

HOW DO WE ENSURE THAT WE GET THE QUALITY WE HAVE ORDERED?

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ABSTRACT

Maintenance of Finland's road network has been subject to tender for a full decade now. The contracts are performance-based, which means that the contractor is responsible for the quality of the product or service, the quality assurance and documentation of the related information, and reporting to the client on the quality. The contractor presents the quality-assurance procedure in an action and quality-management plan. The client's quality-assurance actions focus mainly on monitoring the performance of the contractor's quality-management system and quality plan, while the quality itself is controlled via spot checks.

This presentation examines how quality is assessed both in the tendering phase and during the contract period.

In the tendering phase, the contractor's quality plan plays a central role. The contracts fall into three categories, depending on their complexity: basic contracts, complex contracts, and extremely complex contracts. Each category has its own requirements as to financial position and resources, technical performance, and contractors' work management. A quality certificate is also required.

Key quality-assurance issues during the contract period are the functionality of the contractor's quality-management system and quality plan and the spot checks of the actual quality. The role of data systems in quality control is important, as is the engagement of consultants to complement the control carried out by in-house personnel. Customer feedback and customers' satisfaction provide an important angle on quality and its assurance.

Quality and its assurance have become a central object for development in the procurement of routine maintenance for the road network. A clear objective in the maintenance of the road network is that we truly get the quality we have ordered: the quality we have paid for and promised our customers.

1. THE FINNISH CONTRACTING MODEL AND PERFORMANCE-BASED SYSTEM OF QUALITY MANAGEMENT

The procurement of day-to-day road-network maintenance services is implemented through regional contracts – extensive service contracts that last many years and cover a specific geographic area. All road-network maintenance work in Finland has been put out to tender since 2001. In total, there are 81 contracts, each covering 500–2,000 kilometres of road network, lasting five or seven years, and worth between €0.8 and 4 million. Finland's road-network maintenance contracts are carried out in compliance with nationally uniform procedures, but the requirements vary to some extent with local conditions and the complexity of the contract. At national level, the responsibility for the Finnish transport network is borne by the Finnish Transport Agency, while the regional Centres for

Economic Development, Transport and the Environment (ELY Centres) are the clients, handling the procurement of road maintenance.

Total spending on regional road-maintenance contracts comes to nearly €200 million a year. Approximately half of this, about €100 million per year, goes to winter maintenance. The other half comprises the maintenance costs of gravel roads and the traffic environment.

The quality-management system for regional contracts is performance-based. The client specifies the level of quality desired, and the service provider organises the work, selects the methods, and acquires the necessary materials and machines, while also in charge of quality and reporting on it to the client. The actual quality is controlled by the client by means of spot checks. The contractor presents the quality-assurance procedures in an action and quality plan. While the quality-management system is performance-based, the client must also act so as to help ensure reaching of the agreed level of quality. The client's quality-assurance actions focus mainly on monitoring the functionality of the contractor's quality plan and quality-management system and making spot checks of the quality.

2. QUALITY ASSURANCE DURING THE TENDERING PHASE

The key factor in competitive tendering is selection of a contractor that has all the capabilities required for producing high-quality products and/or services. This means possessing the following: competent, qualified, and sufficiently experienced personnel; equipment and rolling stock that meet the requirements; efficient quality-management procedures; and, above all, sufficient understanding and insight as to the nature of the contract and the content of the service. In addition, the contractor, as a company, must have a solid financial position, with access to sufficient financial resources. An important duty of the client is to make sure that the base data are comprehensive and correct, and that the quality requirements and contract specifications are clear and intelligible [1].

2.1. Classification of the complexity of maintenance contracts

As mentioned above, maintenance contracts fall into three categories, by complexity:

- A) basic contracts (42 out of 81 contracts at present - for example contract in Pielavesi area in eastern Finland with 1000 km roads at total, but 0 km roads with salt used throughout whole winter, low in vehicle kilometres)
- B) complex contracts (33 out of 81 - for example contract in Kemi area in Lapland with 90 km roads with salt used throughout whole winter, but 0 km roads in the highest winter maintenance class, 1340 km roads at total, vehicle kilometres three times as much as in typical basic contracts but only one third of vehicle kilometres in typical extremely complex contract)
- C) extremely complex contracts (6 out of 81 - for example contract in Tampere area in southern Finland with 300 km roads in the highest winter maintenance class, 1030 km roads at total, 4th in vehicle kilometres in whole Finland)

A contract's complexity is scored on the basis of the total number of kilometres of road, the number of kilometres in each maintenance class, the kilometres of pedestrian and bicycle routes, and vehicle kilometres. However, discretion is used in determining to which of the three categories a contract belongs: the classification based on complexity for contracts submitted for tendering is handled by the national network, while contracts falling under the responsibility of a regional ELY Centre are classified by the ELY Centre in question.

The minimum requirements for tenderers are specified separately for each category of complexity. The categories differ in their requirements for the following:

1. Financial position and resources (how long the company has been in operation and its total annual turnover)
2. Technical performance (whether individuals are expected to have a certain level of training and work experience in road or street upkeep and maintenance in conditions similar to those of Finland)

In the tendering phase, each category of complexity has its own requirements related to contractors' work management (the number of full-time responsible supervisors and assistant supervisors and the amount of prior work experience required). In addition, the action and quality plan is viewed differently by category: with greater complexity of the contract, the expectations are higher for the action and quality plan to score a certain number of points, though the criteria and scoring table are identical across all categories.

The classification system based on complexity has been in use for about five years. Experiences have been positive: the category system provides information on contracts and support for communications. Basic contracts can be considered entry-level contracts, while some previous experience is required for carrying out complex contracts. The bar has been set high for the six extremely complex contracts with respect to the company's turnover and employees' work experience. Naturally, the number of tenders submitted for extremely complex contracts tends to be lower than that for basic contracts.

2.2. Minimum requirements related to turnover and personnel

In the procurement notice phase, tenderers are required to meet the minimum requirements set for ensuring the candidates' ability to fulfil the contract in question. Minimum requirements are set for the candidates' financial position and resources, technical performance, professional competence, and quality.

For basic contracts, the company is required to have been in operation for three years (in certain cases, the limit for recently established companies is two years), and its turnover must be at least 1.5 times the annual cost estimate for the contract in question. An additional requirement for complex and extremely complex contracts is that a certain amount of the company's turnover in recent years has come from road-maintenance work. The company is also required to have met all its social obligations (making statutory tax payments, social security payments, and pension insurance contributions; being entered in all the necessary registers; and taking out accident insurance) and must be creditworthy.

The company must present references to establish its competence. In addition, it must have certification for its operating procedures applicable to the contract in question, or other, comparable proof of employing an independently verified quality-management system. At the time of submission of information for the procurement notice, proof of applying for the certification is sufficient; however, said certification must be obtained and presented no later than two months prior to the commencement of the contract.

For a company to qualify for participation in the tendering process for road-maintenance contracts, its personnel must include at least one person responsible for road-maintenance contracts who has at least a year of experience in the work management of road or street upkeep or maintenance contracts in conditions similar to Finland's. For complex contracts, another precondition is that this responsible person has at least completed a technical-school degree or has a minimum of five years of experience in the work management of road- or street-maintenance contracts in conditions similar to those of Finland. For

extremely complex contracts, the company's personnel must include at least three persons who have some experience in work management for road maintenance and upkeep. Two of them must have an appropriate technical-school degree or higher qualifications and at least three years of experience in work management of road upkeep and maintenance contracts in conditions similar to those of Finland, while for the third person a minimum of five years of practical experience in work management is sufficient. These persons need not be among those planned to carry out the contract.

2.3. The action and quality plan

In the comparative evaluation of tenders, the most significant criterion in evaluation of ability to produce the quality ordered involves the action and quality plan. The action and quality plan allows the client to make sure that the contractor has understood the client's expectations. The contractor bears the responsibility for carrying out the work in compliance with the requirements even if the plan is lacking; however, noticing issues afterward is difficult. The client sets the minimum requirements and provides a template for the action and quality plan. This plan is a binding document for the contractor [1].

It is important that the client know how to score the action and quality plan correctly, and that an identical scoring process be applied to all contracts. Separate instructions have been drawn up for the meeting at which scoring is performed. In addition, a related annual training session is provided to the scorers designated by the client. The training is intended for newcomers in particular. To ensure uniformity of practices, clients attend each other's scoring meetings.

The action and quality plan is scored thus:

1. Competence of personnel involved in the contract (in-house and subcontractors'), competence development, and management of information flow 30%
2. Equipment and rolling stock, including accessories; measurement plans; locations of start points and storage facilities; and procurement of equipment, rolling stock, and materials 30%
3. Accessibility plans, monitoring of road-network status, weather observations and road conditions' management, and initiation of measures and the related dissemination of information 20%
4. Implementation and documentation of quality assurance for the contract, and serving of the road-users 20%

2.4. Selection of the contractor

Regional road-maintenance contracts are awarded for the most economically advantageous tender. The qualitative evaluation of tenders is based on the action and quality plan submitted by the tenderer during the tendering phase. A tender must score at least four points, on a scale of 1–10, for each of the four scoring categories listed in the previous section. Otherwise, it will be refused. The maximum weighted number of total quality points is 1,000. A tender may also be refused if the total number of points awarded for quality is less than 500. If a tender is awarded 500–700 points for quality in all, this affects the reference price. A tender awarded 700 points for quality is considered to have received full quality points; any higher number of points for quality will not affect the reference price. The reference price is calculated by summing of the total price and the price of a set

number of working hours to be used for additional and modification work, covering the full duration of the contract and taking into account the impact of the quality points awarded.

The selected contractor will specify the action and quality plan for road maintenance in summer and winter before the agreement review. The contractor's specified quality plan for winter road maintenance is required to include the following details, for example:

- Means of ensuring the dispatch of in-house and subcontractor rolling stock when the weather and road conditions change, in a manner meeting the quality requirements
- The contractor's logbook system for winter road maintenance, and other means of documenting the work and materials, in addition to the report system required by the client
- The contractor's procedures for quality measurement and reporting on deviations
- A plan for minimising salt use

An important aspect of the quality plan for winter road maintenance is the client's duty to inspect the routes that require snow ploughing and road salting and sanding, along with the equipment and rolling stock designated for use in salting of roads and applying of sand [1].

The agreement review is another important element of quality assurance: before conclusion of a contract agreement, a review session between the client and tenderer is held for checking all the relevant invitation-to-tender and tender documents and thus verifying whether the parties' understanding of the content and interpretation of the documents is uniform enough for signing of the agreement [1].

3. QUALITY ASSURANCE DURING THE TERM OF CONTRACT

3.1. Reviews, site meetings, and audits

An initial review is carried out jointly by the client and contractor during the start-up phase of the contract, for determination of the overall condition of the contract area, structures, and equipment involved, among other issues, before the term of agreement starts. If necessary, the client also sets up meetings with contractors before the beginning of each winter and summer road-maintenance season, to provide an opportunity to review any key issues related to quality and the agreement that the client wishes to emphasise or that the contractor feels need further clarification. Another method of maintaining consensus on quality is to organise joint road-network reviews between the client and contractor [1].

Monthly site meetings and an annual mid-term review are held to allow the client and contractor to check the current status of the contract and thus ensure that everything is progressing in accordance with the agreement and that the desired quality level is being reached.

The client will audit all the contractors' activities during the term of contract. Asking precise questions helps to verify that the functions used match the descriptions in the action and quality plan, and that said plan is being implemented in practice by the subcontractors and in-house personnel. Follow-up on corrective measures is carried out after the audit process is complete [1].

The final acceptance inspection is carried out jointly by the client and contractor, for determination of the general condition of the contract area, the structures there, and the equipment involved, among other issues, at the end of the agreement period [1].

3.2. Spot checks in winter

The contractor is responsible for quality assurance while the contract is in force. A supervisor appointed by the client carries out quality-control spot checks to test whether the contractor is up to the task. In quality control via spot checks, it is essential to choose the targets correctly and to treat all contracts equally. Also, consultants are used in spot checks for quality control, supporting and supplementary to the client's own monitoring activities, especially during the evenings, at night, and on weekends. Consultants are needed on account of the client's limited human resources. When deviations are detected during quality-control spot checks, a remark is made to the contractor or a penalty is imposed [2].

The spot checks conducted in winter focus mainly on inspecting the quality of snow ploughing and de-icing measures performed by a local contractor. Other key inspection duties related to winter road maintenance focus on the shape of hard ridges of snow on the road, the height of snow banks, snowdrifts, slushy ditches, and roadside snow ploughing signs, alongside the success of winter maintenance of special areas such as bus stops, rest stops, and parking areas, and pushing snow beyond the shoulder of the road, in addition to other factors mentioned in the agreement documents that influence road use in winter. Other inspection targets include the removal of snow from bus-shelter canopies, the cleanliness and snow cover of traffic signs and roadside posts, and the consistency of quality on the periphery of maintenance areas. It is imperative to verify the correct timing of winter road maintenance [2].

The main focus of the spot checks is on changing road conditions, especially in winter, but spot checks are conducted also in stable weather conditions. In addition, the spot checks pay attention to any special features of a contract, such as requirements set for specific maintenance tasks [2].

Any observations a consultant makes of deficiencies and insufficient quality through spot checks are documented and marked on a map. The observations must be based on measured data: friction, snow depth, and unevenness, for example. A digital photo of the measurement event should be provided too, showing the results in question in the best way possible. The client's contract managers normally monitor the status of the road network in connection with their work. Any observations leading to penalties are entered in the client's information system in the usual manner. In other respects, the documentation process is less complex than the one used for spot checks carried out by a consultant.

Both the client's contract managers and the consultants must be flexible, knowledgeable, and aware of the road conditions at any given time if spot checks are to form the core of an effective quality-control system. The client organisation's administrative practices too (including work times, vehicles, and other equipment) must support the quality-control work.

3.3. The system for reporting on maintenance contracts

The quality-assurance measures implemented by the client during the term of contract are used for quality-control purposes. These measures are given solid support by the contractor's reports and various information systems. One client-contractor information system has been specifically designed for the recording of base data and drafting of

reports related to finances and payments, on the one hand, and, on the other, also broader issues discussed at regional contract-site meetings.

Because comprehensive demonstration of the quality of the road-maintenance work performed by a local contractor would require extensive observation materials, quality reporting is carried out partially through the system for reporting on the work performed. In addition, the contractor is obliged to submit a deviation report on any insufficient quality levels or deviations detected. For reporting purposes, the contractor is provided with the necessary information systems via the client's extranet service, free of charge.

The contractor must have an electronic real-time monitoring system covering both the contractor's own maintenance work and the tasks carried out by subcontractors. The monitoring covers work tasks performed with a vehicle or other mobile work machine, on roads as well as on pedestrian and bicycle routes. The client will have viewing rights to the contractor's real-time maintenance-work monitoring system. Data obtained through the real-time monitoring system shall not be transferred to the client's information system.

The client's reporting system is undergoing modernisation. It will be supplemented with a map interface and systems for reporting on quality results and fulfilment of contract terms, for example. The aim with these additions is to give the system's users access to real-time operation reports for contracts, along with the opportunity to observe road-maintenance measures and road-user feedback on a map in real time via a single point of contact [3].

3.4. Other quality-assurance methods and channels

Notifications of deficiencies in road-network maintenance to the Road Traffic Management Centre, which are submitted by road-users typically but also by various authorities, are forwarded directly to the contractor via the specified system: a specific type of road-maintenance customer-feedback system designed to record the feedback received on road maintenance and forward that feedback to the contractor, for information purposes or in requests for corrective measures. The system is also used for the contractor's acknowledgement of receipt of messages, in addition to being a tool for the person supervising contractors. Quality assurance also utilises camera systems that monitor road weather and road conditions.

In 2001–2012, centralised quality control of winter road maintenance was implemented by means of regular measurements in certain sections of the road network within the area of each ELY Centre (snow depth, friction, and road-surface unevenness). These measurements were not directly related to checking how well the contractor complied with the quality requirements. Instead, they were used for monitoring road conditions from the perspective of road-users. For example, road-users are not familiar with the concept of response time; their assumption is that the road and weather conditions will meet their expectations at all times – not only several hours after it started snowing. The measurements provided an overall picture of what percentage of the time the road and weather conditions were actually good enough, both nationwide and for each ELY Centre. Typically, the results varied between 83 and 96 per cent.

Unfortunately, these measurements were expensive in relation to the usability of the information, so winter 2011–2012 was the last season of centralised quality control of winter road maintenance. The possibility of obtaining sufficient information on transport-service levels in winter via other information sources, without separate measurements, will be investigated in autumn 2013. For example, a monitoring group composed of experienced professional drivers has been established for the area covered by the ELY Centre for

Pirkanmaa. The group's members report their personal observations on road conditions and any deficiencies in road-network maintenance. The data these professional drivers provide are then pinpointed on a map, and the exact time of each observation is recorded. Also, further processing of data from in-vehicle systems (ABS and ESC) into a usable format has been tested; an extensive pilot project will be launched in winter 2013.

4. CUSTOMER PERSPECTIVE ON QUALITY

The primary goal of the winter maintenance of Finland's road network is to secure mobility and the flow and safety of commercial transport in any type of road conditions. While taking into account the limited funds available for road maintenance, the client has specified a level of quality that it deems feasible on the basis of this goal. First and foremost, contract-specific quality assurance examines whether the quality provided matches that ordered. At the same time, it is important to bear in mind the goal of road-network winter maintenance and the importance of serving the customers.

In addition to stressing meticulous compliance with the quality requirements, the client urges the contractor to provide the best possible service to customers. A customer-satisfaction bonus is paid to the contractor for high or improved road-user satisfaction. In addition to the road-user satisfaction survey, the opinion of an evaluation group comprising representatives of the client affects the awarding of the bonus. The customer-satisfaction bonus system for regional contracts has been under development since 2004.

The bonus-system indicators include

- customer-satisfaction trends during the contract period, given separately for main roads and other roads (from a road-user satisfaction survey and a postal survey);
- customer satisfaction in comparison to average customer satisfaction with ELY Centres' regional contracts, separate for main and other roads (postal survey);
- the timing of winter maintenance and the level of service (opinion of the evaluation group); and
- the service level and innovativeness of summer maintenance (opinion of the evaluation group).

The amount of the bonus per contract is 0.4–2.0% of the annual costs of the contract.

Even though the functionality and role of the customer-satisfaction bonus is often a matter of debate and satisfaction has shown a downward trend in recent years, the bonus system is what keeps the local residents and their needs and expectations in the mix as regular topics of discussion. Conducting a nationwide contract-specific road-user satisfaction survey each winter provides ample information on the customers' opinions. It is particularly interesting to examine the differences in satisfaction between individual contract areas. The customer-satisfaction survey results for separate contracts carried out by the same contractor may differ greatly. The discussions have highlighted the importance of having the right attitude to service and of commencing maintenance work rapidly when, for example, it starts to snow, alongside dutiful compliance with quality requirements, as factors that aid in achieving higher customer satisfaction in comparison to other contracts. The same elements are essential when evaluating the quality. Customer satisfaction is a good indicator for the quality [4].

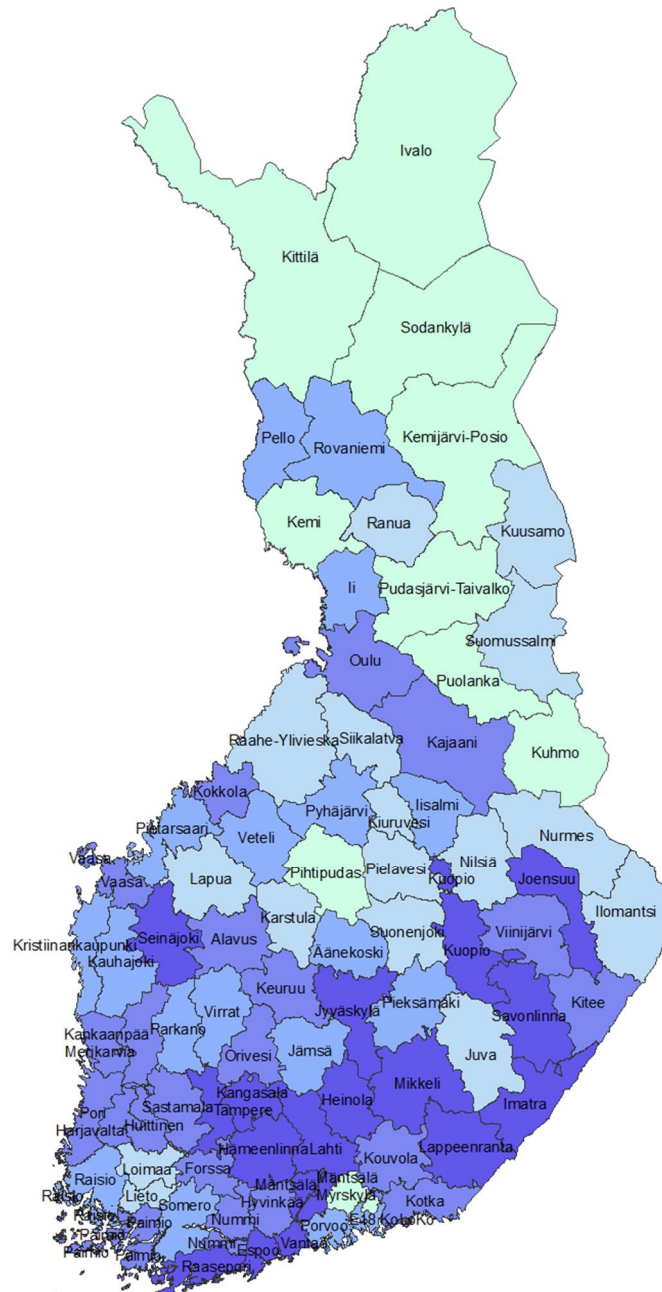


Image 1: Overall satisfaction in various contract areas in winter 2012–2013. Darker shades correspond to higher levels of satisfaction [4].

Finnish citizens, especially professional drivers, give plenty of direct feedback both in situations wherein they experience acute problems and when observing deficiencies in road-maintenance work or the condition of the road network. As mentioned above, all factual notifications of deficiencies in road-network maintenance work are forwarded directly to the contractor, for information purposes or in a request for immediate corrective measures. The client will actively monitor the feedback and the responses to it.

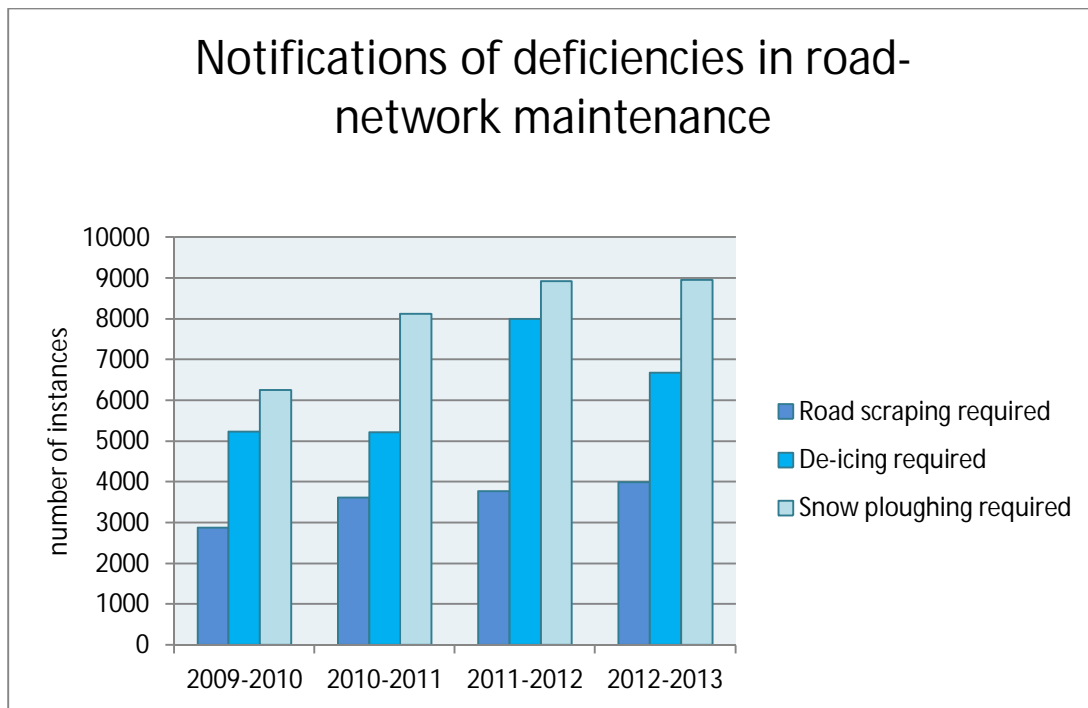


Image 2: Notifications of deficiencies in road-network maintenance forwarded by the Road Traffic Management Centre in winter 2009–10 to 2012–13.

5. THOUGHTS ON THE FUTURE

The question of how to ensure that we receive the quality we have ordered is a complex and challenging one. Road conditions tend to change rapidly, so quality in this context is an observation or phenomenon that is always tied to a certain point in time. In some cases, the quality ordered is not reached. Some of these cases are known to the client; after all, the contractor is obliged to submit deviation reports actively when the quality requirements are not met. But there are also cases in which the quality ordered is not reached and the client is not made aware of it. This presentation has gone through quite a few methods that we, the Finnish clients of road-network maintenance providers, believe are of key importance for ensuring high quality in road-network maintenance.

The central entities requiring development in the area of quality assurance and improvements in the quality of road-network maintenance include contract content and payment criteria, clarity of quality requirements, and quality of client activities. The future should see contract content and payment criteria (including the bonus and penalty systems) established in such a manner that they guide toward the achievement of good quality. It must be profitable for the contractor to produce good quality. The quality requirements must be clear and set in a manner that allows monitoring of compliance. It is important to know the existing quality and condition, just as it is to have a clear set of indicators for expressing these. Client activities must also be of high quality. The competence requirements set for the client and the consultants must be in line with the corresponding requirements for contractors [5].

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