



Ministry of Transport  
and Communications

# Best Finnish Practices on Joint Construction of Infrastructure Networks

Examples of coordinated construction of transport infrastructure, water supply networks and electricity and telecommunications cables in Finland

Ministry of Transport and Communications  
Ministry of Agriculture and Forestry  
Ministry of Employment and the Economy  
Ministry of the Environment  
Association of Finnish Local and Regional Authorities

## **Ministry of Transport and Communications**

### **mission**

The Finnish Ministry of Transport and Communications seeks to promote the efficient functioning of society and national well-being by making sure that people and businesses have access to high-quality, safe and reasonably priced transport and communications networks, and by ensuring that transport and communications companies have the opportunity to compete on a level playing field.

### **vision**

Finland is a global leader in transport and communications through its focus on quality, efficiency and international expertise.

### **values**

Courage

Equity

Cooperation



Date  
23 December 2010

Title of publication

**Best Finnish Practices on Joint Construction of Infrastructure Networks**

Author(s)

Jukka Niemelä, Prepsikka Oy

Commissioned by, date

Ministry of Transport and Communications, Ministry of Agriculture and Forestry, Ministry of Employment and the Economy, Ministry of the Environment, Association of Finnish Local and Regional Authorities, 28 April 2010.

Publication series and number

**Publications of the Ministry of  
Transport and Communications  
41/2010**

ISSN (online) 1798-4045

ISBN (online) 978-952-243-207-0

Reference number

Keywords

Joint construction, transport infrastructure, networks, telecommunications, power distribution, water pipelines, district heating, infrastructure

Contact person

Mr. Juha Parantainen, Ministry of Transport and Communications

Other information

This report has also been published in Finnish (LVM:n julkaisu 37/2010).

Abstract

The Cabinet Committee on Economic Policy gave its strong support in 2009 for joint construction of transport, telecommunications, energy and water distribution networks. As part of measures to promote joint construction, the responsible ministries and the Association of Finnish Local and Regional Authorities have formed this guide on best practices on joint construction of infrastructure networks. With the guide, information on successful projects and best practices is expected to reach as many operators as possible within the industry.

This guide provides information on experience, best practices and acquired benefits on joint construction of infrastructure networks. The guide is aimed at decision makers in the transport, telecommunications, power distribution, water pipeline and district heat network industry.

The guide describes five key challenges. The practical examples from five different operators show ways of overcoming these challenges and gaining the benefits in joint construction. In addition, the guide provides information on joint construction in state-owned transport routes and discusses how joint construction should be taken into account when planning the use of public and private properties.

## Table of Contents

1.	Introduction .....	1
2.	How are the cost savings resulting from joint construction achieved? .....	2
3.	The five main challenges in joint construction .....	3
3.1	Lack of cooperation between the parties .....	3
3.2	Scheduling .....	4
3.3	Funding .....	5
3.4	Lack of resources .....	6
3.5	Documentation and information management .....	6
4.	Practical examples of joint construction schemes .....	7
4.1	City of Joensuu .....	7
4.1.1	Karhunmäki local detailed plan area 2010-2012 .....	8
4.1.2	Rantakatu in Joensuu .....	9
4.1.3	Critical success factors of the operating model .....	11
4.2	City of Helsinki .....	12
4.2.1	Planning stage.....	12
4.2.2	Preparations for construction .....	13
4.2.3	Construction stage .....	13
4.2.4	Developing a joint agreement template.....	14
4.3	Vattenfall's electricity distribution network and joint construction .....	14
4.3.1	Aims of joint construction.....	15
4.3.2	Tendering of joint construction projects.....	15
4.3.3	Experiences and benefits achieved .....	17
4.3.4	Broadband/underground cabling work in Kinnula .....	17
4.4	Network cooperative Kajo – optical fibre cable network project .....	17
4.4.1	Division of responsibility between the water cooperatives and Kajo .....	18
4.4.2	Installing optical fibre cable pipes in the same trenches with water supply pipes .....	18
4.4.3	Distribution of costs of the optical fibre cable network and the water supply network.....	19
4.4.4	Funding of the network cooperative Kajo.....	19
4.4.5	Benefits of joint construction to Kajo and the water cooperatives .....	19
4.4.6	Challenges faced during the construction.....	20
4.5	Joint construction from the point of view of a telecommunications operator ...	20
4.6	Joint construction alongside State-owned transport routes .....	21
5.	How does land use planning support joint construction? .....	22
6.	Summary .....	23
6.1	Common success factors .....	23
6.2	Benefits achieved .....	24
7.	Where can I get more information? .....	24
8.	Thank you .....	24

## 1. Introduction

Are you involved in the decision-making concerning the construction of transport routes, water pipeline networks and electricity and telecommunications cables? Did you know that your organisation can save money by constructing such networks in cooperation with others? For example, excavation work may account for up to 80 per cent of the total cost of building telecommunications links. When networks are constructed as joint projects, excavation costs can be shared between a large number of actors. As a result, all those involved will save money. For the national economy, this means savings amounting to hundreds of millions of euros every year. In June 2009, the Cabinet Committee on Economic Policy gave strong support to joint construction of transport routes and telecommunications, energy supply and water supply networks.

This guide helps you to activate the parties to joint construction projects in your area of operations so that all those involved can benefit. We detail practical experiences gathered during projects involving the joint construction of networks and provide you with concrete ideas and examples of why some approaches are better than others. Operators with many years of experience in joint construction have contributed to the contents of the guide.

Reiniko Oy has been the party with the overall responsibility for the production of the publication. The guide has been prepared by Jukka Niemelä of Prepsikka Oy and commissioned by the ministries responsible for Finland's infrastructure and the Association of Finnish Local and Regional Authorities. We hope that information about successful joint construction projects and the good practices observed during them will become available to as many operators as possible.

December 2010

Ministry of Transport and Communications  
Ministry of Agriculture and Forestry  
Ministry of Employment and the Economy  
Ministry of the Environment  
Association of Finnish Local and Regional Authorities

## 2. How are the cost savings resulting from joint construction achieved?

Excavation accounts for as much as 80 per cent of the cost of constructing new telecommunications networks. In joint construction, excavation costs can be shared among the parties using the 'beneficiary pays' principle. Thus, in a joint construction scheme involving four operators, each of the parties can cut the costs of its own project by almost one half.

Joint construction also helps to reduce access and traffic restrictions, which in turn will reduce the number of complaints by residents on 'continuing and frequent excavation work'.

If the principles of joint construction are not observed, the structures in the excavation area cannot be restored to their former state after the work, which will reduce the value of the infrastructure in question.

In joint construction projects involving more than one party, consideration should be given to the 'speed factor' resulting from the coordination of the work. Simultaneous construction of four infrastructure systems (such as water pipes, district heating pipes, electricity cables and optical fibre cables) into a single trench generates a 'speed factor' of about 2. This means that joint construction may even halve the time required for the work, compared with separately made installations.

Likewise, the installation of optical fibre cables of more than one operator will generate higher and more consistent economic benefits because all cables can be installed at the same depth and no intermediate filling is required. A joint construction project involving two operators will already generate substantial savings.

***"When the tendering, opening of tenders and the selection of the contractor are made jointly, such matters as the sharing of excavation costs and the submission of orders are also made on a single document. Everything goes really smoothly from start to finish. The contractor will also do its job properly. Everything is properly supervised. The price is competitive."***

**- Fortum**



*Cable ploughing carried out as a separate project (Photo: Reiniko Oy)*

### **3. The five main challenges in joint construction**

All operators interviewed for this guide named the same challenges when talking about the problems of joint construction. We have selected five challenges and problems that in our view need to be prepared for in joint construction projects.

We also present our own solution to each of the challenges.

#### **3.1 Lack of cooperation between the parties**

Lack of cooperation is usually a question of operators not providing information about their own projects. The owners of different infrastructures draw up multi-year project plans but there is still little coordination between these plans.

**Joint construction involves the parties maintaining transport routes, water utilities, suppliers of electricity, gas, district cooling and district heating, telecommunications operators and owners of land areas.**



*The parties should hold regular meetings on construction projects involving networks in their own areas. (Photo: Prepsikka Oy)*

In many cases, cooperation is only launched when the client scheduled to start first is submitting an application to the land owner for a site permit for its infrastructure project.

There has been little cooperation with telecommunications operators in water supply projects carried out in sparsely populated areas. This is because these areas are not attractive to commercially oriented telecommunications operators.

The City of Joensuu has for years held regular joint construction meetings between different parties. The meetings are mainly occasions in which the parties are informed about matters; however, from this it is also easy to move on to the next stage: planning, and coordination of plans.

**You can solve the matter by**

**being active and open, by providing information and by inviting the parties to joint construction to a meeting at least once a year. Ask the participants to present the projects already decided for the coming years at the meeting.**

### **3.2 Scheduling**

Lack of information and cooperation inevitably lead to scheduling problems. As a rule, joint construction schemes can only succeed if information about the individual projects is provided at least two years in advance. Because of funding and resource-related issues, projects with a tighter schedule are difficult to carry out. Funding may not be available even if a project is included in the budget. In many cases, projects scheduled within one year are impossible to carry out.



Different parties typically present different target schedules for their projects. As early as the planning stage, emphasis should be on the coordination of the schedules of the projects carried out as part of the joint construction scheme.

The scheduling should be carried out using a principal planner or another person possessing adequate experience and expertise on such tasks. If the scheduling fails, the joint construction scheme may not bring the desired benefits.

**You can solve the matter by**

**requesting all parties to present a target schedule and inviting them to a coordination meeting. Decide on the critical intermediate and main targets.**

A joint construction scheme should have a principal client or a party that is responsible for ensuring that the agreed schedule is adhered to. The same party should also be responsible for coordinating different work stages at sites and for supervising the functioning of material logistics.

### **3.3 Funding**

Lack of information, lack of cooperation and excessively tight schedules will inevitably lead to funding problems. If notification is provided during the year the joint construction scheme is to start, participation is only possible in exceptional cases. Providing funding in the middle of the budget year is practically impossible regardless of whether it is a question of a municipal or a commercial operator. Finding money for schemes scheduled for the following budget year is also difficult. After all, operators have drawn up their project programmes for more than one year and reserved funding for the projects already known.

Even if a municipality or a non-commercial telecommunications operator showed initiative in joint construction schemes, it may not be possible to find funding for an optical fibre cable network. The principal client should at this stage examine whether preparations can be made for future needs and, as part of the joint construction scheme, install piping for cabling to be carried out at a later date. Use can be made of the traditional pipe-section construction or micro pipes pulled from around reels. Both are suited for the installation of an optical fibre cable at a later date.

All new transport routes built with State funding have a provision for broadband cabling. Municipalities should also adopt the same approach for their own projects involving the construction of new infrastructure. It may be difficult to provide funding for the laying of optical fibre cables in projects carried out by private actors such as water cooperatives, especially if the property owners in the areas concerned are not convinced of the need for such networks.

Examination of the joint construction potential has been a requirement in State-supported projects involving the extension of water supply networks since the start of 2010. The aim is to ensure a basis for economically sound coordination of construction in cases where the extension of the broadband network to the area is desirable. Grants provided by the State for water supply schemes cannot, however, be used for the funding of the optical fibre cable network.

**You can solve the matter by**

**providing information about the joint construction potential as early as possible, by examining the project costs and the distribution of costs at the planning stage, by finding out about different funding options and by submitting the necessary applications well in advance.**

### **3.4 Lack of resources**

A large number of simultaneous projects in the area concerned may lead to a shortage of resources. The lack of resources primarily affects planning and project organisations, not the contractors. A lack of resources is not only a question of a limited number of personnel – it may also mean limited expertise. While the principal planner may be a top expert in the field in question, he/she may only possess a limited amount of expertise in the special fields of other parties. This means that coordinating the requirements and schedules of different parties may be difficult.

**You can solve the matter by**

**making sure that you have a sufficient amount of expertise at your disposal. If necessary, you should use external planning offices and project consultants.**

### **3.5 Documentation and information management**

The challenges of the documentation and information management of joint construction schemes are evident before the start of the planning process and after the scheme has been completed. In practice this may mean that there is little or only very general documentation about the existing infrastructure. It is particularly difficult to obtain information about networks located in sparsely populated areas.

For example, the route connecting two operating units is indicated on the street plan with a straight line even though it actually runs on the edge of the street, following its bends and humps.

The second general challenge is that the documentation does not contain information about the installation depth. This makes the planning more difficult as there may already be other pipes or cables in the planned installation depth.

The third challenge is that there is rarely any overall documentation about joint construction schemes in a single place, let alone in a single document.

**You can solve the matter by**

**making sure that all parties have access to up-to-date documentation about the existing infrastructure before the start of the planning process. If no critical information is available, you should find out about it by, for example, visiting the site in question or requesting the details of the cables in the area. Make sure that the parties to the scheme will enter the exact routes plus the measuring data in their own documentation and produce one layered main document showing the documentation of all parties. Determine the manner in which the documentation is maintained and the person responsible for it.**



Trench for the optical fibre cable connection of a property (Photo: Reiniko Oy)

#### 4. Practical examples of joint construction schemes

*"When we are carrying out street construction work, the aim is that all parties are working on structures of similar age. When a street reaches the end of its life cycle, all other parties should also renovate their networks at the same time."*

- Vattenfall

##### 4.1 City of Joensuu

The City of Joensuu has carried its projects as joint construction schemes for more than 20 years and each year dozens of projects are implemented in this manner.

After many years of work, project coordination is now on a reasonably sound footing. Very few of the municipal street construction projects are scheduled in such a way that potential partners would be unable to take part in them.

In Joensuu, project flow steering meetings are held every 1-2 months. Representatives of all parties concerned take part in them, providing information about their projects and project schedules from six months to two years in advance.



A project carried out by the City of Joensuu typically involves

- the owner of the road area,
- the local water utility,
- the local electricity distributor and
- 2-3 telecommunications operators.

Because of the active role played by the City's technical department, other parties rarely act as engines of joint construction schemes.

#### **4.1.1 Karhunmäki local detailed plan area 2010-2012**

Karhunmäki is a new local detailed plan area adjoining an existing 'village' that has a small number of properties. The City of Joensuu has prepared a local detailed plan for the area, which will be constructed in stages between 2010 and 2012.

A joint construction scheme covering the area has been set up and the parties concerned have committed themselves to it. The street construction part is a shared contract involving the excavation work of all parties. The following parties will build their own networks as part of the street construction:

- Water utility
- Energy utility
- Telecommunications operators

A principal client and a principal planner have been appointed for the scheme. The task of the principal planner is to coordinate the planning work carried out by the planners of the other parties.



*Joint construction in Karhunmäki area (Photo: Harri Pyöriäinen P-K:n KTK Oy)*

***A joint site is a construction project on which different clients or their contractors work simultaneously or in succession.***

The clients draw up a project agreement between them, which lays out

- the project,
- the clients,
- the principal contractor and the subsidiary contractors,
- safety coordinators appointed by the clients,
- the parties responsible for safety in connection with the electricity work,
- performance obligations of each party,
- joint deliveries and
- the contract period.

In practice, coordination will be by means of joint site meetings attended by all parties, subsidiary contractors and supervisors. The supervision carried out during the construction also aims at ensuring that the principal implementing party meets its obligations, such as the joint preparation of the site schedule and site safety planning.

A joint contract programme covering the excavation work details the contents of individual contracts and the performance obligations of each contractor.

***"We have prepared a joint contract programme template, which the City modifies to fit the project in question and submits to different clients for changes. This allows us to draw up a joint contract programme."***

**- Fortum Joensuu**

The mapping of underground structures is the responsibility of the principal implementing party. If it does not carry out the mapping itself, it will order the work from the City. The City of Joensuu has a geographical data service unit that supplies services to all parties concerned. At the conclusion of a scheme, each party produces its own documentation on the basis of the final documents supplied by the contractors.

***In overall terms, the end result is better than if carried out as individual projects. The problems resulting from the construction can be minimised.***

The electricity distribution network of the Karhunmäki area was built to meet the immediate needs of the area. At the same time, Fortum made preparations for future needs by, for example, laying pipes for possible cabling. In this respect, Fortum is acting in accordance with a policy decision of the Cabinet Committee on Economic Policy under which provision for telecommunications and other cables should already be made in connection with the planning of transport routes and land use.

#### **4.1.2 Rantakatu in Joensuu**

The technical department of the City of Joensuu was responsible for the joint construction scheme at Rantakatu in 2008. In addition to the technical department, the scheme also involved Joensuun Vesi, Elisa Corporation, TeliaSonera Oyj, Telekarelia Oyj and three property companies.

As part of the scheme, the technical department intended to

- change the cross-sections of the street,
- resurface the street and modernise the traffic control system and the traffic lights,
- replace the street lighting, plants and trees,

- acquire a share of the cable canal, and
- relocate the district heating lines.

As part of the scheme, Joensuun Vesi replaced the water supply network of the area and the service pipes connecting local properties with the network.

The telecommunications operators relocated the existing telecommunications network, built a new telecommunications and cable pipe network and acquired a share of the cable canal.

The three properties involved replaced the water insulation of the basement walls bordering the street and the foundations and surfaces of the yard areas, renovated the subsurface drains and built a pumping station for the street area.

The overall content of the scheme was determined in a needs assessment prepared by the parties involved. As part of the needs assessment, it was also decided to construct a cable canal. The renovation needs of Rantakatu properties were examined and included in the scheme. The decision on the content of the scheme was made by the clients ('owners').

The construction plans were drawn up in accordance with the principle of simultaneous planning, involving the technical department (streets and water supply), the telecommunications operators and the consultants hired by the properties. Already during the drafting of the construction plans, the clients guided the construction planning and agreed on costs (relocation of pipes etc.) and the sharing of the contracts. The planning group was led by a planner appointed by the technical department.

The planning process resulted in coordinated plans and work specifications and a single safety document covering the scheme.

***Preparing a contract programme, a safety document and technical documents covering all contracts has proved as the most efficient approach. All clients and contractors sign the agreement covering the subsidiary contracts.***

The technical department, acting as the principal client, was in charge of the preparations of the construction work. It prepared

- the invitation to tender documents for the street construction contract,
- the joint site contract programme observed in all contracts and
- the safety document.

The technical department also set intermediate targets for different contracts in the contract programme. All clients were involved in the preparation of the construction.

As part of the tendering, the technical department submitted invitations to tender for the street construction contract, which also included the following contract work ordered by the properties:

- Construction of subsurface drains and pumping stations
- Construction of the yard areas
- Site services of the water insulation contracts

The tendering for the water insulation contracts was carried out by the properties themselves.

The benefits of joint construction were also evident in the tendering of the other contracts as one contractor was responsible for all telecommunications and electricity cabling work.

<b>Contract</b>	<b>Contractor</b>	<b>Client</b>
Surfacing contractor	Lemminkäinen Corporation	Technical department
Street and traffic light contractor	Empower Oyj	Technical department
Electricity contractor	Empower Oyj	Fortum
Tele 1 contract	Empower Oyj	Elisa
Tele 2 contract	Empower Oyj	TeliaSonera
Tele 3 contract	Empower Oyj	Telekarelia
Changes in district heating lines	Fortum	Technical department

All clients had the opportunity to take part in the contract negotiations. The clients approved the contract price specifications presented by the contractors without changes even though other tenderers were offering lower prices for parts of their contracts. The experience has shown that in the long run the differences between the prices of contract parts may cancel out each other. The prices should always be carefully examined.

The contractors were selected by the technical department using the lowest total contract price as the criterion.

The agreement for the joint site was drawn up by the technical department while each client was responsible for the agreements for its own contracts. The payments for the street construction contract went directly to the clients. The principal supervisor appointed by the technical department authorised the payment after the work carried out by the contractor concerned was considered to have been completed.

#### **4.1.3 Critical success factors of the operating model**

The clients steer the projects using the principle of process management for the duration of the life cycle of the construction contracts. The life cycle of a construction contract typically extends from the project plan to the end of the contract warranty period.

The client group holds project steering meetings every 1-2 months. Each project must have a principal planner who, using the authorisations received from the clients, leads the planning group and coordinates the plans.

The parties must be familiar with the joint construction model and be able to act as members of the client group and the contractor group.

The critical success factors of a joint construction scheme are

- the ability of the clients to cooperate and the trust between them,
- adherence to schedules,
- readiness and coordination of plans,
- expertise in the preparation of agreements and the ability to act as clients and
- expertise in the field of occupational safety.

Tendered and unit-priced annual contracts mean less work during the tendering stage. The parties should draw up agreement templates for different situations before finalising the project plan. This means less 'unnecessary paperwork' during the project and allows

the parties to focus on the project itself. The parties should also determine what the clients are allowed to do and what types of agreement they are allowed to conclude.

## 4.2 City of Helsinki

In 2008, the City of Helsinki prepared an agreement on joint municipal engineering between the City departments and agencies ordering excavation work. In the following section we will provide a summary of the agreement and discuss the most important points of the document. The chapter below also contains direct quotations from the agreement. The agreement is structured in accordance with the template drawn up in 2006 by the Association of Finnish Local and Regional Authorities. The template can be downloaded at <http://hosted.kuntaliitto.fi/intra/julkaisut/pdf/p060928125405U.pdf> (the text is in Finnish).

The agreement is between the Public Works Department of the City of Helsinki, Helsingin Energia, Helen Electricity Network Ltd, Helsingin Vesi (from January 1, 2010, part of the Helsinki Region Environmental Services Authority), Helsinki City Transport and the City Planning Department of the City of Helsinki.

The Street and Park Division of the Public Works Department starts negotiations with the other parties to the agreement on the implementation of the 'joint site' construction projects and on the appointment of the principal client. The negotiations will be conducted each year during preparation of the budget. The parties select the principal client for each construction project separately. The principal implementing party of a construction project can be changed with the joint agreement of the parties to the agreement.

A realistic and a sufficiently detailed planning and construction timetable will be drawn up for each project covered by the agreement. All revisions and changes to the timetables must be jointly agreed by the parties.

### 4.2.1 Planning stage

The aim of the planning stage is to prepare joint planning documents and reports for each construction project that are not in conflict with each other.

The stage is initiated at the start meeting on which a project-specific memorandum is prepared. The purpose of the meeting is to select the principal planner, determine the scope of the construction project, agree on the most important aspects of the division of responsibilities and to determine the scope of purchases made by each party.

The location of the existing cables, equipment and structures, the need to renovate and relocate them and the impacts of the work on other plans will be examined and determined as part of the planning process. The operating requirements of the existing equipment and structures will also be examined during the planning stage.

Different planners will draw up their own risk assessments for the safety document. The principal planner will coordinate the risk assessments and put the information together into a safety document covering the construction project.

If there are third parties involved in the planning of the construction project (private actors, telecommunications operators), the principal planner is responsible for ensuring that their plans are in agreement with the other plans of the construction project. Each party is responsible for the approval of its plans and the necessary site permits.



#### 4.2.2 Preparations for construction

Coordinated implementation documents will be prepared as part of the preparatory process with the aim of ensuring that the quality and efficiency requirements of the project partners are met.

The party appointed as the principal client of the joint site convenes the meeting initiating the preparation of the construction stage, which is attended by all parties. The meeting agrees on the scope, manner of implementation, schedule and special features of the construction project and prepares descriptions for them.

The parties will jointly agree on the division and scope of the contracts concerning the project. The parties can choose between two approaches when carrying out the project:

1. The parties jointly prepare the invitation to tender documents. The contract programme covers the work of all parties to the agreement. The performance requirements are specified as separate entities and serve as the limits to the parties' scope of responsibilities.
2. Each party to the agreement draws up its own invitation to tender documents and submits them in accordance with an agreed schedule. The invitations to tender set out the procedure for drawing up the agreements on subsidiary contracts.

The parties to the agreement undertake to consider the tenders in accordance with the agreed schedule. If the parties to the agreement consider the tenders jointly, confidentiality should be observed. The parties to the agreement will conduct contract negotiations with the selected contractor candidates before concluding the contracts.

#### 4.2.3 Construction stage

Each construction project has its own implementing organisation and principal implementing party. The work is carried out in accordance with the General Conditions for Building Contracts YSE 1998 and jointly agreed and commonly used quality requirements and work specifications. The parties will also observe the service agreements concluded between the clients and the producers. The project can be carried out as a joint contract or a separately purchased contract. In the latter case, the contracts of the parties concerned are carried out as subsidiary contracts of the jointly agreed principal contractor.

The joint site has a principal implementing party appointed by the parties to the agreement. The principal client will appoint a principal supervisor for the joint site, which is responsible for coordinating the supervision and for cooperation between the other parties. In contracts separately ordered by the parties to the agreement, each client is responsible for the implementation of the contractual obligations of its own contract vis-à-vis the principal client and other parties to the agreement. The parties to the agreement may use a project consultant in the project whose task is to manage the construction project as the representative of the principal client or a party to the agreement. Any use of a project consultant as the principal client will be agreed separately for each construction project.

Each party will appoint a technical supervisor for its own work.

#### 4.2.4 Developing a joint agreement template

The agreement on joint municipal engineering is in effect until 31 December 2013 after which it will be extended for one year at a time unless a party to the agreement cancels the agreement for its own part. The parties have agreed that two years from the signing of the agreement, the experiences gathered will be assessed and efforts will be made to develop the agreement template on the basis of the assessment in autumn 2010.

#### 4.3 Vattenfall's electricity distribution network and joint construction

Vattenfall has made a decision in principle on laying energy cables under ground instead of using overhead cables. In practice this means that the power transmission network laid on poles and located in forests will be gradually moved to roadsides and overhead cable networks will no longer be built.

***"Using the joint infrastructure route makes joint construction possible."***

**-Vattenfall**

Vattenfall has been engaged in large number of joint construction schemes.

- Hämeenlinna: City of Hämeenlinna, HS Vesi Oy, Vattenfall Verkko Oy, Vattenfall Lämpö Oy and AinaCom Oy
- Janakkala: Municipality of Janakkala, Janakkalan Vesi, Vattenfall Verkko Oy and AinaCom Oy
- Jokioinen, Humppila (water pipe line): the municipalities concerned, Vattenfall Verkko Oy and Forssan Seudun Puhelin Oy
- Hattula: Municipality of Hattula, HS Vesi Oy, Vattenfall Verkko Oy and AinaCom Oy
- Tammela: Municipality of Tammela, Vattenfall Verkko Oy and Forssan Seudun Puhelin Oy
- Akaa: City of Akaa, Vattenfall Verkko Oy and the local water utility
- Uurainen: Municipality of Uurainen, the local water utility, Vattenfall Verkko Oy and TeliaSonera Oyj
- Nokia: City of Nokia, the local water supply company, Vattenfall Verkko Oy, Fortum Lämpö Oy and Elisa Corporation
- Kangasala: Municipality of Kangasala, the local water supply company, Vattenfall Verkko Oy and Elisa Corporation
- Lempäälä: Municipality of Lempäälä, the local water supply company, Vattenfall Verkko Oy and Elisa Corporation

Agreement on applying the joint construction principle in future projects has also been made with the municipality of Siikalatva and the municipalities in the Jyväskylä region.

Similar approaches have been applied in all projects and they have also been characterised by similar operating environments. Each project has involved a municipality and/or a municipal water utility, Vattenfall's network company, a telecommunications operator and a district heating company. Thus, the benefits achieved through joint construction have also been similar.

Most of the Vattenfall projects have involved a municipality as the principal client. In order to be able to act as the principal client, a municipality must submit a joint invitation to tender covering the total contract. The joint invitation to tender can only be made if all parties to a joint construction scheme have plans that the principal planner coordinates before the invitation to tender is submitted.

Each project has one principal contractor that is responsible for carrying out the project. All clients are for their part responsible for providing site supervision. Each client is always invoiced separately.



*A mid-voltage cable and the piping for a telecommunications cable in a new local detailed plan area in Janakkala (Photo: Vattenfall Verkkö Oy)*

#### **4.3.1 Aims of joint construction**

The aim of Vattenfall is to carry out all work in new local detailed plan areas and all renovation work subcontracted by municipalities to external contractors as joint construction projects. This would provide a clear and consistent operating model for all municipal projects involving Vattenfall as a party. It would also allow the use of uniform construction methods, while at the same time the best practices generated in the projects could easily be incorporated in other projects.

#### **4.3.2 Tendering of joint construction projects**

In projects involving Vattenfall, the principal client (i.e. technical department of the municipality concerned or a consultant it has appointed) is in charge of the preparations for the construction. The principal client

- arranges the planning meetings between the parties,
- prepares the planning documents covering the street construction contract and
- prepares a joint invitation to tender, the contract programme and the safety document.

Each party prepares its own planning document; these are coordinated with each other and with the street construction plans.

All clients are involved in the preparation of the contract programme and supplement it using their own needs as a basis. The contract programme sets out the interim targets for all project sections.

Each of the parties to a joint construction scheme draws up its own plans, work specifications and the lists giving the amounts and units used.

The contractors selected must meet the competence and experience criteria defined by the clients. The lowest price has been used as the criterion for the total contract. When making the purchasing decision, all parties accept the total contract with the lowest price. All clients will participate in the contract negotiations.

The contract agreement will be prepared by the technical department or a consultant appointed by it. Each client will comment on the contract agreement for its own part. The contractor will provide each client with a proposal for a payment table. The payments will go directly to the clients.



*A pipe to be laid under a road and a mid-voltage cable in a new local detailed plan area in Janakkala (Photo: Vattenfall Verkkö Oy)*

### 4.3.3 Experiences and benefits achieved

The operating model adopted by Vattenfall has been considered to function well and has brought benefits to all parties concerned. Cooperation and trust between the clients has improved and the projects have progressed extremely smoothly. The tenders received have been competitive and there have been few disagreements. Schedules have been adhered to, the parties have acquired more expertise and the quality of work and the occupational safety at the joint site have improved. The number of claims submitted during the warranty period has also declined.

It has also become clear that all parties have achieved savings in construction costs as overlapping work stages have been eliminated.

### 4.3.4 Broadband/underground cabling work in Kinnula

Vattenfall has been involved in a broadband and underground cabling project initiated by the municipality of Kinnula, which has been carried out as a joint construction scheme. The aim has been to construct power transmission and broadband networks simultaneously. The purpose is to coordinate investment schedules and to make use of the road area in the installation work. Constructing all networks on the slope of the road simultaneously is the best alternative because

- the land area has already been purchased,
- there is no need to use privately owned yards, forests or fields,
- the soil, made up of sand, is ideal for ploughing and
- there is a steep slope outside the road area, which is impossible to plough and expensive to excavate.

A further argument in favour of using the road area is that Vattenfall only needs to deal with one party (the municipality or the Finnish Transport Agency) when submitting the application for the site permit.

## 4.4 Network cooperative Kajo – optical fibre cable network project

The network cooperative Kajo mainly operates in the municipalities of Mäntsälä, Pornainen, Sipoo and Porvoo. The water cooperative of south Pornainen, the northern water cooperative of Hinthaara and the water cooperatives Mustijoki and Suoni operate in these areas. Other work in progress in the area includes the excavation work aimed at improving wastewater management in the village of Paippinen in the municipality of Sipoo and the construction of a transfer sewer between Pornainen and Kerava. A great deal of construction involving the water supply network has been carried out in the area since the year 2000. The network cooperative Kajo was established in 2003 with the following guiding principles:

1. No extra costs to water cooperatives
2. No costs to those who are not interested in Kajo
3. No extra costs to municipalities

When the water supply network is complete, it will cover an area of about 4,000 residential properties.



#### 4.4.1 Division of responsibility between the water cooperatives and Kajo

Kajo cooperates with water cooperatives in water supply projects. The water cooperative acts as the principal client and supervisor in water supply projects. The water cooperative plans the routes of the water supply network, concludes the land use agreements using a common form and submits the invitations to tender.

As for the optical fibre cable network, Kajo determines the locations of the connection wells, membership agreements, connection agreements and material purchases and acts as the supervisor during the construction of the network.

#### 4.4.2 Installing optical fibre cable pipes in the same trenches with water supply pipes

Water cooperatives require that the optical fibre cables installed in the same trenches with water supply pipes must be laid inside protective piping. It has been possible to install the pipes at the same depth. Installing the optical fibre cables inside pipes is, however, slightly more expensive than laying the cables directly into the trench.

Using pipes allows the network to be expanded at a later date, while defects can also be repaired more quickly. Starting costs are low because it is not necessary to build the optical fibre cable network in connection with the water supply project. The cable can also be blown inside the pipe at a later date.

The aim is to connect all members of the water cooperatives with the network of protective pipes even if they were not members of Kajo. This helps to keep the costs of any future pipe-laying low. After all, there will not be any need for excavation as the cable can be laid inside an existing pipe.



*Joint installation of the water supply network and optical fibre cabling. The optical fibre cable is laid inside the installation pipe using the blowing technology. (Photo: Network cooperative Kajo)*

#### 4.4.3 Distribution of costs of the optical fibre cable network and the water supply network

The water cooperatives pay the contractor the costs of the whole contract, including the costs of the construction of the protective piping. The costs incurred by Kajo are kept separate as the subsidies granted for water supply projects may not be used for the construction of an optical fibre cable network.

Kajo purchases all materials, protective pipes, wells, connectors etc. at its own cost. The water cooperative charges Kajo for the costs arising from the construction of the protective piping, wells and connectors. Kajo also pays 20 per cent of the metric price of the land use compensations and a jointly agreed proportion of the supervision costs.

#### 4.4.4 Funding of the network cooperative Kajo

The Employment and Economic Development Centre has granted Kajo some EUR 15,000 for preliminary planning and some EUR 60,000 for the implementation pilot project. Kajo provides the rest of the funding itself. Municipalities have been unwilling to provide loan securities. If joint construction of water supply and optical fibre cable networks in sparsely populated areas is to continue, other providers of securities must be found. The banks do not accept a completed network as a loan security.

#### 4.4.5 Benefits of joint construction to Kajo and the water cooperatives

Kajo would not exist without joint construction involving water cooperatives and there are unlikely to be any other providers of optical fibre cable connections intended for local consumers in the next few years. Both parties can also use joint electricity connections (line pump stations of the water cooperatives and regional centres of Kajo).

The optical fibre cable networks jointly constructed by Kajo and the water cooperatives lie deeper and are thus better protected against damage than cable networks ploughed or dug using ordinary methods.



*Blowing of an optical fibre cable into a protective pipe installed during the construction of a water supply network (Photo: Network cooperative Kajo)*

#### 4.4.6 Challenges faced during the construction

The challenges faced during joint construction schemes have included:

1. Funding decisions have caused delays in project starts
2. Fragmented construction (from the point of view of the network cooperative)
3. Municipalities struggle to fund water supply projects; as a result, there is not much willingness to provide the network cooperative with funding

#### 4.5 Joint construction from the point of view of a telecommunications operator

The manner in which telecommunications operators build their networks has changed during the past 20 years; the trend has increasingly been from self-managed projects to joint construction schemes. There are three reasons for this:

1. Competition is now on a national basis and no longer between regional operators
2. Efforts are made to keep construction costs at a minimum
3. Street and road areas are almost fully cabled

In the past, operators built telecommunications networks with their own resources. Nowadays, all major telecommunications operators purchase network construction work as installation services.

Traditionally, telecommunications operators have cooperated with power companies and municipal bodies responsible for street construction when carrying out joint construction at local level and with each other when carrying out such schemes at national level. Joint construction with water utilities has been and still is on a fairly small scale.

The operators finalise the project plans for the following year's construction season by the late autumn of the previous year at the latest. At that stage, the parties joining the same project will tentatively commit themselves to cooperation. The operators will prepare the implementation plans and secure funding during the spring preceding the construction season. Following this, the parties will make their final commitments vis-a-vis the construction projects.

Some of the telecommunications operators hold regular, twice-a-year cooperation meetings on a regional basis in which the participants discuss their future projects. The meetings mainly focus on projects involving the main network. Agreements on the joint construction of local connection networks are made in connection with the drawing up of local plans. A tight decision-making schedule is often a problem in the joint construction of local networks.

There have been problems in cooperation and the sharing of costs in joint construction schemes in which the contractor ploughs a trench for an optical fibre cable on the slope of a route administered by the Finnish Transport Agency and digs a trench for a power cable outside the slope. It is presently not yet possible to lay a power cable in the same trench with a telecommunications cable, which means that the joint construction scheme only generates a few benefits.



In some cases, the principal implementing party asks telecommunications operators to join the scheme after the invitations to tender have been submitted. In such cases, each party agrees on the costs with the principal implementing party separately. Little practical use can be made of the joint construction model in such cases and the cost savings do not benefit the parties in the same or equal manner. When costs are shared, consideration must be given to the volumes of the parties at the joint site.

#### **4.6 Joint construction alongside State-owned transport routes**

Because of higher reliability, an increasing number of power and communications cables are laid alongside public and private roads and even inside structures. A more extensive use of road areas as general network routes would put land use on a more efficient basis and save public-sector costs.

Legislation already defines street areas as common infrastructure routes.

When roads and railways are planned, provisions are made for the installation of cables alongside the route at a later date. In the prevailing practice, the cables are ploughed on the slope on the side of the route. For reasons of traffic safety, the slopes are gentle, which makes cable ploughing easier. Furthermore, they are made of materials making ploughing possible. In railway maintenance, cables were previously ploughed in the embankment. However, cable canals have become increasingly common.

There are cables of numerous telecommunications companies alongside most of the main roads and railways. The route maintenance bodies and the telecommunications companies discuss the plans of the different parties in meetings held during project planning. Timing of the projects, new telecommunications cables and provisions for future cables can thus be taken into account.

The construction of the cable route is the responsibility of the telecommunications company involved. If a cable route must be laid alongside a road or a railway in connection with the construction or improvement of the transport artery concerned, its construction will be coordinated with the work on the road or railway in question.

In accordance with a policy decision of the Cabinet Committee on Economic Policy, piping and wells will, from the start of 2010, be installed alongside all new transport routes and routes undergoing improvements. Telecommunications companies will be obliged to use piping. Likewise, protective piping will be installed on the most important connections so that cables can be laid under the routes at a later date. Protective pipes and cable ladders will be installed on important bridges. The State will pay for the piping as part of the route project. The telecommunications company involved will be responsible for the cost of installing the optical fibre cable inside an existing pipe. Routes to be equipped with such piping will include the new sections of the main road E18.

## 5. How does land use planning support joint construction?

Regional land use plans and municipal-level local master plans guide land use as general planning tools. They provide the parties constructing and implementing networks with information on how different types of land use, such as residential areas and transport routes, should be located. They allow the parties implementing networks to prepare for changes in land use and to plan the organisation and scheduling of their own operations.

In the planning of built-up areas, it is important to ensure that enough space is allocated for appropriately located municipal engineering networks. When drawing up local detailed plans, municipalities should therefore provide prerequisites for the location of networks and in this manner use land-use planning for promoting such networks.

As a minimum requirement, a sufficient number of pipes should be laid under street junctions and in future local detailed plan areas as part of street renovation projects so that optical fibre cable networks can be expanded. This would allow municipalities to diminish the disruptions caused to traffic as the laying of optical fibre cables would not require the damaging of street or road structures and as most of the installation could be made on the slopes or the counter embankment of the trench.



*A cable trench made using a trencher - winter 2010 (Photo: Reiniko Oy)*

## 6. Summary

### 6.1 Common success factors

Successful joint construction schemes have common features. The ten most essential success factors are:

1. Provision of information at a sufficiently early stage and
2. Anticipation of future projects
  - All parties are given enough time to examine their own economic and operational resources regarding the participation in a joint construction scheme.
3. Cooperation between the parties
  - Different municipal corporations: water utilities, managers of power networks and telecommunications operators are engaged in open cooperation that benefits all parties.
4. Use of common infrastructure routes
  - Simultaneous installation allows the parties to save substantial amounts of excavation costs. At the same time, there is no need to damage structures and the disruptions caused to the environment during the construction are minimised.
5. One principal client
  - A party that is explicitly designated responsible for the coordination of the joint construction scheme.
6. Planning and coordination of plans
  - Prevention of overlapping work stages; the principal planner ensures that all plans fit together.
7. Joint tendering
  - Joint tendering produces competitive tenders on total contracts.
8. One principal contractor and
9. Subsidiary contractors
  - A party that is explicitly designated responsible for the implementation of the project, for site management duties and for safety at the joint site.
10. One principal supervisor
  - A supervisor appointed by the principal client whose task is to ensure that all schedules and budgets are adhered to.

If one success factor is missing or the parties fail to agree on it, the joint construction scheme may not bring the expected benefits. It is therefore important that at least one operator in the area is prepared to take charge of the joint construction scheme.

## 6.2 Benefits achieved

The benefits generated by successful joint construction schemes are also similar.

1. Tenders are competitive when the tenderers are requested to provide a tender for the whole contract and the overall economic considerations are used as the selection criteria.
2. Cost savings achieved by the parties involved
  - Shared excavation costs
3. Both the contractors and the clients can strengthen their expertise.
4. Disruptions to road and street users can be minimised.
  - Traffic restrictions and surfacing cause disruptions only once.
5. Disruptions to road and street owners can be minimised.
  - No multiple replacement of soil or refilling, less soil subsidence, less frost damage and less need for surface repairs
6. Higher-quality construction
  - Higher quality and fewer claims during the warranty period as all work is done at the same time.
7. Comprehensive improvements in the service level
  - More reliable power distribution
  - Properties can join municipal water supply networks
  - Broadband connections become faster and their quality improves

## 7. Where can I get more information?

More information about joint construction is available at your Centre for Economic Development, Transport and the Environment, Ministry of Transport and Communications, Ministry of Agriculture and Forestry, Ministry of Employment and the Economy, Ministry of the Environment and the Association of Finnish Local and Regional Authorities.

## 8. Thank you

We would like to thank the following companies and corporations who helped in the compilation of this guide:

Elisa Corporation  
 Finnish Energy Industries  
 Fortum Sähkösiirto Oy  
 City of Helsinki  
 City of Joensuu  
 City of Oulu  
 Prepsikka Oy  
 Reiniko Oy  
 Suur-Savon Sähkö Oy  
 TeliaSonera Oyj  
 City of Vantaa  
 Vattenfall Verkko Oy  
 Network cooperative Kajo