QUALITY SYSTEM FOR WINTER MAINTENANCE IN FINLAND

ANDERS NORDSTRÖM AND KARI MUHONEN

Finnish Road Enterprise
Opastinsilta 12 B
P.O.Box 12 FIN-00521 HELSINKI
Telephone int. + 358 204 44 2775
Fax int. + 358 204 44 2699
E-mail kari.muhonen@tieliikelaitos.fi

1. ABSTRACT

Public roads in Finland are managed by the Finnish Road Administration. The Finnish Road Administration is gradually opening maintenance work, or regional maintenance contracts, to competition in 2001 – 2004. The three-year regional maintenance contracts include total responsibility and they cover anywhere from 500 to 1500 km of roads.

The Finnish Road Administration requires public road maintenance contractors to have a quality plan in which the contractor describes how it assures that the standards specified in the Finnish Road Administration's contract agreements are met. The Finnish Road Administration's role in these quality-responsible regional maintenance contracts is to monitor the functionality of the contractor's total quality management system. The outcome of winter maintenance demanded by the Finnish Road Administration is the level of quality and service offered and guaranteed to road users.

The Finnish Road Enterprise is a state-owned enterprise that was separated from the Finnish Road Administration beginning January 1, 2001. The Finnish Road Enterprise functions as one of the public road maintenance contractors. In order to meet the requirements of the Finnish Road Administration, the Finnish Road Enterprise has developed an operating system that includes quality, safety and environmental aspects. With this operating system the Finnish Road Enterprise assures its overall capacity to produce quality. With the procedures outlined in the system the Finnish Road Enterprise shows that it controls quality and the procedures and responsibilities which indicate that quality. More detailed descriptions of the capacity to produce quality and quality monitoring reports are presented in contract-specific quality plans.

During the winter season the Finnish Road Enterprise has access to networked road weather centers that operate 24 hours a day. The main function of a road weather center is to anticipate changes in weather and driving conditions by analyzing information obtained from road weather stations, radar and road weather cameras. The road weather center alerts the regional maintenance contract staff to

begin necessary winter maintenance work. The contract supervisors and the road weather center are in regular contact with each other.

The Finnish Road Enterprise provides reports on the quality of winter maintenance while monitoring maintenance procedures, in conjunction with road inspections and by providing deviation reports if the quality standards are not met. Supervisors inspect the road network weekly in winter. Everyone working in the contract monitors the condition of the road network while working and reacts to the situation upon detecting a deficiency. Good total quality management allows the Finnish Road Enterprise to meet the standards and demands of the Finnish Road Administration.

2. BACKGROUND

Finland has 77,993 km of public roads administered by the state. These roads are managed by the Finnish Road Administration. The public roads are divided into six winter maintenance classes, which are IS, I, IB, II, III and bicycle and pedestrian routes.

Class IS roads have the highest quality standards of the winter maintenance classes and class III roads have the lowest. Class IS roads are divided highways and motorways, class I and IB roads are main roads, and class II and III roads are local roads.

IS	*I*	*IB*	*II*	*III*	*Total*
2 625	*3 977*	*9 595*	*18 213*	*43 583*	*77 993*

Table 1. Distribution of Finland's public roads into winter maintenance classes (km)

The Finnish Road Administration will open public road management to competition by the end of 2004. Maintenance work, or regional maintenance contracts, will gradually be opened to competition in 2001 – 2004. Maintenance bids will be requested in 28 of Finland's approximately 100 regional maintenance contracts in the winter season of 2001 – 2002. The regional maintenance contracts include total responsibility, and they comprise summer and winter maintenance work. The three-year contracts cover anywhere from 500 to 1500 km of roads.

In the competed maintenance contracts the choice of a contractor is influenced by price (weight = 75 %) and the contractor's qualifications, such as references and the capacity to produce quality (weight = 25 %).

The Finnish Road Enterprise is a state-owned enterprise that was separated from the Finnish Road Administration beginning January 1, 2001. During the transition period from 2001 to 2004 the Finnish Road Enterprise will receive part of the regional maintenance contracts through negotiation procedures. Later the Finnish Road Enterprise will function as one of the contractors.

3. REQUIREMENTS OF THE FINNISH ROAD ADMINISTRATION

The Finnish Road Administration requires a quality plan from the contractors when they submit bids for regional maintenance contracts. This plan is outlined in more detail before the winter and summer maintenance seasons begin. In the quality plan the contractor describes how it assures that the quality standards specified in the Finnish Road Administration's contract agreement are met and how quality monitoring reporting is carried out.

The Finnish Road Administration's role in quality-responsible regional maintenance contracts is to monitor the functionality of the contractor's total quality management system. The Finnish Road Administration does not separately order, conduct or pay for quality measurements. The contractor's quality assurance system has to be so reliable that the Finnish Road Administration is able to trust in the material submitted by the contractor. The Finnish Road Administration uses the documents to monitor whether the contractor employs sufficient resources and operates according to the quality system.

The outcome of winter maintenance demanded by the Finnish Road Administration is the level of quality and service offered and guaranteed to road users. To implement the required quality, the contractor must be able to control the weather and driving conditions on the road network in the region, initiate procedures at the correct time and ensure that the procedures result in the correct level of quality. The contractor assures that this happens.

Quality reporting is implemented as reports on procedures. The contractor is also obligated to provide deviation reports of all cases where the required level of quality is not achieved, such as when the friction limit of slipperiness or snow depth is exceeded. Reports on procedures are compiled for 1 – 3 reporting points in each winter maintenance class. The orderer notifies the contractor of the number of points in the request for bids, and announces the location of the points in the contract review.

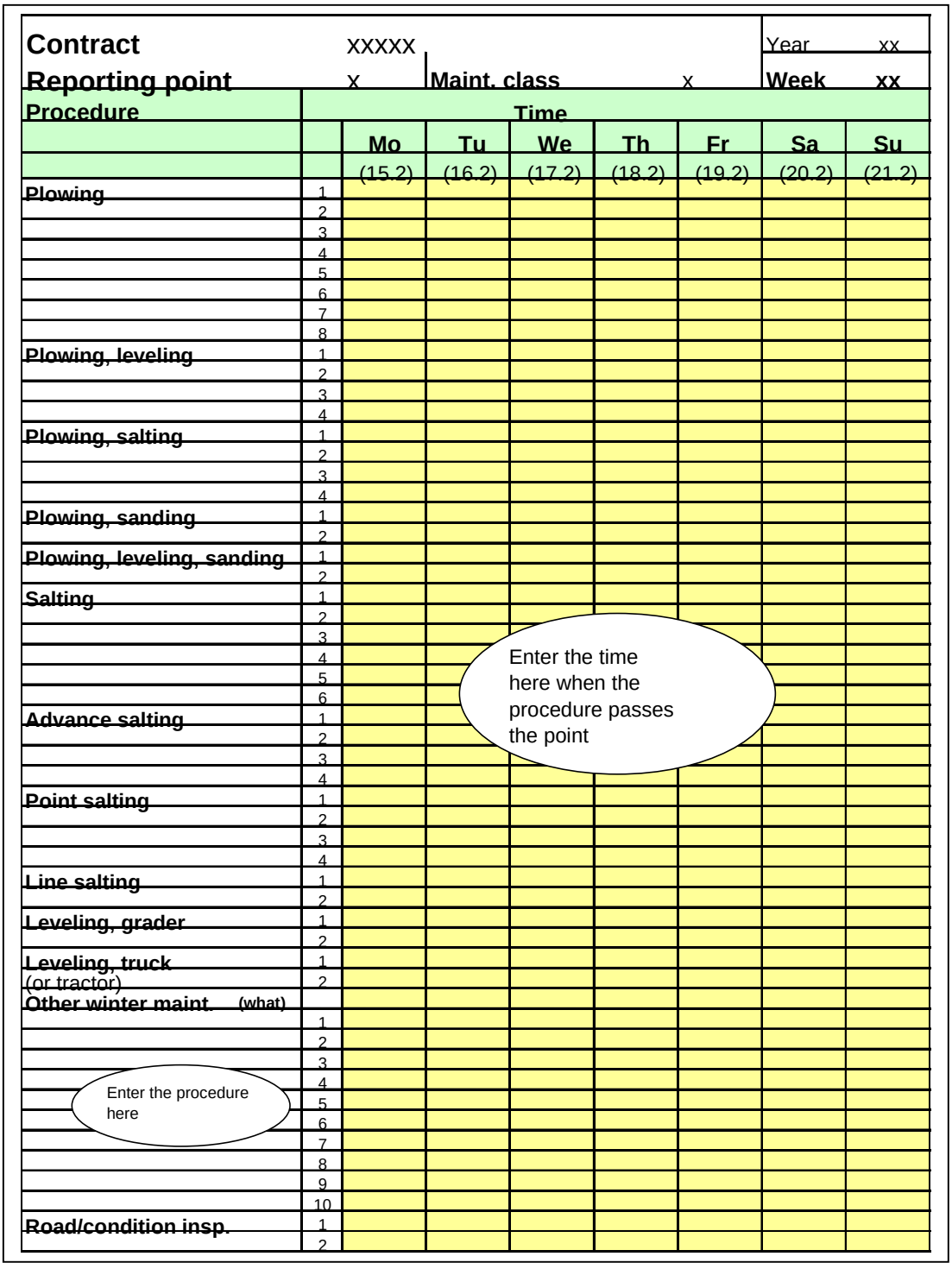

Figure 1. Sample reporting form for winter maintenance procedures.

4. THE FINNISH ROAD ENTERPRISE AS A CONTRACTOR

4.1 Operating system

The Finnish Road Enterprise operates as one of the public road maintenance contractors. In order to meet the requirements of the Finnish Road Administration and other customers, the Finnish Road Enterprise has developed an operating system (figure 2). The system includes quality, safety and environmental aspects. It is based on the ISO 9000 quality system standard, the ISO 14000 environmental system standard and the BS 8800 safety system standard. The Finnish Road Enterprise's operating system is posted on the Intranet, where it can be read by the entire staff.

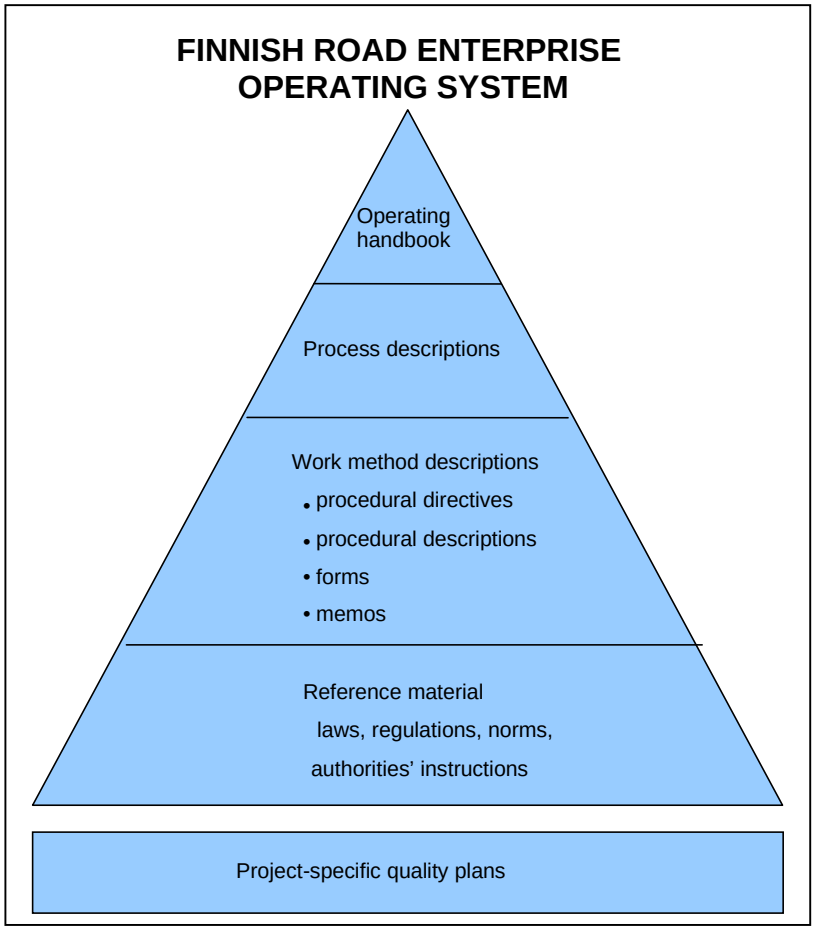

Figure 2. Structure of the Finnish Road Enterprise's operating system

The basic contents of the operating system are an operating handbook, process descriptions, work method descriptions, quality plans and reference material. An important function of the operating system is to assure the Finnish Road Enterprise's overall capacity to produce quality. With the procedures outlined in the system the Finnish Road Enterprise shows that it controls quality and the procedures and responsibilities which indicate that quality.

4.2. Quality assurance in winter maintenance work

4.2.1. General

The Finnish Road Enterprise shows the Finnish Road Administration that it controls quality in winter maintenance work by operating according to its operating system. More detailed descriptions of the capacity to produce quality and quality monitoring reports are presented in contract-specific quality plans and detailed winter maintenance quality plans. The main items in these quality plans are:

- Operational planning, such as monitoring weather and driving conditions and compiling suitable, achievable plans for prevailing conditions
- Quality assurance, such as general principles and winter maintenance quality reporting
- Resources (own staff, subcontractors and equipment)

4.2.2. Monitoring weather and driving conditions

The Finnish Road Enterprise has access to networked road weather centers that operate 24 hours a day. The main function of the road weather centers is to anticipate changes in weather and driving conditions by analyzing information obtained from road weather stations, radar and road weather cameras. This includes the responsibility of providing information to ensure simultaneous implementation of anti-slipping procedures and uniform quality on the main roads. The road weather centers also utilize information about contract procedures implemented in the field.

The road weather center alerts the first available supervisor, who in turn calls the head of the team to begin necessary winter maintenance work. The head of the team calls the necessary drivers to work. The contract supervisors and the road weather center are in regular contact with each other.

4.2.3. Winter maintenance quality reports

The quality of winter maintenance is reported while monitoring maintenance procedures at certain points along the plowed and sanded or salted routes, in conjunction with road inspections and by pro-

viding deviation reports if the quality standards are not met. The Finnish Road Enterprise reports on the type and timing of procedures completed at the specified points.

Supervisors inspect the road network once a week in winter and once a month in summer. Everyone working in the contract also monitors the condition of the road network while working, and upon detecting a deficiency reports it to the supervisor or begins necessary procedures.

The equipment of the Finnish Road Enterprise includes Keiju, an IT-based central information collection system (more about Keiju in a separate presentation by Raimo Autti), which automatically provides the Finnish Road Administration with reported information in electronic form. The unit automatically stores information about location, work unit events and time. If very precise information is needed, for example, when investigating an accident, GPS monitoring makes it possible to determine work quantity and implementation monitoring information later, also.

Deviation reports are one part of winter maintenance quality reporting. If operation or a product does not meet the requirements of the contract, a deviation report is submitted to the Finnish Road Administration.

The goal of a deviation report is to:

- meet the customer's expectations regarding delivery of reliable, customer-oriented service or products
- improve the profitability of operation by developing better, less error-prone operating procedures.

Written approval is requested from the customer for compilation and implementation of corrective measures made necessary by deviations. At the same time the financial consequences are agreed upon.

Each employee and subcontractor is obligated to report any observed deviations. The project manager of the contract ensures that deviation reporting of the contracted work and subcontracted work function according to the Finnish Road Enterprise's operating system.

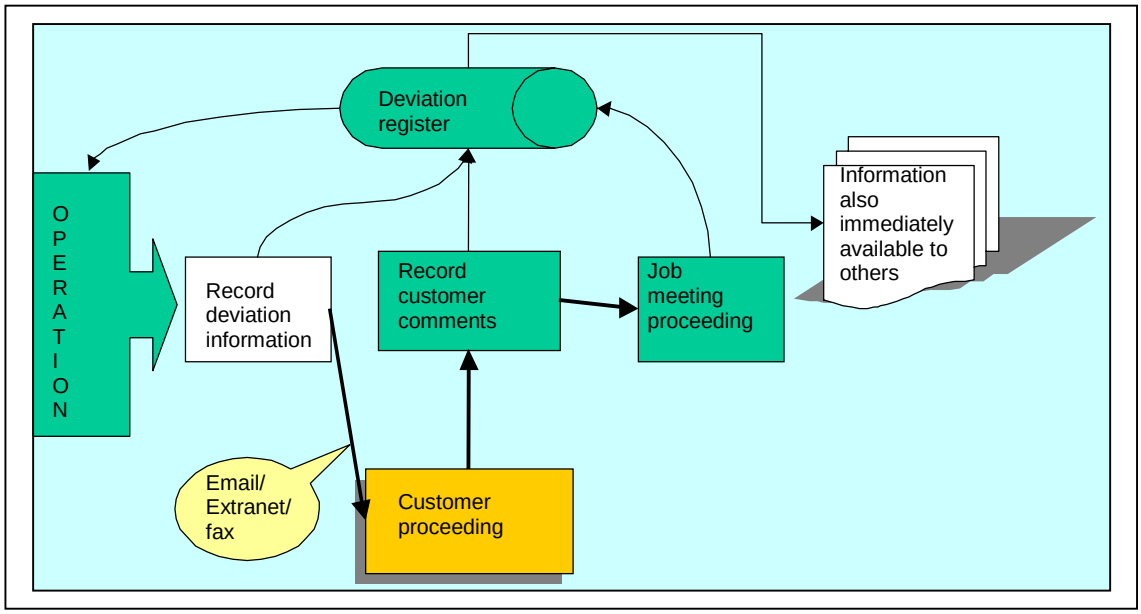

Figure 3. Processing a deviation report

Examples of maintenance product deviations:

- the maximum allowed depth of snow is exceeded during a normal snowfall
- snow removal is not implemented within the cycle time after it stops snowing (and the depth of snow has exceeded the threshold for starting plowing)
- the cycle time for anti-slipping procedures is exceeded (the time from the moment the quality requirement is no longer met to the start of the procedures)
- the evenness of packed snow does not meet the evenness requirement or leveling is not completed within the cycle time.

Examples of maintenance operational deviations:

- because of a breakdown in plowing equipment, all the plowing units specified in the quality plan have not been available for plowing during a heavy snowfall
- quality monitoring and documentation or road inspection are neglected or significantly late with respect to the agreed time
- work guidance and orientation are not done as specified in the quality plan.

Good total quality management allows the Finnish Road Enterprise to meet the standards and demands of the Finnish Road Administration. Both the Finnish Road Administration as the orderer of the work and road users are customers.