Roadwork Safety 1

Training in Traffic Arrangements and Safety during Roadworks

Text Book for the Basic Course
Roadwork Safety 1

Training in Traffic Arrangements and Safety during Roadworks

Textbook for the Basic Course

Guidelines for the implementation stage

Finnish Road Administration
Helsinki 2008
Roadwork Safety is a training programme, which the Finnish Road Administration as the road manager uses to guarantee that the people working on the roads are introduced to the dangers of traffic.

The objective is to increase the knowledge about traffic and occupational safety of the supervisors and, especially, the workers. Another objective is to standardise traffic control on work sites and to introduce safe working methods into road works.

The Finnish Road Administration sets safety competence requirements for the people involved in carrying out, planning, managing and supervising roadworks, which the person in question can fulfil by completing the Roadwork Safety training.

Completing the basic Roadwork Safety 1 course is the occupational safety requirement for all people involved in roadworks, and the basic requirement for the responsible persons participating in the advanced course Roadwork Safety 2.

The Finnish Road Administration has updated this Roadwork Safety 1 text book to correspond with the revised Occupational Safety and Health Act and the Government Decision on the Safety of Construction Work.

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PREFACE

Everyone has the right and duty to work safely. In order to do that, one needs to know the dangers of one’s own work and how to protect oneself against them. One also needs to recognize the dangers inherent in machines, equipment and the work environment. The philosophy behind Vision Zero is that not even one accident is acceptable. The investigation of accidents has proved that all occupational accidents could have been avoided. Vision Zero is also applied to roadworks.

Roadwork Safety is a training programme which the Finnish Road Administration as the road manager and investor uses to guarantee the basic introduction of persons working on the roads to the dangers caused by traffic, and the conditions of work on the roads.

The training programme comprises two courses: Roadwork Safety 1 and Roadwork Safety 2. Roadwork Safety 1 is aimed at everyone working on roads. Roadwork Safety 2 is specifically aimed at supervisors and people responsible for temporary traffic arrangements.

The objective of the Roadwork Safety training is to increase knowledge in safety matters of supervisors and, especially, the workers. Another objective is to standardize temporary traffic arrangements and workers’ behaviour in roadworks.

General traffic causes significant dangers to people working on the roads. On the other hand, roadworks can put other road users in a dangerous situation. Consequently, occupational safety legislation classifies work carried out in the traffic area as dangerous work and only responsible and competent persons can be employed to supervise and carry out such work. Being endangered by traffic in one’s work on one hand and the dangers inflicted to traffic by the same work on the other hand both require skills necessary for the circumstances from the workers and supervisors.

Roadwork Safety 1, the basic safety training course for roadworks, has been developed to provide these skills and ensure workers’ competence in them.

This publication is the trainee’s Roadwork Safety 1 text book and the trainees are tested on its contents at the end of the course.

The text of this revised edition has been edited by Eeva Rantanen, researcher from the VTT Technical Research Centre of Finland, and Esko Tuhola, specialist for traffic safety from the Finnish Road Administration.

Helsinki, 1.10.2008

Finnish Road Administration
Expert Services
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1 INTRODUCTION

1.1 Qualification requirements for work on the roads

1.1.1 Roadwork Safety training

Roadwork Safety is a training programme which provides induction training in traffic arrangements and occupational safety.

The Finnish Road Administration sets safety competence requirements for persons involved in carrying out, planning, managing and supervising road works, which the person in question can fulfil by completing the Roadwork Safety training.

Roadwork Safety 1 training course is aimed at everyone working on roads, streets or in other trafficked areas. The training is especially designed to increase the workers' knowledge in occupational and traffic safety. The course aims at improving the uniformity of the traffic arrangements during works on roads and other trafficked areas. A further objective is that after completing the course the trainee recognises the safety aspects related to the various groups of road users and knows how to take them into consideration while working on the road. The course introduces the dangers inherent in roadworks and how to identify and control them (course programme attached).

The Occupational Safety and Health Act (738/2002) and the Government Decision on the Safety of Construction Work (VNa 629/1994) with amendments are the basis for the Roadwork Safety training. The Occupational Safety and Health Act aims at improving the working environment and conditions, providing preventive measures as well as preventing occupational accidents. Section 14 of the Occupational Safety and Health Act deals with training and guidance to be given to a worker. It requires that the employer has to provide the workers adequate information on the hazards and dangers inherent in their workplace.

The Government Decision on the Safety of Construction Work classifies work carried out in the road and street areas as works which pose special dangers to the health and safety of the workers (appendix 2 of the decision). The Government Decision on the Safety of Construction Work has been amended by the Government Decrees VNa 426/2004 and VNa 702/2006, which further define and increase the responsibilities of the client. These decrees stipulate that the client has to make certain that the project supervisor has the necessary experience, competence, and training to take care of its occupational safety responsibilities. Furthermore, the client is required to prepare codes of conduct on occupational safety matters to be observed by the other working parties. The amendments also stipulate that the client has to disseminate information to the project supervisor and
address safety issues, plans and methods derived from them in co-operation with the project supervisor prior to the start of the construction work.

Finnish Road Administration Requires Roadwork Safety 1 Training:
- of all people working on road management tasks on roads
- of drivers transporting road and pavement materials
- of operators of machines except for one-off work
- of other workers working on public roads
- of the participants of the Roadwork Safety 2 training course

Roadwork Safety Training is not required of persons doing a one-off piece of work or work of a brief duration, providing the work is carried out under the immediate supervision of a person qualified in Roadwork Safety. Such one-off jobs are connected for example with deliveries to the work zone. An example of a work of brief duration is supervised cleaning of road sides or lay-bys by volunteers. However, the employer (supervisor) of such a person is responsible for introducing him/her to the working conditions (dangers) on the road and safety practices to a sufficient level of knowledge.

Finnish Road Administration Requires Roadwork Safety 2 Training:
- of the project supervisor’s employee in charge of occupational and traffic safety
- of the responsible person of another contractor
- of supervisors carrying out road management tasks
- of people planning temporary traffic arrangements
- of people providing consultancy services as part of a contract
- of the representatives of the road manager in projects (such as road inspectors, supervisors, persons handling permits)
- of other people handling permits for work on the road or in its vicinity
- of supervisors working on projects requiring a permit for work in the road area.

A prerequisite for participation in Roadwork Safety 2 training is valid competence in Roadwork Safety 1.

1.1.2 Qualification and registration

The requirement for the Roadwork Safety 1 qualification is completing an eight-hour Roadwork Safety 1 training course and passing the test, after which the trainee is entitled to a certificate and a personal Roadwork Safety 1 card.

The test always has twelve questions. The questions contain statements, which are marked true or false. The maximum result is 36 points and the minimum number of points to pass the test is 27. The text book can be open and used during the test. The time reserved for the test is 30 minutes.

The test can be retaken once without attending the course again. The same trainer will organise for the test to be retaken.
The Roadwork Safety 1 card is valid for five years and the time of validity is marked on the card. The qualification is renewed by taking the course again and passing the relevant test.

The Finnish National Rescue Association (Suomen Pelastusalan Keskusjärjestö, SPEK) holds a register of people who have completed Roadwork Safety training and hold a Roadwork Safety card. Registration makes it possible e.g. to buy a new Roadwork Safety card to replace a lost one. Each person registered in Finland has the right once a year to acquire, free of charge, the information saved in the register. A new card to replace a lost one costs 17 € (cost in 2009), and while waiting, it is possible to get a certificate.

<table>
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<th>Suomen Pelastusalan Keskusjärjestö, SPEK</th>
<th>Finnish National Rescue Association</th>
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<tr>
<td>Ratamestarinkatu 11</td>
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<td>tel. (09) 4761 1301, weekdays 9.00–13.00</td>
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<td><a href="http://www.spek.fi">www.spek.fi</a></td>
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### 1.1.3 Other qualifications in occupational safety

#### Katuturva (®) Street Safety

The municipalities in their role as the road manager or investor may also require Roadwork Safety qualifications. Some municipalities have their own safety requirements such as the Katuturva training of the City of Tampere. In addition to introducing the Roadwork Safety training material, Katuturva training covers Tampere’s own requirements for occupational and traffic safety as well as permit procedures. The Katuturva training satisfies the qualification requirements of Roadwork Safety.

#### Qualification requirements for rail management

In addition to the general qualifications the Finnish Rail Administration (Ratahallintokeskus, RHK) requires safety qualifications of the workers. The required qualifications aim at guaranteeing that rail work is carried out in accordance with the instructions of the Finnish Rail Administration.

General qualification requirements for rail workers or inspectors include health requirements, and the qualifications and professional skills required for the work. The worker is expected to have basic knowledge of the work carried out in the rail area and to have a comprehensive understanding of the operations of the railway system. The Turva (safety) training in occupational safety in rail work is regarded as an adequate general professional qualification. In addition to job specific professional skills the workers are required to undertake this occupational safety training in rail work (Turva) in all construction, maintenance and rehabilitation works in the railway area.
Other safety qualifications include qualifications for platform work and for working as a safety guard (T-mies). For mechanical maintenance and rehabilitation work in the platform area, the workers are required to hold a qualification in platform work (Laituri), which can be acquired by completing the safety training in platform work. A person who works as a safety guard and safeguards work at a railway level crossing is required to have valid qualifications and training to qualify as a safety guard. In addition to the specific training qualification the requirements for a safety guard include experience in rail work and health requirements.

The described qualifications based on training by an approved training institute are valid for five years and thereafter refresher training is required. In order to retain the acquired competence as valid, the person has to work a certain number of days in the relevant tasks per calendar year; the number of required days per calendar year is 7 for the competence of a safety guard and platform work, and 14 days for occupational safety in rail work.

Rail work notification (RT-ilmoitus) and a permit are always required for rail work. These requirements are presented in more detail in the publication of the Finnish Rail Administration (B 21 Radanpidon turvallisuusohjeet - Safety Instructions for Rail Management (TURO), 2008-11).

A permit from the traffic control for rail work is required when the work
- hinders or dangers traffic
- is carried out mechanically in such a way that the machine or part of it may extend into the structure gauge
- affects the rail structure
- concerns the safety facility in use
- is carried out using a machine or vehicle on the passenger platform
- requires traffic to be stopped to secure occupational safety

Other than rail work on rail sites or level crossing, can be carried out when the safety guard procedures are followed. Rail work notification (RT-ilmoitus) is then not necessary. Employing a safety guard is obligatory when work is carried out inside the structure gauge of the rail open to traffic. However, the use of vehicles and work machinery is forbidden in the said work.

A safety guard can be employed to secure worker safety in an area with a permit for rail work, or when work is carried out by a machine on the side of the rails. In that case, work has to be carried out outside the structure gauge ATU. Safety guard procedures are necessary in the work on level crossings when
- the warning signal of the level crossing is turned off and the crossing is open to traffic
- the road traffic volume at an unguarded level crossing is temporarily increased
- the train speeds are temporarily greater than the speed limit for that specific rail section
- the Finnish Rail Administration has otherwise specified.

It is possible to apply for a short-term permit from the traffic control centre to cross a level crossing. A short-term crossing permit is necessary when it is considered that a vehicle cannot otherwise safely cross the level crossing.
**Occupational Safety Card**
Builders (especially industrial plants) and main contractors/project supervisors (construction businesses) may require occupational safety training and the Occupational Safety Card granted after completion of the training. The training covers basic knowledge on occupational safety and identification of dangers in common work situations. In addition to this basic training, workplace and job specific orientation also needs to be organised. The Occupational Safety Card is valid for five years. Occupational safety training is not a substitute for the Roadwork Safety training.

**Hot Work**
All works producing sparks or requiring an open flame or another source of heat, and causing a risk of fire, are regarded as hot work. The insurance companies' general policy conditions require hot work qualifications in the form of the Hot Work Card and training of people carrying out hot work on temporary hot work sites. This qualification may also be required in road projects, e.g. when a municipality is the client, or when the project supervisor so requires.

**Emergency First Aid**
Emergency first aid ability is another qualification requirement for occupational safety. Occupational Safety Act (738/2002 § 46) requires that the employer has to provide for first aid for employees and other people present in the workplace. The Finnish Road Administration requires contractors with regional maintenance contracts to have the ability to administer emergency first aid as part of the precautionary responsibility.

**First Aid**
It is recommended that at least one person competent in first aid is present on each work shift or site where an occupational hazard is probable (e.g. construction work) and the number of persons working is less than 10. In bigger workplaces there should be at least one person with first aid competence for every 25 people, or 5 % of the total number of the staff (Ministry of Social Affairs and Health, First Aid in Workplaces, Occupational Safety guidelines and instructions 33). The most recent recommendations of the Finnish Red Cross state that there should be one person with first aid competence per 10 people in workplaces where an occupational hazard is probable. The minimum requirement is considered to be EA -1 (first aid 1) basic training level with refresher courses taken approximately every three years. The Finnish Red Cross keeps a register of the qualified trainers and persons with first aid competence who have gone through its own training system; it also takes care of the trainers’ basic and continued training.

**Temporary Traffic Controller**
A temporary traffic controller is required to have the Roadwork Safety 1 qualification because the work is carried out on the road. Furthermore, the Finnish Road Administration requires that the person is trained for the job before being appointed as a temporary traffic controller. He/she also has to be introduced to each new work site. These training duties belong to the employer’s supervisors with the Roadwork Safety 2 qualification.
Examples of other qualifications:

- Street safety
- Temporary traffic controller
- Qualifications for rail work (general, safety, platform, safety guard)
- Occupational safety card
- Hot work card
- Emergency first aid (minimum requirement in the maintenance contracts of the Finnish Road Administration)
- First aid

1.2 Road – road manager’s obligations and responsibilities

1.2.1 Parts of the road

The Highway Act is taken into consideration when use of road area is being planned. A highway is defined as a road assigned for general traffic and maintained by the State. Highways are classified as: main roads Class I and Class II; regional roads; or connecting roads, depending on their transportational significance.

Highways may be motorways or semi-motorways or otherwise intended only for certain types of traffic.

The following constitute part of a highway:

1. Carriageway inclusive of shoulders and other areas intended for traffic, such as pavement and bicycle path, special transport road, parking spaces, area serving public transport and use thereof, or a rest, storage or loading area.

2. Structures, constructs and equipment permanently required for the maintenance and use of the areas mentioned above or immediately related thereto.

3. Traffic control devices and other structures, constructs and equipment necessary to guide road users.

4. Other structures, constructs and equipment such as noise barriers and animal fencing necessary for road management or traffic or the prevention of traffic hazards.

An emergency landing place ordered to be appended to the road, and the area required for functions arising from traffic crossing national boundaries shall be considered part of a highway.

A highway is defined as a road assigned for general traffic and maintained by the State.
Where the boundaries of the road area have not been determined in a land ownership survey, the road area extends to a distance of two metres from the outer edge of the ditch or, if there is no ditch, from the outer edge of the road slope or road cutting. Nowadays the road-side area is often included in the road area in a land ownership survey. It is forbidden to have a store, fence or other equipment in the road-side area, buffer zone or lateral clearance area which may pose danger to traffic or hazard to road maintenance. There is separate legislation for erecting power poles in the road-side area.

### 1.2.2 Road manager

The road manager is responsible for keeping the highways in a condition satisfactory for general traffic. The Finnish Road Administration, municipality, road maintenance association or road owner can be the road manager. The Road Regions act as the local representatives of the Finnish Road Administration in the role of the road manager.

The road manager decides on

- the placement of a traffic control device
- speed limits on specific roads and locations
- temporary traffic control due to roadworks

The use of a private road shall not be restricted e.g. by a barrier (traffic control device) if public funds have been used in its construction or maintenance.

The conditions of the contract or permit for road work define case-specifically the measures required for temporary traffic control.

### 1.2.3 Road manager’s responsibility

The road manager is responsible for road management and for the costs thereof, and uses the road management rights set out in regulations. Road management incorporates both road construction and maintenance.

In accordance with the law, keeping the highways in a condition satisfactory for general traffic includes the following tasks:

- delivering materials for road construction and maintenance to the road
- keeping the road surface even
- dust binding
- road cleaning
- waste management
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- drainage
- repairing culverts
- maintaining bridges, piers, emergency landing places and ferries
- placement of rails, road signs or other devices
- clearance of trees, bushes and other vegetation when necessary
- arranging winter roads on ice
- opening and closing a drawbridge
- removing frozen obstacles
- other measures for keeping the road in a condition satisfactory for traffic.

The road manager is liable for impacts on third parties caused by road management operations or other operations carried out in the road area; for example impacts on the road user.

1.2.4 Safety responsibilities of the client

The safety regulations of construction work applied to construction in general and also to for example the construction and maintenance of roads and streets. In addition to the responsibilities of the road manager, the occupational safety responsibilities of the Occupational Safety and Health Act also apply to the road manager directing a construction project.


Client means any person or organization undertaking a construction project, or other actor who directs or supervises a construction project, or, where no such actor exists, the contractor.

This text book describes the client’s responsibilities based on the above mentioned Government Decision and from the perspective of occupational safety liability. In other regulations and guidelines the term ‘client’ may be otherwise defined and the client may be allocated other responsibilities in compliance with the different definition.

1.3 Conditions for roadworks

1.3.1 Work contracted out by the road manager

The Finnish Road Administration contracts out all road management works. The details of the contract are agreed upon with the contractor in the contract negotiations. The parties agree on how to present and process temporary traffic control plans as well as on the traffic arrangement responsibilities deriving from the documents. At the same time they agree on the procedure, notification and documentation regarding the use of speed limits described in the traffic control plans during the entire project cycle.
A contract concluded with the road manager also constitutes a permit for the works carried out on the road in the extent described in the contract documents.

**Key traffic arrangement issues in the work contracted out by the road manager:**
- traffic arrangements are an integral part of the contract
- contractor makes the plan
- representative of the road manager checks the plans before the work starts
- procedures are agreed upon in the contract negotiations.

### 1.3.2 Permits for work on the roads

The Finnish Road Administration considers that all works targeting the road area or carried out using the road area are subject to permission unless they have been contracted out by the road manager. The application for permits is usually administered at the regional level. The procedures for permit application are described on the internet (www.tiehallinto.fi/luvat).

The authorising body in the municipalities varies and the procedure needs to be checked separately in each municipality. Where a private road is concerned, the owners of the road need to be consulted. If the owners have founded a road maintenance association, the permit application has to be presented to its administrative body or agent.

When the work is connected with the installation of a device within the road area, the work specific permit is usually included in the contract between the road manager and the owner of the device. The contract contains the requirements for traffic arrangements during the installation and maintenance works.

### 1.3.3 Other permits

When work is done in the street or road area, and where the road manager is the municipality, the contractor may also have to apply for other permits depending on the municipal permit system.

Such permits may be the following
- permit for fencing in a street, or a part of it
- permit for excavation works
- permit for work
- permit for temporary traffic arrangements
- permit for placement of a tipping body.

**Permit for night work**

Work carried out between 23.00 and 06.00 is considered night work. An employer must notify the labour protection authorities of regular night work, when the said authorities so request (Working Hours Act 605/1996 § 26).

Night work is allowed:
for work which has been divided into three or more shifts
- for work which has been divided into two shifts, but only until 01.00
- for the maintenance and cleaning of public roads, streets and airfields
- for service and repair work that is necessary for the continued regular work process of the business; or in works that cannot be carried out simultaneously with the regular work of the workplace, or that are necessary in order to prevent or minimise losses.

A permit has to be obtained for other intended night work at the Occupational Safety and Health Inspectorate.

**Work causing noise or vibration**
The municipal environmental protection committees have to be notified in writing of work causing temporary noise or vibration, if it is especially disturbing (Environmental Protection Act 86/2000 § 60).

**Blasting work**
The local police have to be notified of the blasting works at least seven days before the work starts (Government Decree on Explosives 473/1993 76 §). The escape and rescue plan of the blasting and excavation work site is given to the local rescue authorities (Government Decision on Blasting and Excavation Regulations 410/1986 § 7). The notice is usually given by the blasting works supervisor.

**Prior notice to the occupational safety and health authority**
The project supervisor shall give the competent occupational safety and health authority a prior notice on a construction site planned to exist longer than one month and where, self-employed workers included, at least ten workers carry out work. (Government Decision on the Safety of Construction Work 629/1994 § 6).

### 2 DANGERS AND PROBLEMS OF WORKING ON ROADS

#### 2.1 General

The conditions of work on roads pose special dangers to the workers. According to research, working on roads is approximately 3-5 times more dangerous than industrial work. Dangerous situations are constantly caused by traffic on road work sites. Vehicles pass workers too close and speeds used are too high. People do not always watch out sufficiently for the work machines. Collisions caused by passing vehicles have often severe consequences to the road workers.

The number of traffic collisions also increase because of the roadworks. Dozens of collisions occur annually on work sites resulting in personal injuries. Damage to vehicles and other material damages caused by collisions may amount to several hundred thousand euros annually.
Road workers easily get used to the dangers caused by traffic, and the ongoing dangers are not always recognised.

**Safety advice!**
- People working on the road should know and take into consideration the typical behavioural habits of the various parties in traffic. This is a prerequisite for the worker’s own safety and for the safety of traffic.

**Danger** is an aspect of work that may cause a collision, misadventure, occupational disease, or physical or mental stress. For example, when a driver is speeding through a work site.

**Risk** describes the magnitude of danger. It is the combination of the severity and probability of the danger.

**Safety** is a condition in which the inherent risks are acceptable. For example, a closed area on the work site protected from traffic.

### 2.2 Dangers caused by traffic

Traffic causes continuously dangerous situations, and the consequences of traffic collisions are often severe; the most severe ones have resulted in the death of a worker.

Drivers do not always take the safety of the road workers sufficiently into consideration, and use too high speeds on the work site or pass the workers at a too close distance.

**It is typical of the drivers:**

- **To use too high speeds on road work sites.** Consequently, the driver’s ability to make observations at the edges of their field of vision becomes weaker, because the driver has to concentrate more on controlling the car.

- **To keep a too short safety distance.** In regard to the speed used, the driver drives too close to the vehicle in front. The risk of a rear-end collision increases and the driver has to concentrate more on the actual driving. He/she may miss making observations necessary on a work site. The front vehicle being close restricts the field of vision, and consequently an obstacle on the work site is not seen in time. **To be ignorant of the impact of speed on stopping distance.** Stopping distance quadruples when the speed doubles. It also works the other way around: decreasing speed by 25 % cuts stopping distance by 50 %.

Furthermore, the number of drivers belonging to various risk groups has been continuously growing. It has been estimated that some 1 % of drivers belong to a risk group, for example drivers under the influence of alcoholic, medicinal or narcotic substances belong to these groups. Also illness, poor eye sight, high age or short driving experience increase the number of risk
drivers. Drivers using out-of-repair vehicles in traffic are also considered risk drivers.

| Out of the 3000 vehicles passing a work site per day, some 30 vehicles are driven by risk drivers. |

2.3 Dangers inherent in the working environment

2.3.1 Factors hindering observation

When the incidents on road work sites have been investigated, the person involved in the collision often gives as an explanation that he/she did not see the work site sufficiently early.

Factors hindering drivers observing the work site, and beyond the driver’s control, may include weather, traffic, on-going work or other circumstance such as road geometry. Slipperiness, fog and rain are weather specific factors hindering observation. Darkness is a significant condition making it difficult to see the work site.

Brightly glaring sun has contributed to a number of incidents. A driver driving into the sun may momentarily lose sight of anything in front. The sunlight glares, or is reflected back in many directions from the surface of the windscreen in such a way that it makes the glass non-transparent. The phenomenon is most dangerous when the sun shines low on the horizon. This happens in spring and autumn, and the problem is made worse by dirty, worn or frozen windscreens.

The time of day may increase the dangers of roadworks. In winter, maintenance operations may often have to be carried out in poor driving conditions and in the dark. Work in the dark poses specific dangers when general visibility and visibility of the work site are poorer than in the daytime. At night there are also more drivers who are tired or intoxicated than in the daytime. At night speeding is more usual, because there is less traffic than in the daytime.

Traffic may hinder the visibility of a work machine in many ways. A driver driving behind a big vehicle may not notice in time the change in the driving lane caused by ongoing work, or may not see the work machine moving slowly in the overtaking lane. The lights of oncoming traffic may glare and make it more difficult to notice the work machine or worker in front.

The work itself may hinder observation on site. The work may raise dust (e.g. brushing, snow ploughing, drilling works) or steam (asphalt works, ice melting). Some objects may temporarily draw the attention of the driver, for instance he/she may look at a work machine and not notice a worker on foot.

Other factors that may disturb drivers making observations can be: bright sources of light in the surroundings; signs and advertisements on the site; an interesting occurrence near the site; or oncoming traffic.
Safety advice!

- The driver of a vehicle approaching a work site has to be able to notice the site, moving work machines or workers sufficiently early. Only then can he/she adjust his/her speed and driving style to accommodate the work site conditions.

2.4 Importance of one's own actions

2.4.1 Routine and blindness to one's own work surroundings

Working in dangerous circumstances without accidents makes one easily insensitive to the dangers inherent in work or the work site. Being busy at work makes one forget other traffic and take increasingly greater risks. A work machine may be parked in a dangerous spot or workers may become careless when moving about in the road area. In a task of a short duration, protective measures or proper traffic arrangements might not be made because the time spent in the road area is very brief.

Although the work only lasts a few minutes, it takes a much shorter time for a car to run over a person – a few seconds.

Even the experienced workers do not always recognize the dangers inherent in work or the workplace. Blindness to one’s working surroundings is shown by the fact that one does not pay attention to the dangers such as untidiness or poor traffic arrangements.

When risks have been taken for too long or when the prevailing circumstances change, even slightly to the worse, a dangerous situation or an accident occurs. Such additional factors may be the sun glaring low on the horizon or a vehicle with a tired or weak-eyed driver approaching the site.

According to accident statistics, young and inexperienced workers are more prone to risks than experienced workers. Young workers often carry out tasks which require a great deal of moving about in the road area, e.g. temporary traffic control or surveying tasks. They often lack knowledge and experience in traffic behaviour or dangerous situations.

Experienced workers have fewer mishaps and accidents than the inexperienced ones, but the occupational accidents of the experienced workers are often severe. Occupational accidents caused by traffic are usually severe and consequently an accident of an experienced worker is often fatal.
2.4.2 Omissions in the use of personal protective equipment

Not using protective equipment is a form of workplace blindness to ongoing risks. Hearing defects or other health hazards may often occur after a long time. Health hazards are not noticed, because the changes are slight or the effects are only seen after many years. By that time there is often not much that can be done; lost health, for example lost hearing, cannot be replaced.

Not using protective equipment also happens in connection with lack of control, or because no clear instructions for their use have been given. Often people complain that protective equipment is inconvenient to use and hinders work. However, protective equipment has developed and it has been made easier and more comfortable to use. Negative experience and attitudes are easily based on outdated information and user experience of old equipment that has since been made obsolete.

People working on streets and roads move about in such a way that drivers have to give way to them. These people often think that their work gives them extra privileges, or that everyone notices a worker wearing warning garments. Everything is fine until a risk driver drives through the site, or the circumstances on the site become worse than usual, for example due to poor visibility or road weather conditions.

On the other hand, there may be deficiencies in the warning system or traffic arrangements of the site. These problems are enhanced in works that last a short time or move on fast. The problem may be caused by the poor visibility of the work machines or because the workers do not use distinguishable warning garments. It may also be that the working methods used are too risky, for example the work site is not clearly and effectively separated from other traffic.

**Safety advice!**
- Work safety is secured by separating the site clearly and effectively from traffic. The worker is protected using a safety truck or by other means.

2.4.3 Dangerous works and working phases

Protecting a work site against dangers from traffic is often neglected. Separating a work site or machines from traffic using light traffic control or warning equipment does not provide protection in a situation where a vehicle crashes into a work site.

According to various research results, traffic poses dangers especially in the following works and work phases:

- painting or removing road markings
- erecting or removing traffic signs or traffic control equipment
- working on foot in the road area
- ploughing and salting in poor conditions, e.g. when it snows
- work where it is necessary to close one of the lanes to traffic
- paving works
- working on a motorway.
Work phases and works are usually dangerous when a worker has to work unprotected on a site open to traffic. Examples of such tasks are: temporary traffic control and stopping traffic using a stop sign; cleaning works carried out on foot; provisional marking or survey works; or setting up, maintaining or dismantling traffic arrangements on a site.

Moving works and works of a short duration are dangerous because protecting such work as well as warning and controlling traffic may be difficult. The probability of risks increases if the used equipment is light or poorly noticeable – for example road marking machinery usually has light structures.

2.4.4 Dangers caused by work machines

Work machines used on the work site pose a great danger to workers on foot. Noise from traffic and work machines hinder the ability to detect the movements of the work machines based on hearing.

A reversing work machine gives rise to dangerous situations. The cabin of a work machine may have blind spots preventing visibility. A worker may be hit by a reversing vehicle, because he/she does not hear the sound of a reversing vehicle over the noise from the work site and traffic.

Safety advice!

- Machines are equipped with reversing alarms. Their performance is tested in the acceptance inspection. The use of a work machine has to be prevented if the reversing alarm does not work.

In addition to the act of reversing, the movable parts of a machine may cause dangerous situations. A bucket may hit a worker working in an excavation pit. A worker may get squeezed between a work machine and a structure, or get squeezed between the movable parts of a machine.

Traffic may also cause danger to the driver of a work machine. Work machine drivers may be injured if another vehicle crashes into his/her work machine. The work machine may topple over causing the driver to fall out of the cabin and be crushed by the falling vehicle.

The work machine driver may be exposed to a dangerous situation if the work machine breaks down and he/she starts to fix it on a road open to traffic.

Safety advice!

- Repairing work machine breakdowns has to be carried out in accordance with the given safety instructions. If the breakdown occurs on the road, risky repair works must not be undertaken. Before starting to repair the vehicle, safety has to be secured through traffic arrangements, or the vehicle has to be moved to a safe place.
Vehicles moving in an unexpected manner may surprise other road users. A work machine that makes an abrupt stop may cause rear-end collisions to the vehicles behind it.

**2.4.5 Special dangers and problems inherent in maintenance work**

The biggest dangers and problems connected to maintenance works are caused by general traffic, because maintenance works have to be carried out in traffic. Part of the work is of short duration and mobile, and consequently it may be difficult to arrange for the advance warning and traffic control of the work site. Protecting the site of mobile works of a short duration may also be neglected, because arranging the protection takes longer than the work itself.

One of the explanations for collisions involving work machines and other vehicles is that the vehicle driver has not seen the work machine sufficiently early. This can happen despite the fact that the work machine is big and is equipped with proper warning equipment. The sudden ‘encounter’ with a work machine has, in some cases, resulted in panic braking, which in turn results in loss of control of the vehicle causing it to crash into the work machine or swerve off the road.

In maintenance work there are also problems connected to operating the machines and equipment. One problem is the great number of machines and equipment, and the variety of the control systems. These problems become more pronounced when the operator has to go out in a strange work machine into difficult road weather conditions, maybe also onto a road section unknown to him/her. Further aggravation may come from haste caused by the time limits set for the maintenance works. The seasonal character of maintenance works increases risks, because the machines and equipment are only used for part of the year.

The road surroundings can cause problems. For example, hilly and winding roads are difficult to maintain. Roads with heavy traffic or with intensive peak periods are also difficult from a maintenance point of view. These factors have to be taken into consideration when maintenance works are planned, e.g. in designing and sizing maintenance routes.

Dangers and problems arise from the warning devices and structures in the road area or in its vicinity. Such devices and structures are for instance: lines crossing over the road, cables in the road area, wires and pipes as well as traffic signs and other traffic control devices or equipment. Bad condition of the road to be maintained may pose danger to maintenance work. Maintenance of the road sections, where roadwork sites are located, can be especially difficult.

**2.4.6 Dangerous and problematic work sites**

Roadworks have also to be carried out outside the ‘normal’ road section. Such sections are for instance bridges, rest areas or pedestrian and bicycle
lanes. When working on a bridge the driver has to watch out for the traffic underneath, nothing must be allowed to fall onto the road users underneath.

When working on bridges over railway lines the driver has to watch out for electric lines. When working in the vicinity of railway lines it is important to secure rail traffic. There are big risks involved in this mode of traffic, because problems in rail traffic may bring about big financial losses. Problems caused to information technology systems, such as cutting optical cables, may bring about big claims.

Roadworks cause dangerous situations not only to vehicle traffic, but also to other road users. When working in rest areas and on pedestrian and bicycle lanes special attention has to be paid to the safety of the pedestrians and cyclists. Special attention has also to be paid to the safety of children, for example in the vicinity of schools and day care centres. Similarly the safety of visually impaired or otherwise disabled persons crossing through a work site has to be ensured.

Near the work site there may be structures or equipment of various plants, businesses or communities, which may pose hazard to roadworks. Such things are high-voltage lines, electric cables, liquid gas pipes, or pipes and cables of industrial plants containing hazardous substances.

Furthermore, roadworks contain works and work phases that may bring about danger or hazards to the local environment. Especially excavation or blasting works may cause great damage to the local environment. Noise, dust and vibration from the work may result in time-consuming investigations and reparations of damages incurring costs.

2.5 Dangers to third parties from roadworks

2.5.1 Vehicle traffic

Work on roads and streets always endangers general traffic. Poor advance warning and defective quality or unprofessional use of barriers and warning equipment increase the risk of danger. The heavy bases of the traffic signs and barriers used to separate a work site are dangerous on impact. Poor or unclear marking of the driving lanes through a site may cause wrong interpretations or hesitation, which disturbs the flow of traffic and increases congestion.

2.5.2 Cyclists, roller skaters, moped and motorcycle riders

Cyclists may behave in an unexpected manner. A cyclist may believe that he/she has been noticed by others regardless of the circumstances. Furthermore, he/she may take a short cut between the work machines placing himself/herself in great danger.

Ruts in the road and big longitudinal differences in the level of the pavement are dangerous to the cyclists. Breaks in the pavement surface may cause a serious accident to a cyclist, or especially to a roller skater.
1. Dangers and Problems of Working on Roads

Safety advice!
- It is important that the driver of a work machine pays special attention to cyclists’ movements.

2.5.3 Pedestrians

It is typical of a pedestrian to use a familiar and shortest possible path, even if it leads him/her between work machines or over barriers. Furthermore, a pedestrian thinks that he/she is visible in darkness, when he/she is able to see the work machine.

Safety advice!
- Pedestrian walkways have to be marked off clearly. Access to work site has to be effectively prevented, when necessary.

2.5.4 Children

Children moving near the work site behave in totally unexpected manner. Children are curious and they come to follow closely the working of a machine. Dangerous situations may arise, if children hide in the bushes or long grass, when grass and copping cutting is carried out, or inside or behind a snow bank when snow removal is going on.

Safety advice!
- If there are children near the work site, the driver must stop work and step out of the work machine to talk with the children. Children have to be told that the driver cannot always see them and therefore dangerous situations may occur. If necessary, the children have to be conducted to a safe distance from the work area.

2.5.5 Other road user groups

The work site may cause dangerous situations and problems for many other road user groups, whose need for access and safety have to be taken into consideration. Examples of such groups are: users of public transport; delivery services; heavy traffic; emergency vehicles; physically handicapped persons; visually impaired persons etc.

Risks
- Visually impaired persons – tripping, falling into an excavation
- Physically handicapped persons – prevented access
- Heavy traffic – failing bearing capacity of a by-pass
- Public transport – unclear arrangements for bus stops
2.6 Other problems from roadworks

2.6.1 Lack of space

Lack of space is typical for roadwork sites, and it may cause danger both to road workers and to other road users. Work has to be carried out in limited space, which makes it dangerous. The working space necessary for work machines, especially for heavy excavation machines, may take the passing motorist by surprise. The lack of space increases the danger of workers being knocked down by a work machine or a passing vehicle.

**Safety advice!**
- The importance of the quality of work site planning is increased on work sites with limited space.

2.6.2 Stockpiling materials

There may be little space for stockpiling equipment and materials on the work site. Unloading and loading areas may not be practical and there may be no space for lifting equipment, or the space may be unsuitable. Stockpiled materials may also obstruct sightlines, or they may be crashed into. Stockpiled materials may sustain damage in traffic collisions.

2.6.3 Workers’ cars

In some works, parking the workers’ cars create problems on the site. Parked cars may impede the visibility of the warning traffic signs and equipment, and reduce the space to be used by traffic and work machines.

**Safety advice!**
- The parking area for the workers’ cars is planned and marked in the site organisation plan.

2.6.4 Other hazards from traffic

Traffic causes anxiety and stress in the workers as well as noise, exhaust problems and other health hazards. Increasing requirements for the efficiency of work, together with the growing amount of traffic have increased traffic hazards.

Other road users’ negative, even hostile attitudes have a detrimental effect on workers’ motivation and may even raise fear. The workplace of no other profession has so many daily ‘visitors’ than a work site on a busy road. Road and maintenance workers have to do their work in view of the general public and are subject to feedback and criticism from the public. Road users may show negative, even hostile feelings towards the road workers. Road users often disobey given orders, especially speed limits.
2.7 Driver’s characteristics

A person can perceive only a restricted amount of things at one time in his/her field of vision. The capacity to handle this information is restricted, but the use of this capacity is flexible. Selection of what information to consider is guided by external and internal factors, which is true of the driver’s conduct in general.

There are many objects and activities on a work site competing for the driver’s attention. The driver has to concentrate on the changed driving lane through the roadwork site at the same time as he/she has to follow instructions and traffic signs on the site.

The length of time the information stays in the field of vision has a decisive effect on the reliability of perception. A short-duration perception channel may become blocked by additional information or fatigue. When the driving speed is high, many important objects stay only a few seconds in the driver’s field of vision. It may only be by chance that the driver notices a traffic sign warning of the roadwork.

**Safety advice!**

- Repeat the warning when necessary. Do not use too long text in signs.

The driver naturally reacts only to a clear and sudden change within their field of vision. Steady movement or other steadily continuing activity over time is experienced as a state of permanence. A work machine’s unexpected movement, such as stopping, may not be noticed in time by the driver driving behind the machine.

**Safety advice!**

- Do not make unexpected movements with your work machine in busy traffic. Allow time for others to react!

When the driver drives fast for a lengthy period of time, he/she will perceive the driving speed as lower than it actually is, and becomes used to the speed creating so-called speed blindness. This phenomenon influences driving speeds on roadwork sites. When the driver lowers speed e.g. from 100 km/h to 60 km/h, he/she may feel that the car is crawling slowly and safely through the site. However, if a vehicle hits a pedestrian at this speed, seven out ten pedestrians die.

A steep hill, or bend in the road or roadworks may make it difficult to notice the need for slowing down. When the road’s character suddenly changes due to roadworks, an ordinary warning sign is not always enough and the driver has to be especially instructed to use adequately low speed.

**Safety advice!**

- In addition to speed limit traffic signs, narrowing the driving lane, rumble strips and humps are used to slow down driving speeds.
Traffic habits and laws of natural perception result in some roads and driving directions in certain circumstances being understood as having a natural right of way.

This psychological right of way is shown e.g. in the following situations and circumstances:

- on the wider street at a two-street intersection (e.g. 90 % of the drivers driving on a narrower street with a right of way do not dare to use their right of way, but doubt, slow down and wait for the vehicles on the wider street to pass)
- on a street with tram traffic (rails)
- on a paved road or street
- on a street with more efficient lighting
- on the straight section of a T-intersection
- when the driver has driven long on a road or street with an actual, or assumed, right of way, he/she expects the right of way to continue at the next intersection, too.

**Safety advice!**

> When making traffic arrangements, the right of way should be accorded in compliance with the drivers’ natural expectations.

Drivers usually overestimate distances. On the other hand, speed and changes in speed are underestimated. Underestimating speed is especially common when the driver has driven for a long time on a good road using high speed and has adapted to it. A common problem is apparent safety of traffic experienced by the drivers and consequently leaving too short safety margins.

**Safety advice!**

> Let the vehicle driving behind you overtake safely. When necessary, give way.

### 2.8 Examples of fatal accidents

**Auxiliary markings for a preselection lane in an intersection TOT^1^ 24/97**

The intersection of a busy main road had been paved a few days earlier and the road markings had not yet been made. Two members of the road marking team were making auxiliary markings by hand with a spray paint in the intersection. Usually this work would be done by one person, but this time another worker was present observing the work and learning how to make auxiliary markings in an intersection.

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^1 TOT = Työpaikkaonnettomuuksien tutkintajärjestelmä, (Investigation system for fatal occupational accidents of the Federation of Accident Insurance Institutions (FAII))
The intersection was within the coverage area of the roadworks sign. The actual roadwork being carried out was about one kilometre before the intersection. The auxiliary markings had first been measured incorrectly and the worker was correcting the auxiliary markings with a black spray paint on the edges of the marked island.

When the worker bent over to paint over the incorrectly made dotted line, he turned his back to approaching traffic.

A passenger car driven by an elderly driver entered the intersection. His car strayed from the correct driving lane too much to the centre of the intersection area. The right front corner of the passenger car hit the worker doing the auxiliary markings causing him severe injuries and he died of the injuries later in a hospital.

Factors leading to the accident:

- impaired eye sight of the driver whose vehicle hit the worker
- driving lanes in the large intersection area were unclear and difficult to perceive
- no specific traffic arrangements had been made for the road marking work
- working unprotected on foot in the road area
- worker wore no visible warning garments
- traffic arrangements or safety issues were not addressed when the work was assigned.

Preventing similar accidents from happening:

- safer working methods should be developed
- clear instructions should be given for working in an environment, which is unprotected from dangers of traffic
- visible warning garments should be used
- proper traffic control arrangements should be made
- supervisors have to control compliance with the given safety instructions
- dangers inherent in the work should be discussed with experienced workers, too
- in roadworks workers have to take into consideration the possibility of risk drivers passing.

Temporary traffic control at a paving site TOT 20/96

Two temporary traffic controllers were controlling traffic on a paving site of a main road, where paving works had started on the tapering wedge of a deceleration lane of a connecting road. The traffic controllers were in visual contact with each other. Due to the paving works the speed limit was set at 50 km/h.

The traffic controller was standing in the middle of the lane whose traffic he was stopping. Because walkie-talkies were not available, he had to turn around occasionally turning his back to the cars he was stopping in order to
look out for vehicles behind him, and also in order not to let traffic through when there were oncoming vehicles.

A speeding van approached the paving works site. The driver was familiar with the route, and that morning he had set off from home, which was located at some two kilometres from the site. Weather was cloudy but dry, road surface was dry and the temperature was +4 °C. The sun shone low on the horizon through the clouds towards the van approaching the site. The previous night the temperature had dropped few degrees below zero and there might still have been fog from moisture on the windscreen. At the crucial moment the driver was concentrating to adjust the sun visor.

The traffic controller ordered the van driver to stop by raising the stop sign, but the driver did not see it. The van drove over the traffic controller without braking. The traffic controller hit the middle of the car’s front and was dragged under the right corner of the van before it stopped. Later that day the traffic controller died of the injuries from the accident in the hospital.

Factors leading to the accident:

- excess speed of the vehicle that ran over the traffic controller and the driver’s lack of attention
- unfavourable weather conditions and the sun shining low on the horizon
- temporary traffic controller standing in the middle of the lane when stopping the first vehicle
- deficiencies in temporary traffic arrangements and visibility of the temporary traffic controllers.

**Preventing similar accidents from happening:**

- improving the visibility of the temporary traffic controller
  - visible warning garments
  - stop sign with daylight film
  - towable warning railings
- improving the traffic arrangements of a work site
  - choice of the stopping location
  - improving the visibility of traffic signs
  - planning traffic arrangements even for works of a short duration
- improving orientation of temporary traffic controllers
- using solutions that guarantee the safety of temporary traffic controllers
  - traffic lights
  - warning lights and equipment.

**Electrical accident at a storing place of a bridge site TOT 14/97**
A pedestrian and bicycle bridge was under construction along the main road. The rest area next to the road was used as the site’s storage area. An open power line of 20 kV went across the rest area at the height of 6.5 m. Carrying out a lifting operation the crane boom happened to touch the power line and the driver got a strong electric shock, which killed him instantly.

Factors leading to the accident:

- lifting operation close to an open power line
- high scaffolding
- overstretch ed hoisting belt
- glaring sun and thick forest
- choice of the location and tidiness of the storing place
- truck on wheels and dry plank woods under the bearer foot.

**Preventing similar accidents from happening:**

- planning the construction work
- taking into consideration the electrical safety regulations in lifting operations near open power lines
- control of the operation
- planning construction in rest areas.

Unloading crushed material on a road rehabilitation site TOT 19/92

On a road rehabilitation site, crushed material was delivered onto one of the traffic lanes leaving the other open to traffic. An experienced worker acted as a tally man and showed where to unload. When he came to the site in the morning, a few trucks were already there waiting to unload crushed material. The worker showed the first truck driver a place where to unload and moved on to give instructions to the other truck. The first driver drove a truck with a trailer. When he had emptied the cassette of the truck, he then drove the truck to fetch the cassette from the trailer behind the unloading place and emptied it to the same place. Close to the second truck’s unloading place there was a telephone line crossing the road low on a slant.

The worker on foot watched the unloading of the second load in order to prevent the platform from catching the telephone line. When the platform was lowered without any problems, he moved to the centre of the lane open to traffic. At the same time the driver of the first truck reversed slowly on an uneven ground to his trailer. The worker was run over by the reversing truck.

The driver of the other truck saw the truck reversing over the worker and tried to warn of the situation by using the horn. However, in his panic he pressed his open hand on the centre of the steering wheel failing to make the horn work. When the ambulance crew arrived, they announced the worker dead.

Factors leading to the accident:
• deficient equipment of the truck delivering crushed material, the truck had no reversing alarm and the tractor unit had no bumper
• low lying telephone lines, which drew the attention of the worker.

Preventing similar accidents from happening:
• trucks on the site equipped with a reversing alarm and making certain that the alarm works
• being careful when reversing a truck on a work site – making certain, before starting to reverse, that workers on foot are at a safe location.

Maintenance of traffic control equipment on a motorway TOT 11/04
A bridge over a motorway was being constructed on a roadwork site. The left lane of the motorway was closed to traffic using traffic control equipment. Two workers were inspecting the warning lights (flashers) of the barriers on the motorway. They had parked the truck they were using on the left lane behind the barrier within the area closed to general traffic. The left lane had been closed to traffic on the scene of the accident for almost two months before the accident.

A speeding van drove on the left lane and crashed into the barrier without braking consequently hitting the workers, who were working between the parked truck and the barrier in an area closed to general traffic.

Several rescue units were alerted to the scene and they gave first aid to the injured workers and the van driver. The injured workers were taken to a near-by hospital, where they died of their injuries the same day.

Factors leading to the accident:
• risk driver
• working without protective arrangements
• there was no plan for carrying out dangerous work.

Preventing similar accidents from happening:
• developing the requirements and instructions for temporary traffic arrangements
• developing technical occupational safety
• safety planning of dangerous work
• increasing traffic control on work sites
• awareness campaigns for drivers on the dangers of roadworks.

Excavation works for sewage and water pipelines TOT 15/06
Excavation for sewage and water pipelines was done in clayey ground. The excavation pit was about 2.5 m wide and 3 m deep. The excavation team
carrying out the work comprised an excavator driver and a worker doing the levelling and compacting at the bottom of the pit.

A ground survey had been made on the site. A day with no rain was selected for the excavation work. It was agreed that the work would be carried out in stages in such a way that the pit would be excavated for the length of 1-2 pipe elements, and after the pipes have been installed, they would immediately be covered. Two vibrating plates had been brought to the site: a 100 kg one for the work at the bottom of the pit and a 400 kg one for the filling layers and street area.

The workers had been waiting for some time for a load of crushed stone for the excavation pit in the street area. The delivery was further delayed, therefore the workers started to continue the excavation increasing the length of the open pit to 25 m.

The bigger 400 kg vibrating plate was used at the bottom of the pit instead of the planned 100 kg one. The worker was measuring the elevation at the bottom of the pit when the bank collapsed. The worker tried to run from the fall of ground, but the approximately 10 m long, half a metre wide and excavation deep landslip caught up with him knocking him down underneath. When he fell, he got squeezed between the plate and earth masses with only his head visible.

Other workers dug the victim from underneath some 70 cm thick layer of earth. Despite resuscitation the doctor, who arrived in the ambulance helicopter, found the victim dead.

Factors leading to the accident:

- deep excavation pit with no support and no inclined slopes
- deviating from the agreed excavation plan
- compaction with a too heavy vibrating plate.

**Preventing similar accidents from happening:**

- supporting excavation pits or making adequately gentle inclined slopes
- making an analysis of the need for support based on ground survey
- competent workers
- risk assessment of dangerous work and work plan in writing
- instruction and control of correct and safe working methods.
3 SECURING SAFETY THROUGH TRAFFIC ARRANGEMENTS

3.1 Principles of traffic arrangements on work sites

3.1.1 Objectives of traffic arrangements

The basic requirement for safe work is that the site, work machine and worker can be seen early enough that the work site does not take the driver by surprise. Only then can the driver adapt his/her driving speed and manner to suit the conditions on the roadwork site.

The most important methods to improve the visibility of the site are to use anticipatory warning signs and mark the area using barriers and warning equipment. Visibility is further improved by the warning garments of the workers and warning equipment of the work machines.

Objectives of traffic arrangements
1. to warn road users
2. to secure the safety of traffic and the workers on the work site
3. to ensure good flow of traffic
4. to create necessary conditions for work on a road traffic route
5. to avoid unnecessary impediment to traffic.

The traffic arrangements of the work site primarily aim to ensure the safety of traffic and the workers. In addition to the safety objective, traffic arrangements guarantee good flow of traffic and create adequate conditions for working on a road traffic route. Legislation stipulates that traffic must not cause unnecessary disturbance. Making traffic arrangement plans is a phase in the organisation planning for a work site.

Making traffic arrangement plans is an aspect of planning the use of the site area, in other words part of the site organisation plan.

The basic principles of the traffic arrangements of a work site are:

1. The work site should never take the vehicle driver by surprise. The objective of the traffic arrangements is to forewarn of the work and in such a way that, based on the quality of the arrangements, the driver can determine the nature of the work and the disturbances to traffic caused by it.
2. **Traffic arrangements from one work site to another follow common practices based on the traffic regulations and guidelines.** The objective is to reinforce the driver’s so-called ‘mental model’ based on experience when he/she comes to a work site. The concept ‘mental model’ refers to the driver’s customary way to act based on perception. When the driver sees certain signs, he/she may assume that they are always followed by uniform arrangements.

3. **Traffic arrangements’ efficacy should also communicate the degree of danger of the site and the difficulty of driving.** It is then easy for the driver to adapt from memory his/her driving speed and manner in compliance with the requirements of the work site. The driver’s insecurity and mistakes decrease, which improves safety and traffic flow.

4. **Reinforcing the mental model requires correct and uniform use of the traffic signs in traffic arrangements.** On the other hand, incorrect use of the traffic signs weakens the functionality of the mental model and decreases credibility of the signs.

5. **Road workers need to be able to interpret signs revealing weaknesses in the traffic arrangements or poor visibility of the work site, and consequently, consider improvements.** Such signs are accidents occurring on the site, near miss cases, feedback from the general public, skid marks and damaged traffic control equipment.

6. **In making traffic arrangements all modes of traffic have to be taken into consideration.** Special attention must be paid to pedestrian and bicycle traffic.

The necessary traffic arrangements for roadworks are planned and implemented by applying set guidelines. These include the publication series ‘Liikenne tietyömaalla’ (traffic on work sites) of the Finnish Road Administration and the publication 19/99 ‘Tilapäiset liikennejärjestelyt katualueella’ (temporary traffic arrangements in the street area) published by the Association of Finnish Municipal Technology.

Electronic versions in pdf format are created when updating the Finnish Road Administration’s guidelines, and thereafter they can be read and downloaded on the internet (www.tiehallinto.fi/thohje).

Traffic arrangement plans are made in writing, or an example solution is used taking into consideration local conditions. The contractor is bound by the contract or permit conditions to comply with the plan. Possible changes are always agreed upon separately. The plan has to be talked through with the persons responsible for the implementation of the traffic arrangements.

**3.1.2 Implementation of traffic arrangements**

The first task in roadworks is implementing traffic arrangements, which are always based on a pre-designed plan. On a busy road the job itself may seem fairly simple although it is to be carried out on the lane open to traffic, and closing the lane clearly requires more effort than the job itself. However, even such a seemingly simple job cannot be carried out without closing the
lane because of occupational and traffic safety risks. Therefore, it must be remembered that traffic arrangements always form an integral part of the work, and consequently of the costs of the work. Traffic arrangements constitute quality and safety in roadworks.

Implementing traffic arrangements in practice - erecting and removing traffic control equipment are always especially dangerous tasks. Implementation work for traffic arrangements also requires planning and securing the safety of the workers.

The weekly maintenance inspection of the site checks the traffic arrangements and their compliance with the plan, as well as the condition and cleanliness of the traffic control equipment. Because the weekly inspection is made using MVR-mittari (checklist on the safety of an earth construction work site), the inspection of traffic arrangements has to be made using a checklist specifically developed for this purpose. The functionality of the temporary traffic arrangements also have to be inspected in the dark. On demanding work sites the performance and condition of the traffic arrangements also have to be ensured outside working hours by organizing an on-call duty rota. The usual system is to give the contact information of the on-call duty person to the Traffic Management Centre.

3.1.3 Structure and erection of traffic signs

The traffic signs used in roadworks should be in flawless condition. The surface materials can be the same as on the signs normally in use, or could be those specifically designed for work site conditions. The quality of the surface material and the size of the signs to be used are specified in the plan for traffic arrangements. The use of traffic signs with both daylight luminescence and lower reflectivity class at the same time is recommended. The traffic signs and other traffic control equipment should be cleaned daily when necessary.

The traffic signs are erected in a reliable manner even temporarily. Wind or air turbulence from passing vehicles must not knock over or move the equipment. Sites at risk from vandalism may require special measures to ensure that the equipment stays in place. Temporary vertical structures must not pose danger, not even in an accidental collision. When procuring traffic control equipment for the work site, the choice will increasingly be influenced by the passive safety characteristics of the structures.

Redundant traffic signs are either removed or covered with a grey panel (protective cover). A refuse sack is not an acceptable cover.

In summer time, traffic signs on the roadwork site are erected in the road’s cross section within the regulated limits, using the minimum distance and height. The minimum height is 1.5 m from the carriageway surface and the minimum distance from the edge of the carriageway is 0.5 m. On a pavement and pedestrian and bicycle lane the lowest sign has to be at the minimum height of 2.0 m from their surfaces. In winter time the effects of ploughed snow are taken into consideration. On a busy road, signs are located on both sides of the road. Based on the special permission granted
by the Ministry of Transport and Communication, the Finnish Road Administration may use a sign on a low stand on a road with a wide shoulder and in mobile work (e.g. paving works).

Warning signs are erected 150 – 200 m before the road section it relates to. On motorways and semi-motorways the maximum distance is 500 m. In built-up areas and within an area with the maximum speed of 60 km/h the warning sign can be located closer to the work site. The basic idea is that the vehicle driver always has enough time to perceive and act in compliance with the sign.

**On all dual carriageway roads and other busy roads, traffic signs are erected on both sides of the road.**

The use of concrete boulders as a base for traffic control equipment has to be considered case by case. **Their use on the carriageway cannot be accepted.** They can be dangerous when used singly on the edge of the carriageway or shoulder, but are practicable when connected to each other in order to mark off the driving lane. The weakness of the concrete boulders is that they can fall over sideways. There are examples of situations when temporary traffic signs set in concrete boulders have been blown over by wind across the carriageway.

Single boulders are replaced by safer solutions, such as by traditional ring bases. This type of a base always requires additional weights. Loose rocks and kerb stones should not be used; one of the best solutions is to use suitably heavy sacks filled with dry sand or crushed stone. A beam made of wood or concrete sized approximately 150 x 150 mm² and 3-4 m long can be used as a base. The beam is firmly fixed to the edge of the excavation pit or area to be closed off. The necessary traffic signs, barriers and railings are fixed to the beam. The beam is suitable for use in built-up areas. It also works well as a guide for the whitestick used as a probe by visually impaired persons.

There are also foldable spring-loaded stands for bigger panels operating on a roller blind principle. Panels with hinges are recommended for use as periodically changing traffic signs. On a site located on a busy road, changeable traffic signs with a battery operated remote control improve traffic safety, because changing the sign does not necessitate stopping and getting out of the vehicle.

- **Speed limit signs are always erected in the scaling order from the highest to the lowest speed limit.**
- **Dismantling the traffic arrangement is carried out in a reverse order.**
3.1.4 Most common traffic signs needed in work

Roadworks 142
The sign is used to warn of a place or section of a road affected by roadworks, where there may be work machines, workers, or dangers due to the work itself or it being unfinished, such as loose stones or potholes.

The sign is used if work which may cause danger to traffic is carried out on the road or in its vicinity, or if traffic poses a danger to the workers carrying out the work.

The sign is not usually used in short-term and mobile work, if the road section has good visibility distance, and if the vehicles and work machines used have rotating or flashing yellow warning lights to warn traffic, or if towed warning equipment or warning equipment attached to a vehicle is used.

The use of the roadwork sign on unfinished road sections is not automatic, if the work has been discontinued. Traffic signs warning of an uneven road or loose gravel should be used instead according to the circumstances.

In the range of the roadwork sign, other warning signs are not usually used to warn of loose gravel, minor potholes or slightly narrower road sections. If the range of the sign is longish other warning signs may be used if the uneven or narrow sections are exceptional in comparison with the general condition or width of the road section under works. If the range of the roadwork sign is longish, it is equipped with an additional panel 814 (distance to which the sign applies) showing the length of the range.

The sign is not used when work carried out completely outside the carriageway does not cause danger to traffic, and the workers do not have to move about on the carriageway because of their work.

When work is discontinued for a longer time than just a lunch break, e.g. overnight or during weekend, and the work or its unfinished nature does not cause danger to traffic, the sign is removed or covered. Traffic is warned using other signs according to circumstances.

It is forbidden to turn the sign sideways, because then it may not be clear to the road user whether the sign is meant to be in force or not. This applies to all traffic signs that are not meant to be in force.

Narrow road 121
The sign is not usually used within the range of the roadwork sign, when the narrowing section is effectively marked with barriers. The sign is erected to warn of a narrowing section if the roadwork sign is not used.

Loose gravel 143
The sign is used to warn of loose gravel temporarily on the road. It is usually used in connection of chip sealing or shoulder filling, when the work itself is over, and the roadwork sign is no longer in use. Loose material may get onto
the road or loosen off the road. The sign can also be used when loose gravel may travel onto the road from a junction due to aggregate transport or some other reason, and may pose danger. It is recommended that the sign is attached to the speed limit sign 50 km/h on a chip sealing site.

The sign is not usually used on gravel roads, unless there is locally loose gravel on an otherwise smooth road due to roadworks.

**Slippery road 144**

The sign is used when there are slippery substances on the road, such as oil.

The sign can be used to warn of possible slipperiness of a newly paved surface. If the paving is especially slippery in rain, an additional panel ‘Sateella’ (in rain) is used. The sign is not used if the maximum speed limit is 60 km/h. On roughened surfaces the sign is not usually used.

**Dangerous shoulders 147**

The sign can be used to warn of a high edge of the paving or weak shoulder. The sign is used to warn of a high edge of the pavement when the edge renders a road section dangerous to traffic due to shoulder erosion or depression. If the dangerous section is longer than 500 m, an additional panel 814 (distance to which the sign applies) is used.

The sign is not used to warn of a high edge of the pavement if the paved shoulder is at least 1.0 m wide.

On paving sites the sign is not usually used at the same time as sign 142 (roadworks), because sign 142 warns of longitudinal differences in level normal to paving work sites.

In roadworks a dangerous road edge is usually separated by posts or other barriers. When the work is temporarily discontinued and sign 142 is not used, the sign can be used on an unfinished road to warn of shoulders with poor bearing capacity.

**Traffic divider / pass this side 417**

The sign is used to show that a vehicle may pass only on the side shown by the arrow. When using the sign it must be noted that it cannot be erected in front of a work site on the left side of a dual carriageway, because it must be possible to pass the sign in travel direction immediately next to the obstacle marked with the sign.

### 3.1.5 Temporary speed limit

A temporary speed limit is used on a roadwork site if the site’s traffic arrangements so require. The contractor has to keep a record of the dates and times as well as locations of the speed limits. The use of a temporary speed limit necessitates the knowledge of and adherence to the traffic regulations connected to the speed limit.
The range of the speed limit does not end at the intersection, but continues beyond the intersection when the driver drives straight on. When the driver turns to another road at the intersection and the temporary speed limit sign is not repeated there, the general speed limit comes into force (in built-up area 50 km/h, outside built-up area 80 km/h). If the driver is within the range of the speed limit when taking a turn to another road at the intersection, the same speed limit continues to be in force.

If the speed limit of the work site continues beyond the traffic border of a built-up area, the traffic regulations connected to the built-up area signs have to be taken into consideration. However, the signs 571 (built-up area) and 572 (built-up area ends) must not be covered or removed even temporarily. After these signs the current speed limit has to be shown by a separate sign, if it is not the same as the speed limit inherent in the built-up area signs.

**The signs built-up area 571 and built-up area ends 572 must not be covered or removed even temporarily in roadworks.**

### Scaling of speed limits

The speed limit is scaled down if the previous speed limit is over 30 km/h greater than the temporary speed limit on the site. On the section of the changing speed limit scaling down by 20 km/h is used 100 - 80 - 60 (50).

The speed limits 30 km/h and 40 km/h are only used in special circumstances and on as short a road section as possible. They can be used without down-scaling, if the speed limit on the previous road section is not higher than 60 km/h (e.g. poor-standard roads under a general speed limit).

### Making speed limits more effective

The effect of speed limits may be improved by making the traffic lane narrower or by using gate structures. These are made with the help of marker posts, cones, barriers and towable warning equipment. On especially dangerous sites the effect of the speed limit may be boosted by rumble strips or humps.

Display panels with road vehicle detectors showing such texts as ‘Ajat liian lujaa’ (you drive too fast) or ‘Hidasta’ (slow down) can be used on a site.

### Ending work site speed limit

The work site speed limit is usually ended by using traffic sign 361 (speed limit) showing the new limit. On a road subject to the general speed limit it can also be done using the traffic sign 362 (end of speed limit) after which the general speed limit takes effect.

The sign 362 (end of speed limit) **cannot be used** to end a lower speed limit after a work site within an area with a road-specific speed limit (different from the general speed limit).
3.1.6 Information on roadworks

Information on roadworks by the Finnish Road Administration

The Finnish Road Administration provides information on roadworks on public roads on the teletext pages of the Finnish Broadcasting Corporation and the webpage of the Finnish Road Administration. On weekday mornings a bulletin on the regional roadworks is sent to the representatives of the mass media in each region.

Information on all works on roads causing disturbance to traffic are made available on the internet on the travel and traffic information/roadworks pages of the Finnish Road Administration website. Information on regional roadworks can be accessed through an area-specific link on the regional roadworks information page. Each regional page has a link ‘Ajankohtaista’ (current situation) with compiled information on the most significant changes in the roadworks of the region.

Contractor’s notification to the Finnish Road Administration

The contracts specify the contractor’s obligations to notify the Traffic Management Centre of the Finnish Road Administration of the work phases of its sites.

3.2 Barrier and warning equipment

3.2.1 Classification of the operating environment

Barrier and warning equipment are classified into three operating environment classes (S3, S2 and S1) based on the quality requirements of the equipment. The class S3 represents the highest quality level and S1 the lowest.

The category of the operating environment depends on which kind of road the work site is located. On motorways, semi-motorways, roads with dual carriageway and roads with heavy traffic (ADT > 3000 vehicles/d) the operating environment class is S3. The lowest class S1 is applied when work is carried out only on pedestrian and bicycle lanes or residential streets with little traffic. The lowest class is also applied to mobile works during daytime when the traffic volume is low (ADT< 1500 vehicles/d). Other main and trunk roads belong to the S2 operating environment.

The operating environment sets out requirements for the barrier and warning equipment in the following categories:

- condition of the equipment (condition class 5 to condition class 2)
- surface material of retroflexive equipment (R3 to R1)
- other characteristics, such as minimum height and the size of traffic signs used with equipment.

2 available only in Finnish
The contracts specify the required operating environment of the work site, which indicates the class of barrier and warning equipment to be used.

The following chapter describes the barrier and warning equipment and their use in general. More detailed requirements for their quality and dimensioning in different operating environments are presented in the Finnish Road Administration’s guidelines ‘Sulku- ja varoituslaitteet 5D-2’ (barrier and warning equipment 5D-2).”

3.2.2 Barriers

Barriers are used to separate the working area from the road area reserved for traffic. Good visibility is a characteristic of a barrier. They are mainly used because of their ability to provide guidance. The barrier structure does not prevent a vehicle from swerving onto the work site. The structures are principally dimensioned to withstand the wind load.

<table>
<thead>
<tr>
<th>Barrier types</th>
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<tbody>
<tr>
<td>• barrier fence</td>
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<tr>
<td>• net fencing</td>
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<tr>
<td>• road barrier</td>
</tr>
<tr>
<td>• marker post</td>
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<tr>
<td>• traffic cone</td>
</tr>
</tbody>
</table>

Barrier fence

A barrier fence may be used to close a carriageway or a pedestrian and bicycle lane partly or completely.

The barrier panels have alternate red and yellow oblique or vertical stripes. The oblique stripes form an arrow, which indicates a clear change in the driving lane (e.g. guiding onto a detour). The stripes on barrier fences are vertical when a carriageway is closed. The barrier panel must be fitted with an all-reflective surface.

Other dimension and quality requirements of the barrier fence depend on the operating environment. In the operating environment S3 a barrier fence of height 3,700–4,000 mm is used. Then the barrier fence is fitted with big traffic signs and oversized traffic divider ‘pass this side’ 417 with a diameter of 1,800 mm. The reflectivity in this class has to be of the daylight luminescence film in retroreflectivity class R3, or at least R2.

In the operating environment S2 the height of the barrier fence is the same as in class S3, when ADT is > 3000 vehicles/d, otherwise at least 2,000 mm. Normal-size traffic signs are used with the fence, however, if ADT is >3000 vehicles/d the diameter of the sign has to be 1,800 mm, otherwise 900 mm. The reflectivity requirement is the same as in the class S3.

In the operating environment S1 the height of the barrier fence has to be at least 2,000 mm and normal size traffic signs are used with it. The minimum reflectivity requirement is a film in retroreflectivity class R1.
**Net fencing**

Net fencing may be used for example in a built-up area to separate a work site from a pedestrian and bicycle lane.

The material used for net fencing may be steel or plastic. Vertical structures have to be such that they keep the barrier net upright.

The visibility of a metal net from its background must be reinforced, for example by fixing a coloured plastic ribbon horizontally to the net. The side of the net fencing visible to the incoming direction of the pedestrian and bicycle lane has to be fitted with reflecting material.

**Road barriers**

The use of a road barrier is restricted mainly to work situations where a work site is separated from the area reserved for pedestrian and bicycle traffic on pedestrian and bicycle lanes. If the road barrier is used to prevent unintentional fall into an excavation on a pedestrian and bicycle lane, it must be taken into consideration that the structures have to meet the requirements for strength in resisting leaning and tighter requirements for installation. More detailed guidelines and requirements for a road barrier have to be taken into consideration according to its use either as an access barrier or safety rail.

When a road barrier is used for temporary traffic control, it must be fitted with a flashing yellow or constant red light in the dark and dusk and also at other times if necessary. A warning lamp emitting a constant red light must be used if a route is closed completely and it is necessary to turn back from where the road is closed.

If a road barrier is used to close a route, it may be fitted with traffic signs similar to those on barrier fences. The use of a road barrier for the purpose of closing a route is relevant mainly on pedestrian and bicycle ways.

The upper intermediate bar of a road barrier must be provided with an all-reflecting surface (R1), or with alternate red and yellow reflectors.

**Marker posts**

Marker posts are used on work sites to define driving lanes. The flat versions of the marker post are installed so that their stripes point downwards on the side where the vehicles pass the row of posts. The erection interval varies case by case.

In the more demanding operating environments (S3 and S2), the flat version of the marker post with the minimum width of 150 mm is used. In the S1 operating environment a circular marker post of diameter is 95–120 mm can be used. The operating environment class also sets requirements on reflectivity and the minimum area of the reflective part.

**Traffic cones**

Traffic cones are generally used to define a closed area from a space used by traffic during road marking and surfacing works. During surfacing works,
Traffic cones are used next to the finisher within the limits permitted by space. The erection interval varies on a case by case basis. On the section of the road being used for work, cones are used at intervals of 50 m depending on the conditions of visual range and phases of operation. There must be no confusion for drivers concerning the length of the closed section.

Traffic cones are only recommended for daytime use. If traffic cones are used in the dark or dusk, they have to be reflective. The operating environment class sets minimum requirements on reflectivity and the height of the reflective part.

The traffic cone is 450–1,000 mm high: in operating environment class S3 the minimum height is 750 mm, in class S2 it is 500 mm and in class S1 450 mm. There are also requirements for the weight of the cones depending on the operating environment class.

Traffic cones have to be designed so that when stacked they do not stick to each other and do not damage each other’s reflective surface. A collision with a traffic cone must not cause damage to a car.

### 3.2.3 Warning equipment

Warning equipment is used to warn traffic in addition to danger warning signs, or in short-term or mobile work instead of danger warning signs.

<table>
<thead>
<tr>
<th>Warning equipment types</th>
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<tbody>
<tr>
<td>• towed warning equipment</td>
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<tr>
<td>• warning equipment attached to a vehicle</td>
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<tr>
<td>• warning equipment placed on a road</td>
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**Towed warning equipment**

Towed warning equipment may be used instead of a barrier fence to warn or control traffic due to roadworks when the work is progressing quickly or is short-term.

The rear of towed warning equipment is no more than 2,600 x 4,000 mm. The height of towed warning equipment from the ground is 3,700–4,000 mm in operating environment S3 and in operating environment S2 on busy roads (ADT >3000 vehicles/d). Otherwise the minimum height of the towed warning equipment from the ground is 2,000 mm.

Traffic sign 417 (traffic divider) and generally also 142 (roadworks) is fixed to the rear centre of towed warning equipment. Operating environment class S3 requires the use of large traffic signs. In addition to the above, sign 417 (traffic divider) is also oversized in the operating environment S2 on busy roads.

The yellow flasher lights on the top of the warning equipment must always be kept on when the equipment is used. Flashing lights must be switched off during transportation and the barrier fence turned to the horizontal position.
Warning equipment attached to a vehicle

Towed warning equipment may be replaced with a corresponding barrier fence attached to a vehicle, for instance, to the back board or platform structures of a truck.

Warning equipment provided with special lifting gear may also be fixed to the roof of an escort vehicle, service van or works machinery to warn of the works.

Warning equipment placed on a road

Special warning equipment placed on a road may be used when the traffic needs to be warned of short-term roadworks and the erection of a warning sign would take excessively long time in comparison to carrying out the work itself.

Warning equipment placed on a road consists of a base and of a traffic sign 142 (roadworks) or 189 (any other danger) fixed to it at the minimum height of 300 mm and also of a warning light fixed on top of it emitting flashing yellow light.

The use of warning equipment placed on a road is also recommended in situations where warning of a work site is only given with a rotating or flashing yellow light and the work site is in a location which is not clearly visible from a sufficient distance.

3.2.4 Installing barriers and warning equipment

When installing barrier and warning equipment, solutions are used so that the equipment stays upright in case of a collision in all normal situations and loads. The installation frames of the equipment have to be suitably strongly built and the support of the base is strengthened using rubber weights or sand bags.

Equipment must not cause unnecessary hindrance to traffic on routes designated for traffic; nor should it hinder the maintenance of the routes. The supporting structures of the equipment have to be designed so that they do not extend onto the carriageway or the pedestrian and bicycle lane. Good visibility of the equipment has to be taken into account during installation.

The barrier and warning equipment at the work site have to meet the quality requirements imposed on them in all situations. Defects in the barrier and warning equipment due to vandalism, natural conditions, accidents or other reasons which cause an obvious danger must be repaired immediately after a defect is detected.

3.2.5 Warning lights

Always in the dark and dusk and also, if possible, at other times when visibility is restricted, road barriers and barrier fences have to be fitted with a
warning light that emits flashing yellow light, or with a warning lamp emitting constant red light.

A constant red light is used if a road is completely closed and it is necessary to turn back from where the road is closed.

Warning lights of vehicles are discussed in section 4.12.

Barriers and warning equipment belong to the most important equipment used in temporary traffic arrangements in roadworks. They help to show the temporary driving lanes to other traffic.

3.3 Protecting a work site

Protection of a roadwork site relates to the structures which protect the workers from traffic, traffic from the site, and the different parties from each other. Protection prevents vehicles e.g. from running over the workers, swerving into an excavation or swerving off the road, and it prevents collision of opposite traffic directions and mixing of different forms of traffic. Protection must also prevent pedestrians from unintentionally falling into an excavation and straying into a work site.

In addition to the normal traffic control measures, the need for protection must be assessed for each work site on a road. Protection is used to guarantee the safety of the site and its workers. The contractor’s duty is to mark and protect sufficiently effectively the sites in the traffic area and dangerous excavations.

3.3.1 Protecting against collision

Crash restrainer
A bundle of car tyres is usually used as a crash restrainer with its performance verified by a collision test. A crash restrainer sliding in front of a swerving vehicle slows down its speed. The level of speed used on the road has to be taken into consideration when placing a restrainer, leaving a sufficiently wide safety zone between the work site and restrainer (example pictures provided in the Finnish Road Administration’s guidelines).

Crash obstruction
A heap of gravel or chippings is usually used as a crash obstruction to prevent the access of a vehicle to a dangerous work site, for example excavation.

Crash obstruction can also be made of a line of concrete elements diagonally anchored to the ground in line with the driving direction to steer a colliding vehicle to a safe direction.

Crash attenuator
A truck mounted attenuator (TMA) is used to protect mobile and periodically stopping work. Currently the use of such a crash attenuator is required on
motorways when making road markings and in maintenance of road lighting when the work is carried out of a lifting cage.

On other roads a warning vehicle or safety truck may be used in mobile or periodically stopping works as a protection method. A safety truck is usually a maintenance vehicle or truck weighing at least 3.5 tons and equipped with efficient warning equipment. A warning vehicle may be lighter than a safety truck. A warning vehicle is moving at a distance of 15–20 m from a worker. In areas with poor visibility the warning vehicle and safety truck has to be visible to other traffic at least from a stopping distance.

Standardised crash attenuators made for permanent use may also be used to protect work sites.

### 3.3.2 Protection against swerving

**Protection classes**

Railings with protection classification are used on work sites. The protection class describes the method restraining a vehicle from swerving to a work site. Protection classes are K0, K1, K2 and K3. The choice of a protection class depends on the amount of traffic and speed limit on the road, and on the seriousness of consequences and duration of a danger.

Railing structures are either based on assembling concrete elements or using steel profiles.

**High edge support**

Concrete piles are used as a high edge support (e.g. 300 x 300 mm or 250 x 250 mm concrete piles) anchored to the surface of the road and locked into each other with fixings. A high edge support may be used to separate a work site from traffic when an excavation is in line with the driving direction and its maximum depth is 1.0 to 2.0 m, for instance in replacing soil and widening a road, both situations in which the work sites are long.

**Line of concrete elements**

A line of concrete elements comprises heavier and cross-sectionally bigger elements than the high edge support. A line of heavy concrete elements is classified as protection class K1 when the elements are not connected to each other. If the elements have been connected to each other with fixings or a guard rail, the structure can be classified as protection class K2.

### 3.3.3 Protecting workers

On work sites, workers on foot are separated from the general traffic using protective measures. At the same time speed of the passing traffic is lowered. The traffic control measures on the site are set up in such a way that they enforce lower speeds, for example by narrowing a lane, or using gates, chicanes or humps.

Attention must be paid to the visibility of workers and warning garments must be used on a work site.
Attention must be paid to getting to the site and leaving it. The intersections used by the work site and general traffic are planned in connection with the temporary traffic arrangement and site organisation plans. The planning also includes the layout and safety of pedestrian routes.

In short term and mobile works carried out on foot, protection of workers is secured by a safety vehicle. When necessary a warning vehicle is also used for traffic control.

Work on foot amidst traffic is one of the dangerous works listed in the occupational safety regulations for which a written plan must be made. Such works are for example installing, dismantling and maintaining traffic arrangements, upkeep of traffic control equipment and surveys made on roads. Dangerous works also require more thorough than usual orientation for the work site and equal attention must be paid to work supervision and control.

3.4 Working as a temporary traffic controller

A person appointed to be a temporary traffic controller must be of age and he/she must have normal senses and usually a driving licence. The person working as a temporary traffic controller must take the dangers inherent in the task seriously. A temporary traffic controller must always be trained for the task. In addition, the employer has to introduce the temporary traffic controller to each work site before he/she starts traffic control work.

**Competence requirements for a temporary traffic controller:**
- Valid competence in Traffic Zone Safety 1
- Age of maturity (18 years)
- Normal senses
- Driving licence (minimum requirement T-licence)
- Trained for traffic control duties
- Introduced to each work site by the employer

According to the Road Traffic Act (4 §) a temporary traffic controller has the same mandate as the police in traffic control, except for summary penal judgement. Instructions of a temporary traffic controller have to be primarily followed, even if it would mean ignoring commands of traffic control equipment or traffic regulation.

**Order of compliance**
1. Sign or instruction given by the police or other temporary traffic controller
2. Traffic lights
3. Traffic signs, road markings and other traffic control equipment
4. Traffic regulations
A person carrying out temporary traffic control has to wear warning garments of standard SFS-EN-471 class 3. The class is marked on the CE label attached to the garment.

The stop sign used in the daytime traffic control is the sign 311 (closed to all vehicles) with a diameter of 400 mm and daylight luminescence film. In the dark and dusk a smaller sign (200 mm in diameter) lit from the inside must be used. Work machines and maintenance vehicles are equipped with a sign of 200 mm in diameter with daylight luminescence film.

<table>
<thead>
<tr>
<th>Temporary traffic controller's equipment</th>
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<tr>
<td>• warning garments of class 3</td>
</tr>
<tr>
<td>• Stop sign, traffic sign 311 (closed to all vehicles)</td>
</tr>
<tr>
<td>• Daytime d=400, daylight luminescence film</td>
</tr>
<tr>
<td>• In the dark or dusk d=200, lit from the inside</td>
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</table>

Detailed instructions have been prepared for the work orientation in temporary traffic control. The guidebook is given to all persons working as temporary traffic controllers (Liikenne tietyömaalla, 5E Liikenteenohjaaja TIEH 220 0008-02 – traffic on roadwork sites, temporary traffic controller, Finnrä publication). Suomen Pelastusalan Keskusjärjestö, SPEK (the Finnish National Rescue Association) has made a guide for traffic control on the scene of an accident ‘Liikenteenohjaus onnettomuuspaikalla’, which contains instructions for a temporary traffic controller in special circumstances.

The guide gives detailed instructions for the steps to be followed in stopping traffic. Furthermore, the Finnish Road Administration’s guidebook presents the principles for selecting a good place to stop traffic.

Movable traffic lights are used to assist temporary traffic controllers in their work, when manual traffic control is long-term or regularly recurrent.

4 SAFETY WHEN OPERATING A WORK MACHINE

4.1 General safety of machines and equipment

The structure, equipment and other features of the machinery and other technical devices used in construction work must not cause a risk of accident or harm to the health of the operators or others on the work site when used as intended by the manufacturer (L 1016/2004).

When considering the placement of a machine or other equipment at the construction site, its safe use and the space necessary for use shall be taken into account (Government Decision on the Safety of Construction Work, VNp 629/1994 § 29 subsection 2).
It is the duty of the employer to make sure that the machinery and equipment used in the work have been proved appropriate for the intended use and in compliance with the specific safety requirements. Tools provided for the workers’ use have to be intended for the work at hand. When the employer selects tools for the workers, he/she has to pay attention to the nature of work and the workplace’s special circumstances affecting workers’ safety and health as well as to dangers caused by the use of the tools in question.

If it cannot be completely guaranteed that workers can use the tools without endangering their safety, the employer must take appropriate safety precautions in order to minimize the risks. Then it will be a question of using different kinds of safety devices, personal protective equipment or working limitations as well as instructing and training employees to avoid danger.

It is the duty of the employer to make sure that tools are kept in adequate repair throughout their service life so that they meet the safety requirements set for them. If an inspection is specifically decreed or stipulated for a tool, it may not be used without the appropriate inspection.

4.2 Requirements for road management vehicles

A ‘road management vehicle’ is a generic name for a motorised vehicle used in road management.

Road management vehicles are for example:
• machines used in different road maintenance operations
• motor construction machines used in different earth construction operations
• motor construction machines used in paving and road marking
• passenger cars, vans, maintenance vehicles and trucks while used in planning, control, supervision and maintenance works.

The owner, or in his/her stead the possessor of the vehicle and its driver are responsible for the roadworthiness of the vehicle used in traffic. Roadworthiness means that all the equipment and devices used in driving the vehicle in general traffic are in functional order.

If the vehicle is driven by an employee of the owner or possessor of the vehicle, the employer is responsible for making sure that the vehicle is roadworthy when it is assigned to the employee for use. Similarly, it is the duty of the employer to make certain that the vehicle is inspected and serviced sufficiently often in order to keep it in a roadworthy condition.

The driver has to inform the employer without delay of the faults detected in the condition of the vehicle that he/she is unable to fix himself/herself. Faulty vehicle jeopardizing work or traffic safety must not be used for work.

The employer has to equip vehicles used in roadworks with warning equipment required by the work to be carried out or client necessary for warning other traffic or other people working on the work site.
Before setting off, the driver must always check that the warning equipment and device are in order and functioning.

4.3 **Driver’s work orientation and professional qualification**

Supervisory staff are responsible for the orientation of the driver in the use of the work machines and auxiliary equipment. In the work orientation the driver is shown how to operate the equipment used in the work as well as how to drive the vehicle in an appropriate manner in traffic. The driver is also introduced to the preconditions and responsibilities set in legislation, e.g. driving under exemptions from the traffic regulations.

The act and government decree on the professional qualification of truck drivers came into force 1.8.2007 (L 273/2007 and VNa 640/2007). The objective of the regulations is to improve traffic and transportation safety, by increasing the driver’s professional skills and the driver's qualifications to carry out his/her work. The training leading to the professional qualification has to include training in anticipatory driving to promote a safe, economic and environmentally friendly way of driving, developing skills for risk assessment in traffic, avoiding dangers and acting in an emergency and in mitigating its consequences.

Truck drivers have to fulfil the qualification requirements by 10.9.2009. However, basic-level professional qualification is not required of drivers who received their driving licence before the date of the new legislation.

After 2009, professional qualification is valid for five years, after which the driver has to re-validate his/her qualification by attending at least 35 hours of further training. Truck drivers have to fulfil the further training requirement by 10.9.2014.

4.4 **Working as a driver**

**Responsibilities of a work machine driver are as follows:**

- use working methods that take into consideration traffic safety requirements
- use working methods proven to be good for occupational safety
- carry out the assigned task, and ensure that the vehicle’s capacity is not exceeded and that loading is undertaken correctly
- acting as the driver of the employee’s vehicle, monitor the condition of the vehicle and inform the relevant people of its faults
- he/she must have a driving licence authorising him/her to drive the vehicle in question and inform the supervisor immediately of the changes in the validity of his/her driving licence.

The driver, for his/her part, shall seek to improve his/her professional competence and to let the supervisors know of his/her need for further training. He/she shall also tell about the improvement needs that he/she has noticed in his/her work.
The driver as a road user has to observe the traffic regulations and show diligence and caution required by the prevailing conditions to avoid danger and accidents. The driver must not unnecessarily hinder or disturb other traffic.

A road user is each person who is on a road or in a vehicle on a road. (Road Traffic Act TLA 267/1981, TLL 1 § subsection 10).

Responsibilities of a work machine driver in traffic are as follows:

- primarily observe the general traffic regulations
- always show diligence and caution required by the prevailing conditions to avoid danger and accidents
- drive the vehicle in such a way that it does not unduly hinder or disturb traffic nor cause obvious danger
- apply exemptions from the traffic regulations in a way necessary to roadwork conditions and with due caution
- when stopping or parking under the exemption from the traffic regulations, the location of the vehicle shall not cause obvious danger or hindrance to other traffic.

Depending on the type of roadwork vehicle disturbance may be caused to other traffic, but causing unnecessary disturbance must be avoided.

4.5 Monitoring the condition of work machines

The condition and safety of work machines is continuously monitored during work as well as in connection with the work zone inspections. It is recommended that periodic safety inspections are included in the routine maintenance procedures and inspections of the equipment. It is the responsibility of the employer to prepare instructions and rules for monitoring and inspecting the condition of equipment. It is the responsibility of the employee to follow the given instructions.

4.6 Daily functional checking

At the beginning of the work shift the driver shall make certain that the machine is in working order and that it has no faults endangering safety. A good way to ensure the safety of the machine is to carry out a daily functional check on the machine and its auxiliary equipment to guarantee the condition of the protective devices and the faultless functioning of the machine. The functional check is especially important if the machine is not otherwise regularly checked, for instance in connection of the weekly work site inspections. There are legal requirements or manufacturer’s instructions for the daily functional check of some machines or equipment, for example hoisting machines and personal manlifts.
4.7 Safe working methods

Working methods are selected in such a way that hindrance or danger to traffic and environment are minimal. The need for safety and protection of the work is assessed by taking into account the volume of traffic on the road, speed limits, road geometry and any other influencing factors. Machine work is planned so that there is no danger of the machine overturning. Solutions to minimise machine reversing should be sought.

Working methods and machines and their auxiliary equipment are selected in such a way that the machine does not extend to the area used by the general traffic. Rubbish, stones or slippery substances must be removed immediately from the carriageway if they are dangerous to traffic. Otherwise they have to be removed as soon as possible after work.

Work is planned so that access of outsiders to the danger zone of the machine and its auxiliary equipment is prevented. The work must be immediately discontinued if someone enters the danger zone. Special care must be taken to prevent children from entering the danger zone.

If the work supervisor wants to talk to the driver, who is working on a road section dangerous to traffic, the work has to be discontinued and the talk resumed in a place safe for traffic.

4.8 Obligation for diligence and caution

Diligence and caution are unconditional obligations presented in the road traffic legislation for driving a vehicle. Neglect of these obligations will lead to punishment via the legal system.

Diligence is presented together with the obligation for caution. A road user has to use diligence and caution necessary in the circumstances to avoid danger and harm (Road Traffic Act TLL § 3).

The caution necessary in the circumstances means in driving a work machine, that other road users are taken into consideration and own movements are demonstrated in such a way that other traffic is able to anticipate them. At the same time, neglect of caution is in legal practice easily regarded as callousness if the driver has been indifferent to the possibility of danger. In legal practice, callousness represents an element of negligence.

Special knowledge and competence, such as knowledge of the technical condition of the vehicle, circumstances and local knowledge may influence the evaluation of diligence. Consequently, it is considered that a work machine driver knows better the risks than a novice, and a professional driver may be expected to display above-average driving skills e.g. in slippery conditions.
Roadwork Safety

3BSAFETY WHEN OPERATING A WORK MACHINE

Fulfilling the obligation for caution:

- caution necessary in the circumstances
- necessary caution
- special caution.

The obligation of caution necessary in the circumstances requires that a work machine does not, through its movements or stopping, cause danger to other traffic even in exceptional circumstances. Aspects making circumstances exceptional are for example, weather, road weather conditions, road, traffic volume, environment, the particular work machine, loading and the many factors connected with visibility.

The obligation to use necessary caution is connected especially with driving a work machine under exemptions from the traffic regulations.

At the same time, other traffic must use necessary caution when passing or meeting a work machine operating on the road.

A vehicle driver driving under exemptions from the traffic regulations is, however, primarily responsible in case of an accident, unless it can be shown that the other party is guilty of neglect of necessary caution.

According to legislation, a driver must use special caution when approaching an equal-rights crossing as well as a stopped school transport vehicle, bus or a tram. A driver must also observe special caution when approaching children, elderly people or others, who have obvious difficulties coping safely in traffic.

4.9 Exemptions when operating a work machine

4.9.1 Application of exemptions

The road traffic legislation includes exemptions for roadworks. The basic principle in applying exemptions is, however, that they are applied only when work cannot otherwise be carried out.

Roadworks should be so planned and carried out that exemptions have to be applied as seldom as possible.

This especially concerns works carried out by work machines on roads with high volume of traffic, for example most winter maintenance works. Applying exemptions to shorten driving distance using temporary crossing of the carriageways is possible only during the quiet hours of the night.
A work machine can be operated applying exemptions from the traffic regulations when there is a legislative provision for it and road maintenance work necessitates exemption from the general traffic regulations.

A work machine must not be stopped or parked in such a way that it causes obvious danger. If a vehicle has to be stopped or parked in a place with limited visibility, traffic must be forewarned and manually controlled.

According to the exemptions, the warning light/lights of the vehicle must be turned on when the exceptional movements, parking, or the vehicle’s width and length may cause danger to other traffic.

**Road Traffic Act TLL § 48 subsection 3 Exemptions**

In roadworks or similar works on road, or next to it, a vehicle may, Road Traffic Act (267/1981) § 8-12 and § 33 notwithstanding, be driven as necessary in the circumstances observing necessary caution.

**Driving a work machine in non-compliance with the traffic regulations is only possible, when the following rules apply:**

1. It is made possible by exemption in the legislation.
2. Circumstances in carrying out the roadworks make it necessary to apply exemption from the traffic regulations.
3. Necessary caution is observed.

Applying exemptions is not a self-evident right of the roadwork vehicles. The law provides separate exemptions to certain situations in order to make carrying out roadwork technically possible and sensible.

An important point is the fact that a prerequisite for applying exemptions is that the circumstances are such that work cannot otherwise be carried out (e.g. many maintenance works).

If such a prerequisite does not exist, the work has to be carried out in compliance with the general traffic regulations. If driving a vehicle in non-compliance with the traffic regulations is required for non-technical reasons, temporary traffic arrangements need to be set up for the particular road section. For instance, the use of separator crossings of a dual-carriageway road for mass hauling vehicles to shorten driving distances during paving works requires setting up temporary traffic arrangements.

When a work machine is driven under exemption from the traffic regulations, other traffic must be given a chance to give way and adapt driving to the moving vehicle.

It is important for other traffic to notice the work machine and its exceptional way of moving. The warning lights of the vehicle must be turned on when the vehicle’s non-compliance from the traffic regulations in its way of moving or stopping, or the vehicle’s width or length, may cause danger to other traffic.
Before the work machine is taken into use, it must be checked that it has an adequate number of warning lights and that their position and type are appropriate.

A flashing warning light must be used when driving a work machine in non-compliance with the traffic regulations.

4.9.2 Exemptions for driving a work machine

Road Traffic Act TLL § 8 Use of different parts of the road

A vehicle shall be driven on the carriageway. If there is a shoulder on the right side of the road that can be driven on without impediment, a bicycle and other non-motorised vehicles including mopeds shall, on the other hand, be driven on the shoulder.

When special grounds so require, a vehicle can temporarily be driven also elsewhere than on the part of the road area designated to it, if doing so does not cause hazard or significant impediment.

According to exemptions from the traffic regulations, a roadwork vehicle can also be driven outside the carriageway if it does not cause danger or great hindrance. It is self-evident when for example, ploughing, sanding and cleaning of pedestrian pavements, but it is separately mentioned in the legislation. When driving a vehicle necessary caution must be observed.

Road Traffic Act TLL § 9 Place of the vehicle on the carriageway

A vehicle shall be driven on the carriageway, paying attention to other traffic and circumstances, as far right as possible without endangering safety. This provision does not apply to driving on a one-way carriageway. When there are at least two carriageways into the driving direction of the driver, he/she shall generally drive, without unnecessarily changing lanes, on the right-most free carriageway. In the aforementioned situation, it is forbidden to drive on the carriageway reserved for oncoming traffic. A traffic island, or any such structure, shall be passed on the right.

A roadwork vehicle can be driven in the centre of the road in non-compliance with the provision of driving on the right side of the carriageway when ploughing or spreading salt or sand. It must be, however, noted that when driving up onto ridges or in other places with limited visibility, the oncoming carriageway is used little enough that oncoming traffic has room to pass the roadwork vehicle with no great difficulty. The skills and reaction ability of not every oncoming vehicle driver are sufficient to give way quickly.

On a road with several carriageways driving in the oncoming lane must be avoided, because it can take other traffic by surprise and the accident risk is great. Applying the exemptions is then questionable because work can be carried out observing the traffic regulations.
Passing a traffic island on the left is so unexpected to other traffic that it should only be done when there is no other traffic on the road where the work is being carried out.

**Road Traffic Act TLL § 10 Distance between vehicles**

*Distance to the vehicle in front shall be adjusted in such a way that there is no danger of collision even if the vehicle is stopped.*

*Outside built-up areas, motorised vehicles going markedly slower than other traffic have to keep enough distance between each other that an overtaking vehicle may pull in between them without danger.*

This provision does not prevent snow ploughing trucks from driving close to each other in a graded formation when they remove snow from the entire cross section of the road all pushing it to the same direction to the edge of the road. This will cause other traffic temporary impediment. If the distance between the snow ploughing trucks is long, the snow bank they leave behind them in the middle of the road will be dangerous to other vehicles.

**Road Traffic Act TLL § 11 Getting into the correct lane**

*The lane for turning shall be selected sufficiently early. A vehicle turning to the right shall get onto the right lane of the carriageway. A vehicle turning to the left shall get onto the immediate right side of the centre line of the carriageway, or on a one-way carriageway onto its left side.*

Although it is possible to deviate from these rules of getting into the correct lane, other traffic must be given enough time to become conscious of the intended different way of driving. However, it should be avoided if traffic is busy.

**Road Traffic Act TLL § 12 Turning**

*The driver of a turning vehicle must not cause danger or unnecessary impediment to other traffic going in the same direction.*

*When taking a right turn at an intersection the driver shall steer the vehicle as close as possible to the right side of the intersecting carriageway. When taking a left turn, the driver shall steer the vehicle in such a way that the vehicle leaves the intersection on the immediate right side of the centre line of the intersecting carriageway, or on the left side of a one-way carriageway.*

Under exemption from the traffic regulations, a work machine may turn off the road where it is otherwise forbidden. However, turning must not come as a surprise. Taking a left turn in places with poor visibility, e.g. at the bottom of a hollow, is forbidden. Observing necessary caution is a prerequisite for applying an exemption and in the above described case this provision is not met. Consequently a vehicle must be driven without exemption from the general traffic regulations, or the principles of temporary traffic arrangements must be applied.
Road Traffic Act TLL § 33 Driving on a low-speed residential street

A motorized vehicle may be driven on a low-speed residential street only to a property on the street or for parking purposes. Parking vehicles other than a bicycle, a moped, or a vehicle with a disabled parking permit, is only allowed on a designated parking area.

Driving speed on a low-speed residential street shall be adjusted to the speed of walking and must not exceed 20 km/h. On a low-speed residential street a vehicle driver shall allow pedestrians unhindered access.

Roadworks are also carried out on low-speed residential streets. Work machine movements should be adjusted so that they do not cause danger or unnecessary impediment.

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<tr>
<th>Road Traffic Act § 48 subsection 3 Exemptions concern:</th>
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4.9.3 Exemptions on the motorway and semi-motorway

Road Traffic Act 182/1982

Road Traffic Act TLL § 9 (29.4.1994/328) subsection 2

The driver of a vehicle in road or similar works on the road, or on the side of the road, may be exempted from the provisions of the Road Traffic Act (182/1982) § 4–8 as required by the circumstances and observing necessary caution.

The exemption allows the work machine driver to use any part of the motorway as required by the work. Although the exemptions also allow using the crossings of the central reservation, it should be avoided, at least in busy traffic. This is especially true on central reservations that are so narrow that a snow ploughing truck does not fit in on it without extending to the overtaking lane. When planning snow ploughing routes using separator crossings as turning points should be avoided.

Nevertheless, working against traffic on the motorway or semi-motorway is forbidden. All work on motorways or semi-motorways has to be planned carefully. For all works other than normal maintenance works, effective occupational and traffic safety measures have to be considered, e.g. the use of a warning vehicle or special temporary traffic arrangements.
Work on the passing lane of a dual carriageway road is especially dangerous to other traffic. The time for the work and necessary measures for securing safety have to be considered for each job separately.

4.9.4 Exemptions for stopping and parking

Road Traffic Act TLL § 48 subsection 4

A ‘vehicle used in work’ as defined by the Road Traffic Act § 48 subsection 4 (in road or similar works on the road, or on the side of the road), and in traffic control or official duties of the police, border guards or the customs, may temporarily be stopped or parked, the provisions § 26–28 of the Act notwithstanding, when necessary for carrying out the task presuming that there is no apparent danger caused to traffic.

Stopping or parking a roadwork vehicle must not cause obvious danger. According to this exemption, stopping and parking temporarily is also allowed for vehicles used in planning, controlling and supervision tasks, when work so requires and it does not pose apparent danger to other traffic.

If a vehicle has to be parked in a place with restricted visibility in such a way that passing traffic has to use the oncoming lane, road users must be warned in advance and traffic controlled using hand signals.

Stopping or parking a maintenance vehicle in non-compliance with the general traffic regulations is only possible if it is required in order to do the work. For instance, routine checking of the functioning of equipment, filling the tank of the painting machine or the arrival of the supervisor to give additional instructions is not such a reason. In these situations stopping and parking must be done in a safe location. However, on a motorway or semi-motorway stopping and parking for the aforementioned reasons is permitted on the right shoulder of the road.

Warning lights are used only if parking may cause danger to other traffic, or their use is necessary for warning of the work site.

During coffee and lunch breaks the vehicle must be parked in compliance with the regulations in a safe location on the road or outside the road.

Road Traffic Act TLL § 26 Stopping and parking

A vehicle may be stopped or parked only on the right side of the road. On a one-way road stopping and parking is also permitted on the left side of the road. A vehicle shall be stopped or parked in the direction of traffic flow and as far as possible from the centre of the road.

Road Traffic Act TLL § 27 and § 28 Prohibitions concerning stopping and parking
A vehicle may not be stopped or parked in such a place, or in such a way that it causes danger, or that traffic is unduly obstructed or hindered.

Road Traffic Act TLL § 52 subsection 3 Exemptions/no exemption

The driver of a vehicle in roadworks or similar works on the road, or on the side of the road, may, as required in the circumstances and by observing necessary caution, act in non-compliance with a traffic control device except in case the device implicates a prohibition, restriction or regulation on speed limit or obligation to give way. However, he/she may not drive through a red traffic light.

- Roadwork vehicles have no exemption from regulations on the obligation to give way.
- No exemption from regulations on observing the speed limit.
- It is never permissible to drive through a red traffic light.

The following traffic signs must be always observed in roadworks:

- priority for oncoming traffic (222)
- give way (to vehicles on the road you are approaching) (231)
- stop and give way (to vehicles on the road you are approaching) (232)
- speed limit (361)
- speed limit zone (363)
- built-up area (571) (= 50 km/h speed limit)
- low-speed residential street (573) (=20 km/h speed limit, give way)

4.10 Traffic regulations within a closed area

Road Traffic Act TLL § 5 subsection 1 Traffic in a closed area or outside the road area

When driving a motorised vehicle outside the road, necessary caution required in the circumstances shall be used to avoid danger and hazards.

When driving a vehicle in a closed area or outside the road area the traffic regulations must be observed as required in the circumstances.

The regulations concerning equipment for vehicles used in a closed area or outside the road area are presented elsewhere in legislation, primarily in the legislation concerning occupational safety. On blasting and quarring work sites traffic must be organized with respect to the regulations concerning these works.

Road Traffic Act TLL § 49 subsection 1 Deciding on a road closure
Those who have the right to place traffic signs on roads shall decide on a temporary road closure and on traffic control due to the condition of a road or to works carried out on a road or in its vicinity.

Closed area
A closed area is an area separated from general traffic where the roads leading up to it are closed by a gate or barrier. The roads leading to a roadwork site working as a closed area are closed by gates in such a way that it is not possible for outsiders to stray accidentally into the roadwork site. An entry for the vehicles of the work site through the barriers is equipped with the traffic sign closed to all vehicles (311) with an additional panel ‘Ei koske työmaan ajoneuvoja’ (does not apply to construction site vehicles).

A road being crossed is considered a closed area when temporary traffic controllers or traffic lights have stopped traffic from both directions because of the roadworks. Then the procedure for transportation crossing the road is the same as in transportation in a closed area. A private road can be used as a closed area for earthmoving transportation with the permission of the owner. A prerequisite for this is that the conditions for a closed area are met, which necessitates for example the use of a boom that can be closed.

4.11 Instructions for machine work
For work machine drivers there is the Finnra publication ‘Liikenne tietyömaalla, 5F Tienpitoajoneuvot’ (Traffic on roadwork sites, 5F Roadwork vehicles), no TIEH 2200007-01, Helsinki 2002, which mainly explains legislation on road traffic.

4.12 Warning lights of a work machine
Warning lights
Warning lights are only used when the work machine is operating on a construction site in such a way that it may cause hazard or impediment to other traffic. The warning light has to be kept turned on even when it is light. The warning light must not be turned on when work is being carried out outside the road area without causing hazard or impediment to other traffic.

If the work machine is moving fully or partly on the carriageway clearly slower than other traffic, it is advisable to use the vehicle’s directional daylight warning lights to warn traffic. Directional daylight warning lights are always used in pairs. They are placed sufficiently far apart from each other in order to reveal also the width of the work machine.

Emergency lights must never be used as warning lights on a work site.
Slow vehicle sign
Work machines moving slowly (limited maximum speed 40 km/h) have to be equipped with a slow vehicle sign. This triangle must be periodically replaced, because the daylight reflective colour in the centre of the triangle fades with time in the sun.

Reversing alarm
All vehicles used for transporting and loading soil as well as rollers weighing more than 7 tons must be fitted with a reversing alarm. Such work machines that have similar controls for driving forward and reversing and rotating excavators make an exception to this rule.

The employer has to make sure that the aforementioned vehicles used in the work he/she is managing and supervising are fitted with reversing alarms before the work is started. Similarly, the employer has to make sure that the working order of the reversing alarms is checked regularly. Faults detected must be repaired without delay.

The reversing alarm may be replaced by a device installed in the vehicle that detects a human being or an obstacle behind the vehicle from a safe distance and immediately and reliably stops the vehicle, or sounds a distinct alarm in the cabin of the vehicle (e.g. reversing radar), by a device that transmits a sufficiently good quality picture from the reversing direction to a monitor within the driver’s field of vision within the vehicle’s cabin (e.g. TV-camera combination).

The reversing alarm has to be attached to the back of the vehicle and installed so that it is activated when the vehicle is reversed or when the driver puts the vehicle in reverse gear. The alarm may be equipped with a switch which has an indicator light showing when the alarm is on and making it possible to switch the alarm off. The alarm may only be turned off if its noise causes unreasonable nuisance to the environment and other methods are used to secure safety whilst reversing the vehicle.

Warning equipment of a truck with a snow plough and spreader of liquid salt
A vehicle used in snow removal and de-icing that has a spreader of liquid salt on the platform must be fitted with two warning lights emitting backwards yellow flashing light, in addition to the normal warning lights. In order to keep the lights clean, they are attached on each side of the back of the vehicle enabling the free flow of air behind them.

Marking a plough
Protruding parts wider than the vehicle (the ends of a plough) have to be marked with alternative red and yellow stripes visible both to the front and back. In addition, they have to be equipped with white forward directed reflectors and red backwards directed reflectors and corresponding lights. A side plough has to be equipped with one light emitting yellow light forwards and another emitting red light backwards, positioned to show the furthest reach of the plough.
When a truck with a snow plough is in transit, warning lights are turned on.

Reflective markings
Reflective marking can be used to improve the visibility of construction and maintenance vehicles and highlight their shapes. The markings are made using banded adhesive tape, which is attached to the surface of the vehicle in places where it is visible and at the same time protected. The markings are made in accordance with a separate set of subject-specific instructions.

Condition of the work machine’s warning equipment
The driver must regularly check the condition and cleanliness of the warning equipment during the work. Faults and defects endangering safety must be repaired without delay. The driver is responsible for the visibility of the machine and its equipment during work. Before each daily work shift the driver must make a functionality test to check the functioning and cleanliness of the warning equipment. Broken equipment must be repaired before starting work and dirty warning equipment and lights should be cleaned at the same time.

4.13 Principles in ensuring the visibility of work machines
The visibility of work machines and their equipment is one of the most important factors in traffic safety. A road user must be able to see a work machine operating on road or street areas sufficiently early.

On roads, streets and other trafficked areas the machinery has to be distinguishable from other traffic (Government Decision VNp 629/1994 § 29 subsection 4).

Ensuring the visibility of the warning light in all directions:
- enough warning lights should be used that at least one is visible to each possible direction of approaching traffic
- directional lights with daylight warning lights should be used in slow moving work machines on the road area
- warning lights should be placed as high as possible
- double-flash warning lights should be used
- warning lights should be placed so that they stay clean and intact.

Improving the colouring of a work machine:
- reflective coated tape should be used to improve the visibility of work machines in the dark; these tapes are used to mark the shape of the machine
- daylight luminescence films should be used to improve the visibility of a work machine in daylight and dusk
- the condition of the machine’s coloured bodywork and its general cleanliness should be maintained.
Assuring the condition and cleanliness of the warning equipment:
- the condition and cleanliness of the warning equipment should be maintained as part of the inspection procedure of the equipment
- the functioning of the warning equipment should be checked when transferring a work machine to another work place or site, or to another driver.

Assuring the visibility of a work machine after the attachment of auxiliary equipment:
- make sure that the visibility of the attached auxiliary equipment is sufficient, at least the same quality as that of the main machine
- make sure that the auxiliary equipment does not obscure the warning equipment or lights of the basic machine
- if the auxiliary equipment obscures the warning equipment or lights of the basic machine, then responding warning equipment or lights should be attached to the auxiliary equipment, or responding warning equipment or lights should be attached to another place on the basic machine.

5 ACTION IN THE EVENT OF ACCIDENTS

5.1 General obligation to render aid
When an occupational accident or traffic accident happens, all parties or persons present are duty-bound by the general obligation to render aid. If someone has been hurt in the accident in such a way that he or she has to immediately be transported to a hospital, every vehicle driver has an obligation to transport him/her. If the vehicle is not suitable for transport, the driver has to, nevertheless, assist in organising the transport.

5.2 General instructions in the event of an accident
When an accident has happened, it is important to raise the alarm, save persons in danger and warn others of the danger. Traffic should be warned using the vehicle’s emergency hazard lights, and the warning triangle or warning equipment from the work site. Safety garments should be worn during rescue operations to ensure the safety of rescuers.

The emergency call is made to the emergency number 112. State your own name, tell what has happened, give the precise address and municipality, answer any questions and act according to given instructions. You must not turn off the phone before you have been given permission to do so. Public phones can be used to call the emergency number free of charge. When using a mobile phone, dial without the area code.

It is also important to start giving first aid to the best of one’s ability.
Tell what has happened. Give the exact address. Do not turn off the phone; you will receive instructions.

Source: Finnish Red Cross, Giving first aid on the scene of an accident. Have the courage to help!
Action in the event of an accident

1. Determine what has happened
   Assess the severity of the accident, determine the location of the accident and the number of injured people.

2. Call the emergency number 112

3. Prevent additional accidents from happening
   Warn other traffic (emergency lights, warning triangle).
   Rescue people in life-threatening danger.
   Prevent fire hazard: turn off the engine of the car.
   Remember your own safety.

4. Give first aid to the best of your ability
   Secure the injured person’s breathing and circulation.
   Prevent suffocation by opening airways.
   Stop bleeding.
   Support fractures.
   Place the injured person in the recovery position if appropriate for his/her symptoms and keep him/her warm.

5. Observe and calm the injured person while waiting for professional help
   Observe any changes in the condition of the injured person and note them down.
   Calm the injured person. Do not leave him/her alone.

6. Provide information of the accident to the professional rescue workers

Anything that may cause hazard or impediment to traffic must be removed from the road after the accident. If the accident has been fatal or someone has received severe injuries, the vehicle must not be moved or the conditions changed without the consent of the police, as this may have a bearing on the investigation outcome of the incident.

5.3 Dealing with occupational accidents on the work site

In roadworks the risk of an accident is always present. Actions required in case of an accident are part of professional competence. It is recommended that the instructions in case of an accident be repeated once in a while.

Work machine drivers are given instructions on how to act in case of an accident at the work orientation.

It is recommended that each work machine be equipped with a phone or responding device suitable for reliable communication. It is recommended that work machine drivers learn first aid. In addition, the work machine must be equipped with a first aid kit.
If an accident has taken place on the work site, it is advisable to take detailed notes of one’s own to record what has happened, and when necessary also take pictures. The contact information of the eye witnesses should always be collected in case witnesses of the incident are needed later. The minimum precaution is to note down the registration numbers of the vehicles. These notes become useful if the incident is revisited later. It might be practical to have claim notification forms for road traffic accidents available in work machines.

### 5.4 Fire safety

Work machines are equipped with a hand-held fire extinguisher of minimum requirement type 34 A -183 B C plus suitability for extinguishing electrical fires. The extinguisher has to be inspected annually.

The work machine driver has to receive training in the use of a hand-held extinguisher, because the extinguisher’s fire-extinguishing material lasts only for a few seconds. A panicked user may empty the extinguisher onto a wrong target, or do it too fast.
6 OCCUPATIONAL SAFETY OBLIGATIONS IN CONSTRUCTION

6.1 Principal safety obligations of the client

The client is under a general obligation for the safety of construction work. The obligation concerns all the factors that the client may anticipate and monitor, and which the client has a possibility to influence.

The client ensures that safe implementation of the practical construction work is taken into account in the design and preparation phase of a construction project. The client expects the designers to take into account the health and safety of the construction workers in all phases of planning. Along with the contract, the client is expected to provide the designers with sufficient information to manage safety tasks. The client is responsible for co-ordinating the plans and checking them also in view of occupational safety.

The client has to nominate a project supervisor to a shared construction site when the construction project requires expertise in co-ordination of tasks, work site planning and implementation of general safety. When a project supervisor has not been nominated on a shared construction site, the client itself is responsible also for the duties of the project supervisor. The client has to ensure that the project supervisor they appoint possesses the expertise and actual authority to take care of the duties of the employer using the main authority on a shared construction site (Occupational Safety and Health Act 738/2002 § 51).

The client has to draw up a safety document for the design and preparation of the construction work, which contains hazard and risk factors depending on the features, conditions and nature of the construction project as well as necessary information on occupational safety and health related to the construction project. At the same time also the hazard and risk factors specified in the occupational safety regulations concerning dangerous work are clarified and presented.

The client has to also draw up written code of practice and require that the parties of the construction project follow it in matters concerning safety and health at work. The code of practice provides instructions that are binding to all parties of the construction project. For instance, the guidelines of the Finnish Road Administration on temporary traffic arrangements constitute such a written code of practice of the client. The client may instruct, using a code of practice, the project supervisor to draw up a plan for dangerous work and have it accepted by the client before starting the work.

When preparing the construction project on the basis of separate contracts, the client has to draw up written safety rules for co-ordination of the various tasks and work phases in order to ensure the safety of employees.
The client provides information and requirements on occupational safety, and expects safety protection measures from the other parties of the construction project based on all aforementioned documents. According to legislation, the client is also responsible for the follow-up of the implementation of these documents. It means that the client has to monitor the consideration of occupational safety measures during the design, preparation and implementation phases of the construction project. The client has to make certain that e.g. the project supervisor has made the plans concerning occupational safety and organization of the work site, and that the plans have taken into consideration the information of the safety document drawn up by the client. The client has to also monitor that safety measures are implemented on the work site.

It is the responsibility of the client to ensure that each person working on a construction site wears photographic identification. This is a provision that has to be included in the contracts of all parties as a responsibility of photographic identification.

The client is also obliged to draw up written instructions for the use, maintenance and repair of the construction object, which contain sufficient data on occupational safety and health matters.

### Occupational Safety Obligations of a Client

- provide necessary safety information to the planners in the planning assignment
- prepare the safety document and maintain its information during the project
- prepare the code of practice for the occupational health and safety matters required of the different parties of the construction project
- supervise and co-ordinate the planning of construction in order to ensure occupational safety
- appoint the project supervisor (making certain that the appointed party possesses the required expertise and authority)
- process the information in the safety document and the safety plan of the project supervisor before the start of the work
- update the information in the safety document
- disseminate and handle safety information during construction
- draw up safety regulations for separate contracts
- draw up written instructions for use and maintenance before the construction project ends
- ensure the control of the use of photographic identification
- co-ordinate tasks in co-operation with the contractors carrying out different construction works.
6.2 Principal safety obligations of the project supervisor

6.2.1 Safety design

The project supervisor, usually the main contractor, is responsible for ensuring the safety plan of the construction work is drawn up before initiating the work. It is the duty of the project supervisor to plan the implementation and scheduling of various tasks and work phases so that work can be safely carried out and without danger to the workers or other people, e.g. road users. The assessment of risk factors connected to work tasks, conditions and environment is the basis for safety planning. The factors presented in the safety document and code of practice, as well as the possible safety rules drawn up by the client, are also taken into account in safety planning. It is a legislative requirement that written occupational safety plans are drawn up before the start of the work and that the plan is presented to the client.

Government Decision VNp 629/1994 § 2

The project supervisor means any main contractor appointed by the client, or any authorised employer, or where there is no such employer, the client itself.

It is the duty of the project supervisor to plan the use of the construction site, in other words make a written work site organization plan. The plan is presented by construction and work phase when necessary. Planning of traffic arrangements is also part of the site organization plan. In addition to the site organization plan, on demanding construction sites separate traffic arrangement plans are drawn up and presented to the road manager for approval before the start of the work.

In construction, dangerous work and work phases also have to be planned, and safety plans made for dangerous work. Such work is for example: work in street or road areas; excavation work; demolition work; assembling or dismantling of heavy prefabricated elements; lifting and blasting works. Safety plans may be part of work task planning, i.e. planning for safe implementation of work. Safety plans are not made for the authorities, but to help work and decrease disturbances and risks connected to work. Consequently, the safety plans can be used as tools in assisting the orientation of employees and in completing the work itself.

Safety planning is also included in other planning. Safety measures are also taken into account when planning for example the work site schedule, equipment, and resources as well as other production. The consideration of safety has to be included in the planning of all activities. Taking safety into account must not be regarded as a separate activity on its own, but as an integral part of the working culture, as a way to act.

6.2.2 Follow-up of safety

Safety follow-up covers both normal safety monitoring, and site inspections concerning safety such as the weekly work site inspections. The project
supervisor is responsible for organising the follow-up for safety. It is part of the safety follow-up to see to detected defects and hazards and necessary measures are taken to remove them.

The project supervisor is responsible for the inspections during the construction project. The inspections of the construction site and construction work can be divided into three groups:

1) Every machine and piece of technical equipment has to undergo an approval inspection before it can be used on the work site. The approval inspection also covers the appropriateness and functioning of the warning equipment necessary for the work.

2) Work platforms and riggers as well as hoisting equipment and hoisting auxiliary devices always have to undergo initial inspection before being used. As part of the inspection it should be ensured that the work site is separated and protected from traffic.

3) Safety of the work site is checked weekly in the maintenance inspections of the work site, i.e. weekly site inspections.

The weekly site inspection includes for example: general order of the construction site and workplaces; protection against falls from heights; lighting; electrification during construction work; cranes; personal manlifts and other hoisting equipment; hoisting auxiliary devices; construction saws; scaffolds; routes & tracks; and prevention of danger from falling earth and landslides in excavations. The inspection also looks at the traffic arrangements of the construction site and separation of the workplaces from the general traffic. It is recommended that the weekly inspections also deal with possible feedback from other road users concerning the construction site, and any consequent measures to be taken to revise traffic arrangements.

6.2.3 Safety management

The project supervisor appoints a competent person responsible for the construction site, and when necessary a substitute for him/her. The project supervisor is responsible for the general management of the construction site with regards to safety and health, arrangements for co-operation and dissemination of information between parties and co-ordination of functions, and general order and tidiness of the construction site. The responsible person appointed by the project supervisor is charged with the safety tasks of the project supervisor.

The safety management process of the construction site includes dealing with safety matters in the weekly site meetings and commitment of the management to comply with the occupational safety regulations. Safety management promotes safety through comprehensive supervision and planning of activities, combining the management of methods and practices with the management of people.
6.2.4 Work orientation, working instructions and safety training

The employer is responsible for providing the employees with necessary information concerning safety and health on the construction work site in good time.

Each worker coming to the work site is given an orientation organized either by the project supervisor or his/her own employer. The project supervisor makes certain that all contractors know the orientation material and practices of the construction site. Competence can be shown by different valid safety cards (e.g. hot work card or occupational safety card).

The employees particularly have to be orientated in the circumstances of the work site and instruction in the correct methods for work. In addition, new employees have to be given special guidance and instruction in the use of tools, which should pass on the trainer’s experience accrued in the use of tools and avoidance of risks, as well as foreseeable unusual situations. The professional competence and experience of the employee have to be taken into account when providing guidance and instruction.

Before starting to do dangerous work, safety measures required for the specific task are briefly discussed with the employee. The same procedure applies to new and demanding tasks. Each contractor also has to ensure that all its employees receive sufficient guidance in a new or otherwise unusual work method, or in the use of new or unusual chemicals, machinery or tools.

When work is carried out by teams, the importance of work orientation and working instruction is emphasized because the workplace does not provide continuous supervision and control. A sufficient amount of preparation is ensured by the site orientation and working instructions, as well as the fact that employees know how to do their work and know the work’s safety requirements. At the same time, the ability to cope with disturbances and dangerous situations is stressed. Employees have to recognize possible dangerous situations arising from work better than before and they have to know how act correctly in such situations.
Work orientation
Work orientation means orientation of both new employees and old ones in new tasks. Work orientation is more general in nature than working instruction, and it presents general operations models. Work orientation helps to ensure that employees know how to work correctly and safely.

Working instructions
Working instructions teach e.g. the correct and safe way of carrying out of work, and the correct and safe way to use machinery. Similarly, safe working methods and the use of personal protective equipment and safety device are taught.

Orientation to the work site
Orientation ensures that an employee knows how to act in a correct and safe way on the work site. For example, the orientation talks through dangers on the work site and their prevention.

6.3 Safety obligations of other parties

6.3.1 Safety obligations of the contractor and self-employed worker

Each employer determines the dangers to safety and health connected with the work being done in his/her employ and the protective safety measures. For a self-employed worker, this means preparing written plans for one’s own work that is classified as dangerous.

The employer has to ensure that employees receive information on matters concerning safety and health in their workplace sufficiently early. These matters have to be processed by the employer and employees, or their representatives properly and in good time.

Before starting the work, it is determined which equipment and structures in the scope of work require particular attention from the workers. Information on these equipment is often in the safety document. The client and road manager may give additional information on equipment and structures requiring particular attention. The owners of the equipment also provide information and instructions on how to protect oneself and work in the vicinity of the equipment and structures requiring particular attention.

‘Self-employed worker’ means any person who carries out work on the basis of a contract, subcontract or supply contract agreement, and who does not employ any other employees on the same construction site.

A self-employed worker at a shared workplace has to follow the provisions of the Occupational Safety Act (Occupational Safety Act 738/2002 § 53) regarding:
(1) the competence of employees, necessary permissions and minimum ages

(2) machinery, work equipment, personal protective equipment and other devices as well as statutory initial and periodic inspections of them

(3) the handling, storage and marking of dangerous substances.

In addition, a self-employed worker has to follow the workplace safety instructions he or she has received from the employer exercising the main authority at the shared workplace (Occupational Safety Act 738/2002 § 53).

### 6.3.2 Safety obligations of the work supervisor

Occupational safety obligations are connected to the position, tasks and authority of the person. In other words, occupational safety obligations are mainly allocated in the organisation on the basis of decision-making powers and the authority to act. Occupational safety obligations are part of the supervisor’s roles and duties. The supervisor’s occupational safety obligations are always based on his/her real decision making powers and authority to act, which are specified in the job description or work contract.

**Work supervisors are responsible for:**

- monitoring the condition of the machines and equipment,
- supervising the use of work methods and personal protective equipment,
- providing working instructions and guidance to the workers.

Experienced workers are in danger of growing numb of the dangers, and in particular the dangers to work from traffic can easily be forgotten. It is the duty of work supervisors to monitor these matters and when necessary intervene in risk taking.

Even experienced workers have to be reminded of the dangers inherent in the work. Before the summer and winter seasons of maintenance work, issues concerning how to carry out the work and especially the dangers of the work have to be revised. Similarly, in all seasonal work such as paving, road marking and cable laying works the special features and dangers of the work have to be re-examined.

With the increase of team work and also at other times when working without the continuous control of the work supervisors, special attention has to be paid to work orientation and working instructions, to ensure that employees are given thorough instructions for their work. In addition, the employer has to draw up clear codes of practice and instructions in order to avoid unnecessary risks.

Legislation does not recognise occupational safety obligation of a team, but allocates the obligation to individual workers. Even though work is carried
out in teams, the obligations and responsibilities for occupational safety of the subordinates remain with the supervisors. Consequently, responsible and skilled workers have to be selected for independent and team work.

6.3.3 Safety obligations of the employees

Employees have their own tasks and obligations in occupational safety matters, although the majority of the legislative obligations concern the employer and its line organization.

The objective of the occupational safety legislation is to protect the employee, therefore in principle an employee cannot be punished for actions in violation with the occupational safety legislation. (Exemption, see chapter 6.3.4)

It is most important for the personal safety of a person working on a road to recognize dangers connected to his/her work and take them into consideration in all his/her tasks. Recognising dangers and taking precautions to protect against them is part of each employee’s professional competence.

When moving and working in a road area, everyone has to ensure that the visibility of oneself and of the work site is sufficient. The objective is always to carry out work in an area clearly separated from and protected against traffic. Moving about on the parts of a carriageway used by vehicles has to be minimized, and whenever possible pedestrian crossings, underpasses and overpasses should be used.

Working on a road does not exempt individuals from compliance with the traffic regulations, or give permission to endanger the safety of other road users. Work machines may only be exempted from the general traffic regulations within the restricted exemptions, but even then they must not endanger traffic.
Essential contents of the individual safety obligation of an employee is as follows:

- compliance with the occupational safety legislation and the employer’s orders based on it
- compliance with the safety and protection instructions given in connection with work orientation and instructions in order to avoid risk of danger to oneself and other workers
- observing good order and cleanliness
- eliminating detected faults and defects to the best of one’s ability and informing relevant persons about them
- wearing appropriate personal protective equipment and using safety device properly
- wearing of such appropriate garments which do not cause a risk of accidents
- using machinery and tools properly and correctly
- refraining from removing or demolishing equipment, or instructive or warning markings intended for avoiding danger
- avoiding harassment and other inappropriate treatment of other workers
- participating in industrial co-operation to maintain and strengthen occupational safety at workplace.

An employee has to comply both with the occupational safety regulations and the orders and instructions given by the employer. In his/her work he/she has to observe good order and cleanliness as well as care and caution. In accordance with the instructions and guidance given by the employer and in line with his/her professional competence he/she has to take care of his/her own safety as well as that of other workers. Similarly he/she has to use machinery, equipment and tools correctly, and comply with the safety instructions in the use of hazardous substances.

An employee has a duty to use the personal protective equipment assigned to him/her and wear such garments so as not to cause a risk of danger. In addition, highly visible warning garments have to be worn in works prone to risks from traffic. He/she also has a duty to inform the employer of faults and defects, even if he/she would eliminate them.

The employer and employees have to cooperate to maintain and improve the occupational safety of the workplace. The employees have a right to make the employer proposals concerning occupational safety and receive feedback on the proposals. When there are several employers on a work site, it is important that employees take the initiative to inform on defects and suggest improvements for safety.

The employees of the work site have the right to select their representative to participate in the site inspections. It is usual that the Occupational Safety
and Health Representative represents the workers in the site inspections. When a crane is inspected, its operator must be present.

**The employee's duties do not affect the general principle that the employer is responsible for the working conditions on the job. The employer has to oversee that the employee complies with his/her duties and given safety regulations.**

**Good professional competence** includes continuously observing both the traffic and circumstances, and one’s own assessment of how one’s own work and actions affect traffic and other activities on the work site. One has to work and move about in such a way as not to cause danger to other road users or people working on the site.

**Good professional competence** also includes taking care of one’s own safety and planning one’s own work. Planning in this connection means that one thinks about the dangers inherent in the work and the protective equipment and safety arrangements that will be necessary. Once on the work site, it is too easy to not go and fetch missing traffic control equipment or protective equipment if they were forgotten in the base.

**Good professional competence** includes orientation to the work and its safety principles on one’s own initiative. Professional competence means also reflecting on one’s own knowledge and asking for instructions and guidance for the work or use of equipment when necessary.

In team work, or when working alone, an employee has to adopt a more responsible attitude towards safety matters. He/she also then has to take care of his/her own safety and that of others in accordance with his/her experience and professional competence, and in line with the employer’s instructions. An employee has to comply with the given safety instructions and observe safety, maintain good and safe order and use machinery, tools and other equipment correctly.

### 6.3.4 Special safety regulations

If a person either without permission or without a good cause removes or ruins a device or an instruction or a warning intended to avoid the risk of accident or illness, he or she can be sentenced for violation of occupational safety and health. This applies to an employee as well as an outsider. (Occupational Safety and Health Act 738/2002 § 22 and § 63).

If the work causes a serious risk to an employee’s own or other employees' life or health the employee has the right to cease such work. The employer or his or her representative shall be informed of the employee ceasing the work as soon as possible. The right to cease work continues to exist until the employer has eliminated the risk factors or in some other way ensured that the work can be done safely. Ceasing work shall not restrict working on a larger scale than is necessary for safety and health. When ceasing work, it must be ensured that the danger that may be caused by this action is as low as possible. (Occupational Safety and Health Act 738/2002 § 23).
6.3.5 Obligations of the occupational safety organisation

On a shared construction site it is the project supervisor that initiates co-operation on occupational safety. The project supervisor appoints an Occupational Safety and Health Manager to the site, unless otherwise agreed with the other employers. On a shared construction site it is possible to agree to appoint one common Occupational Safety and Health Manager. Each workplace has to have one person responsible for the Occupational Safety and Health Manager’s duties. He/she represents the employer in industrial co-operation concerning occupational safety. The primary duty of the Occupational Safety and Health Manager is to organize and develop co-operation between the employer and employees concerning occupational safety at the workplace. The Occupational Safety and Health Manager assists the employer and the supervisors in matters that concern obtaining occupational safety knowledge and co-operation with the employees and the occupational safety authorities. The line organisation is responsible for the implementation and enforcement of occupational safety activities.

Workers on a construction work site may elect amongst themselves one common Occupational Safety Representative for the specific construction site and two deputies for him/her. The Occupational Safety Representative has to be elected at the latest after two months from the moment when the total number of workers on the site exceeds ten persons. The Occupational Safety Representative represents all the workers on the work site and takes care of the tasks assigned to him/her by the occupational safety legislation.

An occupational Safety and Health Committee or corresponding co-operative organisation can be founded for occupational safety co-operation, if the size or duration of the work site so require (number of workers at least 20 persons).

The objective of industrial co-operation on occupational safety is to strengthen interaction between the employer and employees at the workplace. Matters having an immediate impact on an individual worker’s safety and health are handled by industrial co-operation between the employee and employer, or the supervisor acting as the representative for the employer. The Occupational Safety Representative may on his/her own initiative, or on the initiative of the worker or the supervisor, participate in the handling of the case.

Far-reaching matters and matters concerning the workplace in general are dealt with in the Occupational Safety and Health Committee. If such a committee has not been founded, matters are handled between the employer and the Occupational Safety Representative. A member of the Occupational Safety and Health Committee has the right to suggest motions to be handled by the committee. The person who made the motion, has the right to an explanation in answer to his/her motions.
6.4 Warning garments and other personal protective equipment

6.4.1 Warning garments

The use of warning garments is the most important way of improving personal safety of a person working on a road or in other traffic area. Appropriate warning garments improve significantly the visibility of the worker as well in the daytime as in the dark and dusk.

When working on a road, the Finnish Road Administration requires the use of visible warning garments of the standard SFS-EN 471, whose protection classification is 2 with regard to the minimum area of the visible material. The classification can be checked on the CE tag on the garment.

Persons acting as temporary traffic controllers have to use warning garments of the standard SFS-EN 471, class 3 in accordance with CE markings.

All vehicles and machines used in the contracts of the Finnish Road Administration have to have reflective vests of the standard SFS-EN 471, class 2.

The warning garments of the contractors' employees and self-employed workers working in the Finnish Road Administration’s projects have to meet these requirements, too.

| Warning garments’ classification SFS-EN 471 and the Finnish Road Administration’s requirements |
| Class 1. Finnish Road Administration does not accept at all |
| Class 2. Finnish Road Administration requires in roadworks |
| Class 3. Finnish Road Administration requires of temporary traffic controllers |

6.4.2 Other personal protective equipment and their use

If a risk of injury or illness cannot be avoided or adequately reduced by measures focused on the work or working conditions, employers shall acquire and provide for use by employees appropriate personal protective equipment.

Personal protective equipment refers to all instruments and equipment used personally by the employee and which are designed to protect him/her from risk of injury or illness at work.

The employer makes an evaluation of the need for protective equipment through a risk assessment process. The employer is responsible for its own employees’ use of appropriate personal protective equipment at work.
The employee has to carefully use and care for the personal protective equipment and other equipment provided by the employer, in accordance with the employer's guidance for use and other instructions. The employee has to inform the employer without delay of any faults and defects detected in protective equipment.

A representative of the employer makes a risk assessment and decides on the need for protective equipment based on it.

The employee has to use and care for the personal protective equipment given to him/her and required by the work.
APPENDIX 1

Terms and definitions

Accident cause (tapaturman aiheuttaja)
An accident cause refers to a factor in the technical surroundings, which is considered to have attributed most to bringing about the accident. The accident cause is used in identifying the dangers leading to an accident. The accident cause reveals the object that brought about the accident, the structure or functioning of which did not necessarily show any deviation.

Accident factor (tapaturmatekijä)
Accident factors help to establish why the accident happened. Accident factors are looked for in the background of the course of events and the reasons directly connected to it, and in both the incident and rescue operations. All the changes, disturbances, characteristics and circumstances that could have affected the course of events of the accident are regarded as accident factors.

Accident frequency (tapaturmataajuus)
Accident frequency is the number of incidents per million person-hours.

Accident type (tapaturmatyyppi)
An accident type describes the way in which the injured person got into contact with the accident cause. For example being hurt through a contact with a physical object, being squeezed between objects or falling from heights.

Barrier (sulkulaite)
A barrier is a traffic control device used to close up a road, or its part, due to work carried out on the road or other reasons. The barriers are equipped with reflective alternating red and yellow stripes, or alternating red and yellow stripes with reflectors.

Client (occupational safety perspective) (rakennuttaja, työturvallisuusmielessä)
Client means any person or organisation conducting a construction project, or other actor who directs or supervises a construction project, or, where no such actors exist, the contractor. In the designing and preparing stages, the client shall ensure that the practical construction work will be taken into account at these stages in a manner that enables to carry out the work and work phases safely and without causing any harm to employees’ health. The client has to co-ordinate the implementation of these plans. The client draws up the safety document, code of practice, and when necessary safety rules. The client is responsible for the follow-up of the implementation of these documents, updating and disseminating their information, and the follow-up of the implementation of the measures. (Government Decision VNp 629/1994 § 2-5a).

Decision on speed limit (nopeusrajoituspääätös)
Those who have the right to place traffic signs in accordance with the Road Traffic Act § 51, decide on the temporary speed limit for the duration of the work. An official appointed by the Finnish Road Administration makes the speed limit decision for roads and a municipal official for streets.

**Employer (työnantaja)**
A person or organisation employing outside labour to work in return for compensation.

**Approval inspection (vastaanottotarkastus)**
An approval inspection shall be made on each machine and technical device brought to the site and before they are taken into use to make certain that the machine and device are safe to use and that they are appropriate for the purpose. (Government Decision 629/1994 § 11).

**Initial inspection (on construction site) (käyttöönottotarkastus rakennustyömaalla)**
An initial inspection has to be performed on the hoisting equipment, hoisting auxiliary device and scaffolds always after their installation or erection to ensure that installation and erection have been carried out in compliance with the instructions, and that the erection location and environment are safe. (Government Decision 629/1994 § 12).

**Inspection before taking into use (initial inspection) (käyttöönottotarkastus, ensimmäinen tarkastus)**
A relevant initial inspection has to be performed for example on a crane, manlift and garage jack before they are taken into use for the first time, or after having been altered causing a significant impact on safety (Government Decision 856/1998 inter alia § 62).

**Machine safety (koneturvallisuus)**
When a machine has been designed and manufactured in accordance with the essential safety and health requirements, its technical structural documentation has been drawn up, the Declaration of Conformity provided and the CE mark affixed to it, the machine can be placed on the market. (Government Decision VNp 1314/1994).

**Maintenance inspection (kunnossapitotarkastus)**
See weekly site inspection.

**Occupational Safety and Health Manager (työsuojelupäällikkö)**
The Occupational Safety and Health Manager’s main duty is to initiate and keep up occupational safety and health co-operation on the site with the employees (Decree on the Supervision of Occupational Safety and Health 954/1973 §16-17).

**Occupational safety and health policy (työsuojelun toimintaohjelma)**
A company- or workplace-specific policy prepared by the employer for action needed in order to promote safety and health. The objectives for promoting safety and health deriving from the policy must be taken into account in the workplace development and planning, and they must be discussed together
with the employees or their representatives (Occupational Safety and Health Act 738/2002 § 9).

**Occupational Safety and Health Representative (työsuojeluvaltuutettu)**
The Occupational Safety and Health Representative is selected by the workers and/or officials and he/she represents the workers in the occupational safety activities in co-operation with the employer and in regard to the occupational safety authorities (Decree on the Supervision of Occupational Safety and Health 954/1973 §18-25).

**Occupational safety responsibilities (työsuojulevastuut)**
Occupational safety responsibilities are based on the tasks and powers specified in organisational hierarchy. Practical organisation of work, instruction of workers, guidance and supervision are typical occupational safety duties of the work supervisors. (Occupational Safety and Health Act 738/2001 §14). Each employer is primarily responsible for the safety of its own employees (Government Decree 426/2004 § 3a subsection 1). The employer shall systematically analyse and identify the hazards and risk factors caused by the work, the working premises, other aspects of the working environment and the working conditions (Occupational Safety and Health Act 738/2002 §10). On a shared construction site the project supervisor carries the main responsibility for the general safety matters of the construction site.

**Occupational safety (työturvallisuus)**
Occupational safety contains preservation of health, prevention of accidents, healthiness and well-being.

**Orientation to the work site (perehdyttäminen työmaahan)**
Orientation ensures that an employee knows how to act in a correct and safe way on the work site. For example, dangers of the work site and their prevention are talked through in orientation.

**Perceptibility (havaittavuus)**
Perceptibility, in this text book, means that an object or equipment is visible, or distinguishable from its surroundings. For example traffic control equipment or a person working on road has to be easily perceptible, or distinguishable for example from the surroundings.

**Perception (havaitseminen)**
Perception, in this text book, refers to the ability to see and notice an object or equipment.

**Periodic inspections (määräaikaistarkastus)**
A periodic inspection is carried out regularly, usually once a year for example for hoisting auxiliary devices, cranes, manlifts and carage jacks. The periodic inspection’s objective is to find out, if the use of the equipment being inspected has brought about significant changes concerning safety. (Government Decision 856/1998 inter alia § 63).

**Permission for work in road and street area (lupa tie- ja katualueella tehtävään työhön)**
A permission is required for all work carried out on the road or street area, or using the road or street area, when the client is other than the road management authority (Highways Act § 42).

**Prior notice (ennakkoilmoitus)**
The project supervisor shall give the competent occupational safety and health authority a prior notice on a construction site planned to exist longer than one month and where, self-employed workers included, at least ten workers carry out work. (Government Decision VNp 629/1994 § 6).

**Project Supervisor (päätoteuttaja)**
Project supervisor means any main contractor appointed by the client, or any employer using the main authority, or where there is no such employer, the client itself. The project supervisor is responsible for the general safety of the construction site. The project supervisor carries the main responsibility for safety management, planning and monitoring. (Government Decision VNp 629/1994 § 2, § 6-10).

**Regulations for co-ordination (yhteensovittamisen säännöt)**
When preparing a construction project on the basis of separate contracts, the client shall draw up written safety rules in order to ensure the safety of employees and other persons working at the site and to coordinate the various tasks and work phases. (Government Decision 629/1994 § 5, subsection 2).

**Responsible person of the work site (työmaan vastuullinen henkilö)**
The project supervisor appoints the responsible person, who is responsible for the safety obligations of the project supervisor; the responsible person has to be appointed in all circumstances. (Government Decision 629/1994 § 9).

**Responsible persons (vastuulliset henkilöt)**
Every employer shall appoint a competent responsible person for the management and supervision of the work carried out for the employer. (Government Decision 629/1994 § 9, subsection 2).

**Responsibility for one's own safety (vastuu omasta turvallisuudesta)**
The employees shall, in accordance with the instruction and guidance provided by the employer, take care of both their own and, if their work affects other workers, other employees’ safety and health. (Government Decision 629/1994 § 3, subsection 2).

**Risk (riski)**
Risk means the probability and gravity of a harmful event.

**Risk assessment, risk survey, risk analysis (riskien arviointi, riskikartoitus, riskianalyysi)**
Risk assessment means a process, which aims at identifying probable causes for a mishap or accident in technical equipment, human activities and environment, assessing their consequences and searching for optimum
improvement alternatives (e.g. Government Decision 629/1994 21 §, Government Decision 1407/1993 and Annexes).

Road (tie)
Road is a generic name for a public [highway] and private road, street, snowmobile route, market square and other area meant for or used by general traffic (Road Traffic Act TLL § 2)

Highway is comprised of a carriageway inclusive of shoulders and other areas intended for traffic, such as pavement and bicycle path, special transport road, parking space or parking area, area serving public transport and use thereof, or rest, storage or loading area.

Structures, constructs and equipment permanently required for the maintaining and use of the areas mentioned above or immediately related thereto; traffic control devices and other structures, constructs and equipment necessary to guide road users; other structures, constructs and equipment such as noise barriers and animal fencing necessary for road management or traffic or the prevention of traffic hazards. An emergency landing place ordered appended to the road and the area required for functions arising from traffic crossing national boundaries shall be considered part of a highway (Highway Act 503/2005).

Road management (tienpito)
Road management comprises the construction and maintenance of roads, as well as the activities necessary for the planning, monitoring and supervision thereof.

Road manager (tienpitäjä)
The road manager of the public highways is the Finnish Road Administration, in town plan areas it is usually the municipality. The road manager of a private road is either a road association or the owner of the real estate.

Road Users’ Phone Service (tienkäyttäjän linja)
A phone service at the Traffic Management Centre of the Finnish Road Administration, which road users may use to report on problems they have noticed either on roads or in traffic. The number is 0200 2100. The same number is in use all over the country at a local call charge.

Safety (turvallisuus)
Safety is a state of affairs, when risks inherent in it are acceptable.

Safety control (turvallisuusvalvonta)
Safety control is necessary on a shared construction site in order to supervise safety activities and make the necessary corrections in time. The objective of safety control is to ensure that work on the site is carried out in accordance with the given safety plans and instructions. Site inspections are part of the safety control measures.
Safety data sheet
The properties and dangerousness of chemicals are revealed in their classification, labelling and safety data sheet. (Chemicals Decree 675/1993 §18).

Safety design (turvallisuussuunnittelu)
Safety design includes e.g. planning how the area of the construction site is going to be used (Government Decision 629/1994 § 8), planning how to carry out dangerous work and work phases (Government Decision 629/1994, Annex 2), planning made before the start of the construction work in order to ensure safety (e.g. Government Decision 629/1994 § 7, § 16-23) and assessment of possible hazards and risks and the drawing up of plans and measures to eliminate them. Safety planning is also connected with other planning taking place on a work site, for instance scheduling, planning of purchases and resources. The essential parts of safety planning have to be produced in writing (Government Decision 629/1994 § 7) and the project supervisor carries the main responsibility for the safety planning. Also other contractors and self-employed workers have to follow the principles presented in the safety planning in their own work.

Safety document (turvallisuusasiakirja)
A document (Government Decision 629/1994 § 5) drawn up for the design and preparation of the construction work, which comprises the necessary safety information resulting from and connected to the features, conditions and nature of the construction project, taking account of the industrial and other comparable activities relating to the construction site and the code of practice that the client expects other parties of the construction project to follow in matters concerning safety and health at work. It is the client that draws up the safety document. When drawing up the safety document, the hazards and risks connected to the construction project must be clarified and presented.

Safety follow-up (turvallisuusseuranta)
Safety follow-up comprises the inspections connected to safety, such as the weekly site inspections, approval inspections of equipment, initial inspections of scaffolds and hoisting equipment. The competent responsible person of the project supervisor is responsible for organizing the inspections on the work site (Government Decision 629/1994 § 11-15). Safety follow-up covers also the general safety follow-up of the work site.

Safety management (turvallisuusjohtaminen)
Safety is managed in the same way as other activities. The management shall manage safety by setting targets, planning and supervising the activities, and by controlling the implementation.

Safety management (on construction site) (turvallisuusjohtaminen työmaalla)
Making safety an integral part of the normal practice of construction site management is safety management. Safety management is part of coordination of tasks and work phases, drawing up safety rules and instructions, organizing communication and orientation and supervision. The project supervisor of the construction work is responsible for safety
management of the construction site (Government Decision 629/1994 § 9-10).

**Safety plan (turvallisuussuunnitelma)**
Safety plans refers to the written occupational safety plans drawn up by the project supervisor before the start of the construction work, which take account of e.g. the information and safety rules included in the safety document provided by the client. (Government Decision 629/1994, Government Decree 702/2006 § 7). The plans ensure that the various tasks and work phases can be carried out and scheduled in such a way that no danger arises from the work to those working on the site or other persons in the zone affected by the work. Safety plans can be included in the other production planning documents. The client is responsible for ensuring that the essential safety plans have been drawn up before initiating the construction work. The analyses and identification of hazards and risks is part of the process of drawing up of safety plans. Also subcontractors and subsidiary contractors may be required to draw up safety plans before they start their work. Safety plans are also such special plans connected with the safety of the work site as dust reduction plan, plan to protect against falling from heights or action plans in case of accidents. Safety plans can also be drawn for dangerous works (Government Decision 629/1994 Annex 2).

**Safety regulations (turvallisuusmääräys)**
Safety regulations are comprised of labour legislation and other statutes, which regulate working conditions or occupational safety activities.

**Safety rules (turvallisuusohje)**
Safety rules provide practical solutions or instructions for meeting the requirements of obligatory safety regulations. Safety rules can be drawn for a shared construction site concerning all the aspects, which may pose significant dangers, when working or moving on the site. More detailed safety rules can be drawn for separate work stages or jobs to be followed in order to work safely.

**Safe use of tools (työvälineiden turvallinen käyttö)**
Machinery and other technical equipment used in construction work shall be suitable for the purpose, solid enough and safeguarded in such a way that they do not cause any risk to their user or other persons at the construction site. (Government Decision 629/1994 § 29).

**Self-employed worker (itsenäinen työnsuorittaja)**
Self-employed worker means any person who carries out work on the basis of a contract, subcontract or supply contract agreement, except for an employment contract, and who does not employ any other employees on the same construction site. (Government Decision VNp 629/1994 § 2). A self-employed worker at a shared workplace shall follow the provisions of the Occupational Safety and Health Act regarding e.g. machinery, equipment and devices, working methods and handling and storing dangerous substances. (Occupational Safety and Health Act 738/2002). In addition, a self-employed worker has to follow the work site regulations provided by the employer exercising the main authority.

**Shared construction site (yhteinen työmaa)**
A construction site where more than one employer, or more than one self-employed worker, working in return for compensation, operate simultaneously or successively (Government Decree 426/2004 § 2). The client, designer, employer and the self-employed worker shall together and each for their part ensure that no danger arises from the work to those working on the construction site or other persons in the zone affected by the work. (Government Decision 629/1994 § 3).

**Temporary traffic controller (liikenteenohjaaja)**
A police officer, and in situations decreed by the Road Traffic Act a military police and person appointed by a competent authority to act as temporary traffic controllers. A temporary traffic controller has to wear clearly visible garments, or be otherwise identified. (Road Traffic Act TLL § 49).

**TOT Investigation (TOT)**
Investigation system for fatal occupational accidents in Finland. TOT investigation is always carried out in fatal occupational accidents.

The investigation report number 23 of a specific fatal accident in 1997 published by the investigation system for fatal occupational accidents.

**Traffic arrangement plan (liikennejärjestelysuunnitelma)**
A traffic arrangement plan is a plan made in advance to describe the measures to be implemented in the traffic area for ensuring fluency of traffic flow and safety. The traffic arrangement plan of a work site takes into account the aspects pertaining to all modes of traffic and their safe passage during the work and all its phases. The plan specifies the work site specific traffic signs, barrier and warning equipment, information signs etc. necessary for traffic control. The plan also includes measures protecting people from accidentally falling into deep excavation pits and other places presenting a danger for falling.

**Traffic arrangements (liikenteen järjestelyt, liikennejärjestelyt)**
The term ‘traffic arrangements’ refers to the measures implemented in the traffic area to ensure fluency of traffic flow and safety. On a work site, traffic arrangements mean the measures, which ensure both occupational and traffic safety of the work site and fluency of traffic flow.

**Traffic control (liikenteenohjaus)**
A road user has to primarily obey the signs or instructions given by a police officer or other temporary traffic controller. An instruction of a traffic control device has to be followed, even if it means deviation from the traffic regulations. If traffic is controlled by traffic lights, its light signals have to be obeyed regardless of the instructions of other traffic control equipment. (Road Traffic Act TLL § 4)

**Traffic control device (liikenteenohjauslaite)**
Traffic signs, traffic lights and other equipment designed for traffic control and road markings are traffic control devices.

**Traffic control plan (liikenteenohjaussuunnitelma)**
A traffic control plan refers to a plan showing the placement of equipment and device in the traffic route necessary for controlling traffic.

**Traffic regulation (liikennesääntö)**
It is a rule, regulation or instruction to be followed in traffic.

**Traffic sign (liikennemerkki)**
A traffic sign is a sign erected for controlling traffic on a street or road. A traffic sign carries the meaning designated to it in the Road Traffic Decree using a name, picture and possible explanation.

**Warning device (varoituslaite)**
A device specifically described by the Ministry of Transport and Communication’s decision on traffic control devices, which can be a towable warning device or a warning device mounted to the back of a truck (LMp 203/1982 § 41) and a warning device placed on the road (§ 42).

**Warning garments (varoitusvaatetus)**
When carrying out work in road or street areas or other places used by traffic, protective clothing or accessories with clearly visible colours shall be used. Reflective materials shall be used when such work is carried out in darkness or dusk. (Government Decision 629/1994 § 21, subsection 5).

When work is carried out on the road or in the road area posing a possible danger to traffic, the road or road section shall be equipped with appropriate traffic signs. The worker shall wear garments with clearly visible colours, and when the work is carried out in darkness or dusk, garments with reflective material. (TLA 50 §)

**Warning vehicle (varoitusauto)**
A truck with a warning device or equipped with a crash attenuator used to warn of slow moving or intermittently stopping work.

**Weekly site inspection (työmaan viikottainen kunnossapitotarkistus)**
The general safety of the work site and the working environment, as well as the implementation of other inspections, is looked at in the weekly site inspection (Government Decision 629/1994 §13).

**Working instruction (työnopastus)**
Working instructions teach, among other things, how to work in a correct and safe manner, and how to use machines correctly and safely. At the same time, safe working methods are taught as well as the use of personal protective equipment and safety device.

**Work instructions (työohjeet)**
At the workplace, work instructions provide clear instructions on how a task is repeatedly carried out.

**Work orientation (perehdyttäminen)**
Work orientation means orientation of both new employees and old ones in new tasks. Work orientation is more general in nature than working
instruction, and it presents general operations models. Work orientation helps to ensure that employees know how to work correctly and safely.