Main steps


Client
Team
Selection of the roads
Selection of the team
Preliminary data analysis
Site inspection
Brainstorming
Risk assessment
Final report
Response report
Design and implementation of accident countermeasures
Safety audit of design
After 1 year: implementation report
After 3 years: monitoring report
5 years

Selection of the team

- Road Authority selects the audit team
- The audit team has two essential requisites: independence and qualification
  - Independence from the design, maintenance and operation of the road to be reviewed is needed since the team has to look only at safety problems applying “fresh eyes” to the task
  - Qualification is vital for the process to be effective. The basic skills are:
    - a road safety specialist
    - a geometric design engineer
    - a traffic management engineer

Site inspections

- More site inspections are needed
- As an example, IASP procedures require:
  - preliminary inspections, in daytime, aimed at understanding the relationships of the road segments with surrounding land use, terrain and road network
  - general inspections, in daytime, aimed at examining the general safety concerns along the road segments
  - detailed inspections, in daytime, aimed at examining in detail safety concerns of specific sites
  - night time inspections, aimed at analyzing the road perception without natural lighting

Brainstorming

- In the office, the team focuses on the results of inspections and on safety problems
- Reviewers write a list of safety problems taking into account potential accident scenarios
- Each safety problem is discussed by the team in order to assess if it is really a potential contributory factor of road accidents and if countermeasures for his elimination or mitigation can be carried out
- For any problem, the team defines recommendations, which are engineering solutions to the reported problem
- Audit team can use checklists, which are aimed at ensuring that important safety problems are not overlooked

Safety review report

- The team writes the Safety Review Report in "problem/recommendation" format, where
  - the problem is described in terms of an accident risk to a road user
  - the recommendation is an engineering solution to the reported problem
- The report contains all the information regarding job procedures, inspections, meetings with the Road Authority, and the results of the analysis

Response report

- The Road Authority is responsible for writing the Response Report. It outlines the actions that will be taken in response to each safety concern identified in the review report
- Different types of responses are possible
  - the Road Authority may accept the recommendation and implement it
  - the Road Authority may not accept the recommendation because of constraints
  - the Road Authority may not accept that the problem exists

Follow-up

- An essential follow-up to the review is monitoring the safety performances of the road and the actions undertaken in response to the review report

International experience

- In countries where the process is applied, national guidelines define the operational procedures
- Usually safety reviews are addressed as one of the stages of the audit process
- In New Zealand and Canada separated guidelines for safety reviews of existing roads have been edited

New Zealand

- Transfund New Zealand “Safety Audit Procedures for Existing Roads”,1998
  - the manual defines the sampling and describes inspection of the selected roads. From the data collected on the sample of roads, the audit team identifies the recurring themes and trends. The audit report concentrates on the recurring themes. The team’s recommendations are pitched at a policy level
- Road Infrastructure Safety Assessment (project under development)
  - the purpose of RISA is to provide a rating method to improve the systematic quantification of the safety impacts associated with items identified during an assessment. By using a quantitative rating method, the nation’s roads can be assessed with a greater degree of objectivity

New Zealand

- Transit New Zealand code of Practice for Temporary Traffic Management, third edition, 2004
- Site Condition Rating
  - High Standard
  - Acceptable
  - Needs Improvement
    - maximum of 4 hours to bring the site rating to an "Acceptable" standard or better
  - Dangerous
    - all work shall cease on site immediately and the temporary traffic management be brought up to an "Acceptable" level or better

Canada

- Transportation Association of Canada in 2003 published “The Canadian Guide to In-Service Road Safety Reviews”
- An In-Service Road Safety Review is an in-depth engineering study of an existing road using road safety principles with the purpose of identifying cost-effective countermeasures that would improve road safety and operations for all road users
- Reviews make use of overall collision history and patterns among many other measures in order to identify cost-effective countermeasures

Australia

- Many safety reviews are performed
- Austroads Road Safety Audit 2nd edition (2002) states:
  - "the value of a safety review is that it allows:
    - Identification of types of features that we know, in total across the network, are hazardous ..
    - Identification and treatment of other potential hazards at a crash location, at the same time that the accident causes are being treated.."
- Victoria Road Safety Committee recommends "that safety reviews of existing roads be undertaken on a regular basis to improve road safety and satisfy potential legal liability requirements."

USA

- In 2003 the FHWA commissioned the development of a document “RSA Guidelines and Checklists”
- One stage of the RSA is “existing roads”
- Team qualification
  - the team members should possess a minimum of five years of experience in road safety, traffic operations and road design, or other related disciplines
- FHWA intends to develop RSA software
- FHWA, in conjunction with the Institute of Transportation Engineers, supports a web site, http://www.roadwaysafetyaudits.org/

EU

- EU Commission in 2003 published the document “Road Infrastructure Safety Management”, where is stated:
  - The whole road network should be inspected frequently regarding potential safety deficiencies, in order to take the chance of implementing remedial measures way before potential accidents
  - Among others the inspection allows the implementation of short term small and low cost improvements, which can have a strong impact on road safety
- ERF in “Guidelines to Black Spot Management”, 2002, defines detailed safety inspection checklists

Italian experience

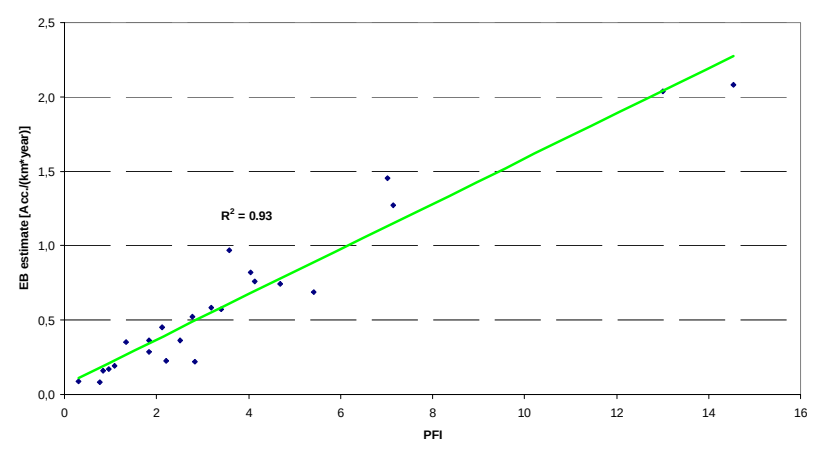
- No experience before 2000
- In 2000, pilot reviews have been performed
- In 2001, guidelines have been published
- Some application, but not enough (only a few roads reviewed, few actions after reviews)
- Guidelines need revision
  - they were written in the year 2000
  - they’re not based on consolidated experience
  - they’re not operational
  - different guidelines for design and existing roads can be useful

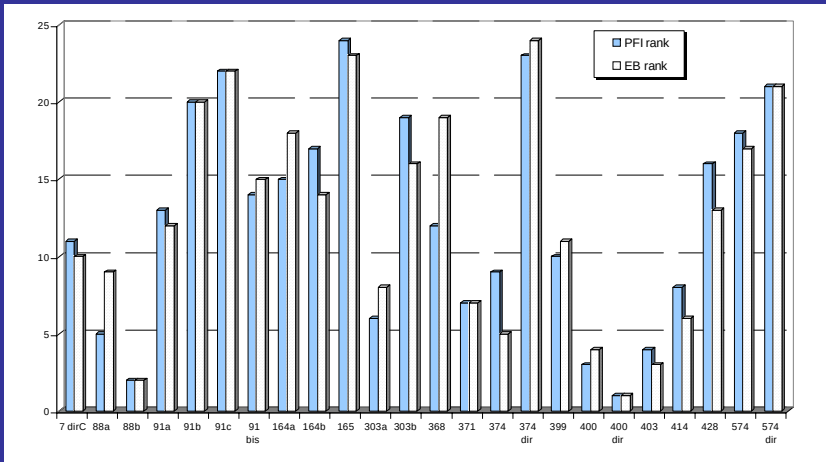
The IASP project

- The IASP project is funded by European Commission (DG TREN) and Province of Catania (Italy) with the scientific coordination and operative support of the University of Catania
- Results of the project will be explained in a future conference (Catania, early 2006)
- The research defined a RSI operative procedure able to improve the effectiveness and reliability of the methodology
- The procedure has proved to be effective to identify and to rank most safety issues
- Safety inspections are only a step of a more complex safety evaluation process which provides quantitative evaluations
- As a research outcome, a RSI operative manual will be published

The Potential For safety Improvement Methodology

- Research performed at University of Naples, with experimental application on 400 km of rural two lane highways at non intersections
- A systematic process to determine which road features should be investigated and how each feature should be evaluated during the review has been described





The work zone GSI

- Risk assessment procedure, specifically suited for workzones, developed at University of Naples
  - risk indicators have been defined: the Total Weighted Score of the main safety aspects, which relates to the risk factors that may be improved by engineering measures, and the Global Safety Index, which allows the evaluation of the global safety of the work zone and the ranking of work zones in the road network
- The procedure has been published in national and international journals; it is explained in wok zone safety courses in UK; applications in IRAN (by local engineers)
- Number of work zone safety audits in Italy = 0
- Are Italian wok zones very safe?

The way ahead

- Safety reviews are spreading around the world. For the process to be more effective, some improvements are needed:
  - More participation of the road authorities, since if reviews are not followed by corrective actions safety benefits cannot be reached
  - Road safety training of the personal involved in the road safety management
  - Road safety reviewers training
  - Road safety reviewers qualification
  - Compulsory RSA of countermeasures design
  - Research on quantitative methodologies of existing roads safety impact assessment

Thank you for your kind attention !