FINNCONTACT

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GREAT INTEREST IN TECHNOLOGY TRANSFER

INTEREST IN TECHNOLOGY TRANSFER IN THE ROAD SECTOR HAS INCREASED LATELY IN THE COUNTRIES SURROUNDING THE BALTIC SEA. THIS FACT HAS BEEN NOTICED IN SEVERAL CONNECTIONS DURING THE PAST YEAR, E.G. AT THE 14TH REGIONAL TECHNOLOGY SEMINAR ORGANISED ON DECEMBER 1-3, 1999 IN TUKUMS, LATVIA. THE SAME PHENOMEN HAS BEEN MANIFESTED IN THE STATEMENTS OF OPINION EXPRESSED BY THE REPRESENTATIVES OF THE ROAD ADMINISTRATIONS FROM THE NORTHWESTERN REGIONS OF RUSSIA TO THE FINNISH TECHNOLOGY TRANSFER CENTER (FINNT^2), AND AMONG THE OPINIONS OF THE MEMBERS OF THE RENEWED ADVISORY COMMITTEE OF FINNT^2 AS WELL.

It was now the seventh time that the Regional Seminar prepared an annual technology transfer program for the Baltic T^2 Centers sponsored by the Federal Highway Administration (FHWA) of the USA and the Finnish National Road Administration (Finnra). This time, representatives from the Road Administration of the Arkhangelsk Region of Russia, the Ministry of Transport, Telecommunication and Water Management of Hungary and the Transport Research Centre of Czech also attended the Regional Seminar in order to deepen relations and information exchange in the future. The representatives of the eight countries present agreed on the particular, practical forms of cooperation.

One week later, the events of the 14th Seminar were presented to the spectators of the Latvian Television on a programme on the international rehabilitation efforts of the Via Baltica Highway which connects Finland and Poland through Estonia, Latvia and Lithuania.

FinnT^2 and the Baltic T^2 Centers have strongly been involved in the work of the World Interchange Network (WIN) since its foundation.

A pleasant meeting with Santa Claus on the Arctic Circle in connection of a Baltic low-volume roads study tour to Finland.

Currently, there are three Board Members from the region (one from Finland, Estonia and Latvia) in the WIN Board of Directors.

Finnra carried out a project on the development of technology transfer in Finland last year. Based on the final report of the project, the composition of the Advisory Committee of FinnT^2 was revised. In addition to the host organisation Finnra, the following bodies are now represented in the Committee: the Ministry of Transport and Communications of Finland, Helsinki University of Technology, Technical Research Centre of Finland, Finnish Road Association and Finnish Association of Consultancy Firms. Revision of the tasks of the Committee members and the forms of participation of the organisations in question in practical technology transfer in Finland are currently underway.

JARMO IKONEN

Also In This Issue:

FINNISH TEAM VICTORIOUS IN PIARC ESSAY COMPETITION

PIARC (The World Road Association) announced an Essay Competition for Young Professionals and Graduates in early 1998. The subject of the competition was "Infrastructure and Transportation in the 21st Century".

The Finnish team "Life on the Move" was one of the four winning teams which were invited to present their essays in the PIARC XXI World Road Congress in Kuala Lumpur, Maleysia, in October, 1999.

In the Congress, the Finnish team was rewarded also with the medal of the Most Innovative Idea by the British PIARC Committee.

The Finnish team consisted of five young women (Architect Hanna Pikkarainen, Traffic Engineer Sini Puntanen, Industrial Designer Mari Siikonen, Geographical Planner Maija Vähä-Rahka and Landscape Architect Laura Yli-Jama). Two of them presented the essay in the Congress. The presentation got a lot of positive feedback, especially because of its humanistic point of view.

The medal mentioned above was named by the former president of PIARC, Maurice Milne. The most innovative idea was a global trade in emissions permits, which will control the exhaust emissions of traffic. In the system of emissions permits, every single individual has a responsibility of his transport solutions.

In this article some of the ideas of the Finnish essay are briefly presented.

INTRODUCTION

Transportation has provided people with a means of expanding the spheres in which they live, and of acquiring experiences of many differing kinds. The result has been an ironic loss of contact with our immediate environment – we know better the wonders of distant lands than we do that little wood behind the crossroads at the end of the street. Our closest acquaintances do not live next door – they live somewhere to which we can travel easily by car. Travelling somewhere is an essential part of our free time pursuits, although doing so means we do not have the time to be at home or to stay in one place. The hunt for experiences is on, at any price. In our search for experiences of the great outdoors and natural sights we inevitably sacrifice a small piece of nature itself through exhaust fumes, noise, and the sprawl of highways.

Transport routes, emissions, and accidents place more limits on life than they create new freedoms. The obstacles are highest for those who do not use a car of their own. The breadth of the living environment of children, the elderly, and the carless is dictated to a great extent by drivers. The time use of these drivers, individuals of productive age, is the measure according to which communities are planned and designed.

Our basic needs a hundred years from now are likely to be much the same as before - things like clean food, an unpolluted environment, a social community and the security it brings, and a meaningful way of earning a livelihood. In the future we shall see a broadening of the choices we can make in the way we lead our lives. People will no longer need to make do with a grim living environment simply because of the inefficiency of the society to do anything about it. Planners will be trained into professionals whose role is to prompt residents to seek out sound and lasting solutions for the spaces they inhabit. The local hindering effects of through-traffic routes will be single-mindedly reduced, and communities reduced in size. Walking and cycling will operate as easily accessible and inexpensive means of transport that also satisfy our need for physical exercise. The apparently insatiable appetite we have for experiences will not necessarily require trips to another continent or hurried visits to enjoy some specialized hobby. Experiences gained closer to home and with less time spent in travelling will prove to be qualitatively better.

WHO DESIGNS THE COMMUNITY STRUCTURE?

The needs and dictates of business and commerce produce living environments that lack a human perspective, and do not satisfy those living there. The poorer sections of the society are nudged into the less attractive areas. Those with money or with their hands on the helm of power can choose their environment.

The first condition for a living urban culture is a well-founded and balanced contact between planners and residents, in which the residents are not mere listeners and driftwood, but active players and subjects in their own environment. The planners are professionals, with a training behind them that helps them help the community to reach its aims of a pleasing and workable living environment. In the post-modern era, heroic architecture forms but a small part of urban planning, and is not the only God to be worshipped.

Aims to be sought in the fields of movement and infrastructure include freedom from noise and from pollution, safety, a visually attractive environment, and connections that operate smoothly. The various functions making up the community structure will be located close to one another. Places of work, schools, and the establishments

needed on a regular basis by the residents will be within walking or cycling distance. Transport routes do not form unwieldy obstacles to movement within the community, but rather all areas are easily accessible. Transportation and infrastructure will be developed with an eye to preserving the natural environment. Traffic-related environments become attractive and pleasing elements in the landscape and not simply "necessary evils", space-consuming areas good for nothing else.

The indications are that in the future, as now, traffic planning and the building of roads and other transport links will involve the use of power. Is it possible to plan the ways in which traffic moves without a power struggle? Can the already greatly fragmented process of decision-making be made more coherent? Without goals geared to a common good it is difficult to achieve any kind of overall vision. Such goals are easily threatened by the decision-maker's fears of damage to his or her own personal advantages, the erosion of the authority of his organisation.

These days the different forms of transport all have their own administrative machinery; the administrative organs for roads, railways, and air or water traffic make decisions and distribute resources within their own branches and compete amongst themselves for "customers". It is in the interests of each particular instance to swell and strengthen its own organisation and to fight for what it sees as its market share.

One way of reducing the fragmented nature of these swollen administrations is to develop for a region one overall umbrella organisation to plan and decide on the area's matters. In this scenario, the regional entity must be of a suitable size that it can be managed comfortably. When the number of administrative units "serving" the region is reduced, there is not the same tendency for a remote and inaccessible power structure. At the same time, people have a greater sense of being able to influence their own environment.

In planning work there is a need to elevate the importance of comprehensive analysis of the effects of any projects, to assess the rightness or otherwise of the direction being taken. Running projects through the decision-making process and getting down to bricks-and-mortar building work cannot be an end in themselves. It is a very human feature in all of us to wish to leave our own thumbprint on history. If in future decades that thumbprint were to be an environmental act rather than a monument, then we would have taken a useful step forward.

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Mr. Leyrit from France, members of the Finnish team Sini Puntanen and Laura Yli-Jama, and the Mayor of Yokohama in the PIARC World Road Congress in Kuala Lumpur after the presentation of the essay.

TAILORING A NATIONAL WINTER MAINTENANCE POLICY FOR A ROAD REGION

INTRODUCTION

Background

National policies and standards are a necessary framework for a uniform road management in a country. When thinking of regional road management there is often a need for more precise guidelines which take the local conditions better into account.

So far, only nation-wide road management policies have been implemented in Finland. In 1999, Häme Region in Finland defined the areas where winter maintenance activities should be better directed according to the most important local traffic needs in the region, looking specifically at the villages and secondary road network. The work was done by the consulting unit of the Finnish National Road Administration (Finnra) supported by a group of specialists.

Generally, the local specifications are in line with the national winter maintenance policy in the new guidelines. Exceptions have been made in mutual understanding with the Finnra national level policy makers. The guidelines will be used as a maintenance contract document. If needed, it will be adjusted after the experiences of the winter 1999-2000.

Regional Objectives

The main objective of the guidelines and the study on which the process was based, was to revise quality requirements for winter maintenance. Therefore the study also included a program for measures to be taken, such as:

- Revision of winter maintenance classes for roads
- Moving maintenance "boundaries" to more realistic locations and mitigating their effects
- Uniformity of the level of service (LOS) on main highways
- Revision of winter maintenance quality requirements
- Customer based approach
- Minimizing the use of salt.

STARTING POINTS

General

The Finnish National Road Administration (Finnra) was divided into administrative (client) and production (contractor) functions in the beginning of 1998. Road winter maintenance, for instance, was earlier carried out by road master areas, but now it is executed in the form of area contracts. The client must give very clear instructions for operations (contract documents) to contractors. Thorough instructions should facilitate the know-how gained during one contract to be transferred to benefit the other contracts.

The national winter maintenance policy that has been made by Finnra is not based on different conditions in different parts of the country. It is the task of the Road Regions to adapt the policy and strategies into practice in the regional level.

Critical Conditions and Main Objectives

The critical conditions of winter maintenance are traffic safety, fluency, environmental impact and customer satisfaction.

The main objectives of winter maintenance are partly the same: providing good level of traffic safety and fluency, and uniformity in conditions, because predictability and punctuality in goods transportation are important.

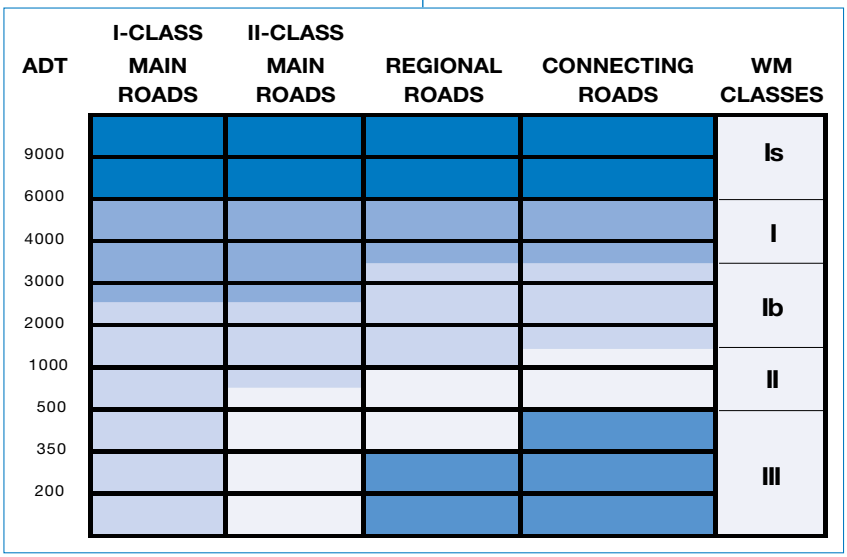
According to customer surveys among the road users, truck drivers want more input to ice control at problematic sites, whereas car drivers want less salt on the road.

The Government and the Ministry of Transport and Communications of Finland have set a target to have a 50 % decrease in fatalities by the year 2000 when comparing to 1989 (518 fatalities on public roads in 1989, and 291 fatalities in 1998). It has been estimated that by the direct activities of Finnra an approximately 25 % decrease can be achieved. The efficiency of winter maintenance plays an important role. A bit contradictory is the fact that, simultaneously, the annual salt application should be decreased by 50 % by the year 2002 when comparing to the beginning of the decade (from nearly 150 000 tons to about 70 000 tons).

The trend in financing winter maintenance has decreased from 1993 to 1996 by about 25 %. In the future only minor cuts in expenditure will take place. Organizing work more efficiently has resulted in great savings.

WINTER MAINTENANCE POLICY OF FINNRA

The main objective of winter maintenance is to guarantee quality traffic conditions for the



Distribution of roads (by average daily traffic, ADT) into different winter maintenance classes in Finland.

society. The following are the key areas in formulating requirements for the Level of Service (LOS) for the road:

- Fluency
- Uniform LOS on the main highway network
- LOS directed according to local conditions and traffic needs
- Traffic safety
- Environmental impacts
- Safeguarding and promoting pedestrian and bicycle traffic
- Optimal cost-benefit ratio on busy roads
- Feeling of responsibility for safe behavior among the road users together with the road user information (public awareness).

REGIONALLY TAILORED POLICY IN THE HÄME REGION

Both the main and secondary roads were included in developing a regionally tailored policy and guidelines in the Häme Region. Traffic on the busiest main roads limit road maintenance operations in the winter time and was taken into consideration when defining the allowed time for snow removal. On the secondary roads about 10 of the most important sites and population centers in each contract area will be given more detailed instructions (about 120 sites total in the whole Region). The instructions cover snow removal and winter salting/sanding activities and also define operations on paths for pedestrian and bicycle traffic.

Special attention was given to motor vehicle traffic. However, shoulders which are heavily used by pedestrians and bicycles were selected to be cleaned during the allowed carriageway response time. It is expected that this kind of approach optimizes the use of scarce resources together with providing better service.

The tailored winter maintenance policy in the Häme Region is summarized in the following list:

Fluency

- Tailoring the nation-wide winter maintenance classification for regional conditions
- Planning of targeted winter maintenance operations
- Weather and road condition information
- Use of telematic solutions on problematic sections / spots
- Good quality maintenance operations
- Avoiding rush hour maintenance (advance timing)

Uniform LOS on main highway network in the entire country

- Mitigation on effects of boundaries of different maintenance jurisdictions

LOS according to local conditions and traffic needs

- Targeted winter maintenance
- Specific population center requirements

Traffic safety

- Mitigation on effects of boundaries of different maintenance jurisdictions
- Road user information including the spots where bare pavement policy changes to white surface (packed snow) policy to avoid surprises

Environmental impacts

- Co-operation between the client and contractor to minimize the use of salt
- Use of winter maintenance Class I b will be extended
- On parallel roads: good LOS is offered for the busy one, but only satisfactory for the lower volume road

Safeguarding and promoting pedestrian and bicycle traffic

- New winter maintenance classification created

Feeling of responsibility for safe behavior among the road users together with the road user information

- Informing on prevailing conditions and forecasting the next hours
- Road user information when the bare pavement policy changes to white (packed snow) policy to avoid surprises
- Informing on limited road sections where use of salt is avoided

Targeted Winter Maintenance

Targeted winter maintenance means improvement of winter maintenance in short sections of roads due to local conditions or temporary specific traffic needs. It can relate to timing, site or method of operation.

Based on the previous paragraph, targeted maintenance can be divided into site specific or traffic specific sections of roads. The site specific sections are as follows:

- Boundary between Finnra and a municipality
- Steep or very long hills
- Intersections, interchanges and traffic circles
- Traffic signals
- Busy bus stops
- Level crossings with a railroad
- Bridges
- Population centers (built-up areas with narrow sections, traffic circles, elevated cross roads and crossings, traffic islands, offsets of alignment and other structures hampering maintenance activities)
- Shoulders in population centers, if no paths for pedestrians and bicycles are available.

Traffic specific sections are maintained to the requirements of a specific use of a road (temporarily higher traffic volume than normally). The traffic specific sections are as follows:

- Bus traffic (first scheduled buses in the morning, school buses, commuter traffic)
- Site related traffic
- Do-business traffic
- Collection and delivery traffic (log transportation, peat transportation, soil transportation, refuse area traffic etc.)
- Military traffic
- Transportation of hazardous materials
- Oversized traffic
- Other limited time heavy goods traffic (e.g. annual service or repair of a factory)
- Temporary events (holidays, fairs, sports etc.)
- Maintenance operations based on special requests
- Pedestrian and bicycle paths for commuting, for school traffic etc.

Targeted sections must be mentioned in the area maintenance contract documents. Maintenance operations based on special requests by the road users cannot be written down in the documents, but are executed as targeted winter service. This calls for the need of a certain kind of criticism, because resources are limited. Also at times when the snow/storm requires the use of all available equipment, it is not possible to implement targeted winter maintenance.

Population Centers

Current winter maintenance classification does not take the specific needs of population centers into consideration. Roads are maintained to Class II requirements, as normally. Salt is not used in population centers. Also, the evenness requirements are not very high because of low speed traffic. Even then there is a big problem in the use of Class II for these centers, the problem being the length of the allowed response time. Snow removal and ice control operations should obviously be carried out before the peaks in traffic to maximize the benefits of maintenance.

Based on the study and the new guidelines, a new winter maintenance Class II+ was created. The exceptions of Class II+ when compared to Class II are as follows:

- Only sand is used for ice control in the middle of winter. Liquid salt can be used in the fall and spring for black ice treatment.
- Allowed response time for snow removal and ice control is according to Class Ib.
- In case the average daily traffic (ADT) calls

for a need to use Class I in the centers, Class Ib is used instead. The Class I allowed response time can be used for the contract documents as far as snow removal and ice control activities are concerned.

The requirements for the new winter maintenance Class II+ are summarized in Table 1.

Targeted Sections in Contract Documents

Targeted sections must be defined in the contract documents. Both unit price and total price can be used when placing an order to a contractor.

LEVEL OF SERVICE (LOS) REQUIREMENTS IN THE HÄME REGION

LOS is defined according to the traffic and climatic conditions. On the main roads a bare pavement policy applies, but this policy becomes more difficult when getting towards north and east in Finland. In these areas it is possible to maintain even main roads allowing some packed snow formation. This is true especially when the speed limit is low.

In the Häme Region, main roads are usually kept bare. By defining a targeted policy it is possible to produce higher LOS where and when needed. Each contract area (total 12 areas in the Region) will have about ten targeted sites for winter maintenance. Sites must be maintained in as uniform way as possible and without any surprise factors.

IMPACTS ON REGIONAL PRACTICES

Maintenance contracts are lump sum contracts where prices have been calculated by winter maintenance class. Average winter maintenance costs are about FIM 53 million (USD 9.2 million) in the Region.. The use of targeted winter maintenance sites increases the costs by about 4.5 %. The direct benefit from this is improved winter service to the road users.

Targeted sites are described in the contract documents during the tendering process. A follow-up will be organized for the fine-tuning of the system including contract management, effects on traffic safety and fluency and customer surveys. Effort will also be made to identify further benefits and their direct effects.

ICE CONTROL ACTIVITIES

WM CLASS	Friction	Temperature Limit (C°)	Allowed Response Time (h)	Hours when Requirements Apply
II+	0,20	-	4 (sanding)	5 – 22

SNOW REMOVAL ACTIVITIES

WM CLASS	Maximum Snow Depth (cm)		Allowed Response Time (h)		Hours when Requirements Apply
	Loose Snow	Slush	Loose Snow	Slush	
II+	6	3	3	3	5 – 22

Table 1. Requirements for Winter Maintenance Class II+ (a new class).

WHAT IS NEW IN THE TARGETED APPROACH?

Every winter maintenance organization in the world could probably say that it has been a normal practice to take specific traffic needs into account in directing its activities. That has also been the case in Finland. So, what, after all, is new in the targeted winter maintenance system?

Obviously the biggest difference when comparing the old and new practices, or the nation-wide and region-wide policies, is the systematic approach. All needs have systematically been analyzed and the targeted sites have been chosen based on severe consideration. The workload has been calculated and the sites are now taken along in the tendering process. That the total winter maintenance costs will increase in order to obtain better service on the selected roads, has also been evaluated.

The follow-up of this system is also new. It probably will reveal more benefits of the system. Targeting winter maintenance needs directly relates to optimized use of scarce resources.

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The winter maintenance class and, thus, the service level depend on the traffic volume and the functional class of the road in question. This motorway carries 45,000 vehicles per day.

NORDIC TIMBER BRIDGE PROJECT

In Europe, Finland and the other Nordic countries are perceived as timber and paper producing countries. The Nordic countries are also held as experts in timber construction. Finland has a long tradition of using timber in single-family houses and small bridges. Currently, approximately 700 of Finnra's bridges are timber bridges. This corresponds to about 7 per cent of the Finnish National Road Administration's (Finnra) bridges. Nevertheless, timber has been used less in structurally demanding structures with a long span. This was noticed in the Nordic countries, and in the early 1990's the Nordic Industrial Fund (Nordisk Industrifond) prepared and started the Nordic Wood Project which is to develop the widespread use of wood in bridge construction.

As part of this mutual Nordic research project, the first phase of the Nordic Timber Bridge Project was conducted in 1995-96, and the second phase, in 1997-98. The third phase was started June 1, 1999 and it will end September 30, 2001. The goal of the project is to promote the competitiveness of timber bridges compared with other materials, for example, by developing technical designs.

PROJECT REALIZATION

The Nordic Timber Bridge Project is based on cooperation between Nordic timber industry and the road administrations of the participating countries. The study is being carried out by Teknologisk Institut (Denmark; phases 1 and 2), Helsinki University of Technology (Finland), Treteknisk Institutt (Norway) and Trätek (Sweden). The project is financed by Nordisk Industrifond, national research funds (Technology Development Centre in Finland), timber industries and road administrations.

A management team consisting of the financiers' representatives (two per country; one from the road administration and one from industry) has set goals and steered the work.

The first phase of the study examined the markets and competitiveness of timber bridges, different structural designs of timber bridges, and the durability and methods of preservation. The first phase ended June 1, 1996 and a report of its results was given during a timber bridge seminar in Finland September 1-3, 1996.

The second phase of the study continued looking into timber bridge durability and an inspection system, developed structural designs and prepared information about the developed designs. Phase two ended June 1, 1999 and a report was given during a seminar in Stockholm May 27, 1999.

Phases 1 and 2 of the study were based on cooperation between the timber industry, road administrations and research institutions in Finland, Norway, Sweden and Denmark. The total budget (phases 1 and 2) was NOK 15.25 million.

The third phase of the study will deal with the following partial projects: 1) Stress-laminated deck slabs , 2) Fatigue (joints), 3) Standardized solutions for timber bridges (joints, bearings, light substructures), 4) Calculation models, 5) Pilot bridges and 6) Surveillance of some existing bridges.

The budget of phase three is NOK 5.8 million, of which amount the timber industries and road administrations of the different countries together will cover 50 %. (Denmark is not participating in phase three). Nordisk Industrifond and the national financial backing funds are responsible for the remaining 50 %. Finnra is responsible for FIM 0.35 million over two years.

The project is flexible in that each country has been able to plan the contents and goals of its own part of the project on the basis of its own development needs. However, the results obtained by all the countries are available to everyone. In conjunction with management team meetings the possibility has been offered to become familiar with the laminated wood factories and innovative timber bridge designs in the different countries. This is very significant from the standpoint of the exchange of information and the formation of new ideas.

FINLAND IS DEVELOPING COMPOSITE BRIDGES WITH TIMBER AND CONCRETE DECKS AND TIMBER ARCH BRIDGES

During phases 1 and 2 of the research project Finland placed major emphasis on further developing the technical designs of timber beam bridges and arch bridges. The economy of a beam bridge is improved if the deck and beams are joined together using dowels, whereupon the deck also functions as part of the main carrier. The project has developed suitable dowels for this purpose and test constructed composite beam bridges. Functioning of the pilot bridge was tested using test loads. Alternatively the deck can be constructed of concrete in place of wood, in which case the bridge has a composite construction formed from laminated timber beams and a concrete deck. The advantage of this design is the possibility of using the bridge on busier roads than before. The composite construction consisting of a concrete deck and timber beams used in the Vihantasalmi bridge is based on results obtained from this project.

An arch bridge is a beautiful type of bridge, and it permits longer spans than beam bridges. Arch bridges have good possibilities ahead, especially as bicycle and pedestrian bridges. The project examined the principles and structural design of arch bridges and suitable spans and structural designs for both motor vehicle traffic and bicycle and pedestrian traffic. Pilot bridges have been constructed, and the results have been utilized.

NEW AREAS OF RESEARCH IN FINLAND

Research in the third phase of the project comprises the following partial projects in Finland:

- New possibilities with synthetic fibre tendons
- Joints of king-post bridges
- Joints of arch bridges
- Light sub-structures for pedestrian bridges and road bridges with low traffic density
- Design and construction of pilot bridges (pedestrian and road bridges)
- Follow-up of the Vihantasalmi bridge, Mäntyharju, Finland

REPORTS OF FINLAND'S PARTIAL PROJECTS

Phase 1:

- Rules Concerning the Design of Nordic Timber Bridges
- Wood-Concrete Composite Bridges
- Design of Wooden Arch Bridges

Phase 2, partial project Wood-Concrete Composite Bridges:

- Analysing Methods of a Composite Girder Containing Wood
- Tests on Shear Connectors
- Formwork and Falsework Construction
- Follow-up Tests of the Uusisalmi Bridge

Phase 2, partial project Example Drawings for Timber:

- Wood-Concrete Composite Bridges
- Arch Bridges for Road Traffic
- Arch bridges for Pedestrian Traffic
- Prototype Models of Timber Bridges with Prefabricated Deck Units
- Timber Bridges – a presentation of 22 Nordic timber bridges

The results of the project were presented at the Timber Bridge Event held in Finland January 13, 1999 and at a Nordic Timber Bridge Seminar held in Sweden in the spring of 1999.

When phase 3 is ready, a Timber Bridge Conference will be held in the autumn of 2001.

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Vihantasalmi bridge, Mäntyharju, Finland. Total length of the bridge 182 metres.

Tirva bridge, Valkeala, Finland. A timber-concrete composite beam bridge.

Ollas bridge (overpass), Espoo, Finland.