List of measures under Article 10 of the Directive on the energy performance of buildings (2010/31/EU)

FINLAND

30.6.2014

Ministry of the Environment

Foreword

Article 10(1) and (2) of Directive 2010/31/EU on the energy performance of buildings states: '*In view of the importance of providing appropriate financing and other instruments to catalyse the energy performance of buildings and the transition to nearly zero-energy buildings, Member States shall take appropriate steps to consider the most relevant such instruments in the light of national circumstances. Member States shall draw up, by 30 June 2011, a list of existing and, if appropriate, proposed measures and instruments including those of a financial nature, other than those required by this Directive, which promote the objectives of this Directive. Member States shall update this list every three years. Member States shall communicate these lists to the Commission, which they may do by including them in the Energy Efficiency Action Plans referred to in Article 14(2) of Directive 2006/32/EC'.*

This report contains the list of measures referred to in Article 10(1) and (2) of the Directive on the energy performance of buildings for Finland. The measures described have been mainly implemented or are in preparation in the period 30 June 2011 – 30 June 2014. Also described are measures that were decided on previously but are still being implemented.

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1. Policy actions and programmes

This chapter sets out the policy actions and programmes that concern the promotion of the energy performance of buildings. The list is chronological, describing the older measures first and then the latest ones. Of the older ones, only those where measures are still being implemented are presented.

Government resolution of 18 September 2008 on renovations

On 18 September 2008, the government passed a resolution on renovations. It lays down policy on the aims of renovations and the state's investment in its development. It highlights measures for improving the energy efficiency of building stock, reducing building stock energy consumption and emissions, social integration through supplementary construction, and better knowledge and expertise relating to renovation. The resolution is based on the Renovation Strategy 2007–2017, drawn up as a collaboration between the Ministry of the Environment and the property and buildings sector, and a programme of implementation measures was produced in 2009 based on the strategy.

The goal of the Renovation Strategy introduced in 2007 is to promote predictive property management and renovation culture. Systematic and properly timed renovations are a way to save on costs and respond to the demands of users and sustainable development. The Strategy consists of policies for the implementation of measures and development up to the year 2017. The main aims of the Strategy are the creation and establishment of a buildings maintenance and renovation culture, improved processes and guidance tools, better expertise in the field of renovation, the safeguarding of resources and the dissemination of information and knowledge on renovation work. A total of 13 measures were proposed to implement these policies.

Energy Efficiency Committee (2008)

On 22 April 2008, the Ministry of Employment and the Economy set up a broad-based energy efficiency committee to prepare new measures for energy saving and energy efficiency. The Committee's work was based on the Long-Term Climate and Energy Strategy, which called for energy savings of 37 TWh, with electricity accounting for 5 TWh. The committee's report to the Ministry dated 9 June 2009 describes almost 125 new or broadened energy saving and energy efficiency measures. An evaluation of the impact of the measures presented in the report was also undertaken. The committee's work involved the contribution of 130 experts and 40 organisations. The Energy Efficiency Committee's report led to a Government proposal for energy efficiency measures issued on 4 February 2010. These measures are still being implemented.

Government resolution of 4 February 2010 on energy efficiency activities

The government resolution of 4 February 2010 on energy efficiency activities was drafted in autumn 2009 at the Ministry of Employment and the Economy as a programme of measures implementing the energy saving and energy efficiency measures set out in the Energy Efficiency Committee's report for the period 2010–2020. The aim was to initiate most of the measures by the end of 2011. The resolution presents a total of 19 measures across four areas (1. establishing activities, 2. developing research and innovation, 3. communication, consultancy and training, and 4. the public sector), and a total of 28 measures for five sector-specific areas (1. community structure, 2. buildings, 3. transport, 4. households and agriculture, and 5. industry and the service sector). The Ministry of Employment and the Economy regularly coordinate and monitor the implementation of the measures set out in the resolution. The measures have mostly been implemented.

Government foresight report on climate and energy policy: towards a low-carbon Finland

The objective set out in the government foresight report on climate and energy policy drawn up in 2009 was to reduce greenhouse gas emissions in Finland by at least 80 % from 1990 to 2050 as part of an international effort. The report focused on climate and energy policy, global development and preparations for the impact of climate change throughout the timeline for the strategy and extending up to the middle of the century and beyond, where necessary. Four different scenarios were examined for the report; they present potential routes towards a low-carbon Finland. In the report, the government outlines the targets and measures that point the way towards a thriving, low-carbon Finland.

One of the conclusions reached in the report for Finland states that an essential improvement in energy efficiency in all sectors is justified, regardless of what energy sources are required to meet the need. This would, for example, require more stringent standards in new construction projects that would take the country towards zero-energy status as well as the imposition of obligations on renovation projects. Because the renewal of building stock is such a slow process, private houses and buildings in the 2010s must be built with reference to the 2050 targets.

ERA 17 action programme (2010)

In 2010, the ERA17 action programme ('For an energy-smart built environment 2017') was drawn up by a working group comprising policymakers from the worlds of business, research and public administration, led by Jan Vapaavuori, Minister of Housing. The aim of the comprehensive action plan which the working group drafted in 2011 is to improve the energy efficiency of the built environment, cut the number of emissions it generates, and promote the

use of renewable energy. The goal is to become a trailblazer in energy smartness when Finland celebrates 100 years of independence in 2017, and to make the Finnish built environment the world's best by 2050. The action programme, consisting of more than 30 recommended measures, focuses on land use, decentralised energy production, construction guidance, property use and ownership, and improved expertise. A monitoring group set up in February 2011 is promoting the implementation of the ERA17 action programme, and its task is to encourage and coordinate the various parties involved in the accomplishment of the programme, with the emphasis on avoidance of overlap. The monitoring group will support the implementation of the separate objectives under the programme and oversee the projects being developed in the different areas by motivating businesses and local authorities.

Government Programme of Prime Minister Katainen's Cabinet (2011)

The Government Programme is an action plan approved by the political parties representing the Cabinet and which agrees on the main tasks to be carried out by the Government. Prime Minister Jyrki Katainen's Government Programme contains a number of references to improved energy efficiency in construction, including the following measures:

- A road map for regulation on the energy performance of buildings aiming at virtual zero-energy construction by 2020. The roadmap aims at the greatest scope for the entry-into-force of regulations and legal provisions.
- Improved energy performance of buildings through legislation and other guidance measures and supervision and by providing incentives
- Enacting requirements for energy efficiency in renovation projects where they are cost-effective
- Greater use of renewable energy in the building stock
- Specific and realistic opportunities to cut emissions in the building stock, especially public and residential buildings and determining what sort of timescale would be needed to achieve them, with the relevant financing and tendering options and technical solutions.

Government resolution for a Housing Policy Action Programme for 2012-2015

On 3 May 2012, the government presented a resolution for a Housing Policy Action programme for 2012-2015. Under the programme, the energy efficiency of the housing stock would be improved cost-effectively in conjunction with renovation projects. The loans provided by the Housing Finance and Development Centre of Finland (ARA), which reports to the Ministry of the Environment, would be conditional on new housing having an energy classification of A, and, in the case of renovated dwellings, C would be the classification aimed for. Lending would also take account of how great the carbon footprint would be and the life-cycle costs, to ensure that the overall impact is properly acknowledged. Under the Action Programme, the Ministry of the Environment would clarify and simplify the scheme for providing renovation grants. There would also be a focus on the need for genuine competition in alternative forms of heating and for impartial information and advice.

National Energy and Climate Strategy (2013)

In March 2003, the Government updated its National Energy and Climate Strategy (Government report to Parliament of 20 March 2013). The update is a way to ensure that the targets for energy and climate set for Finland for 2020 are achieved and to pave the way for long-term objectives. To achieve them and to provide the same direction for developments beyond 2020, the report contains a total of 120 strategic initiatives. They relate to such areas as Finland's position on EU energy and climate policy beyond 2020, energy efficiency, preparing for further cuts in greenhouse gas emissions, the additional measures required for the promotion of renewable energy, consumer guidance, the controlled reduction in the use of peat, the response to trends in the energy market in Europe and Finland, guaranteed self-sufficiency in the energy supply and issues relating to district heating.

Government resolution of 13 June 2013 for a sustainable consumption and production programme - 'More from less - wisely'

The government resolution outlies measures in three areas: the quest for energy-smart and comfortable living, good quality food without waste, and a smooth system of 'greener' transport. The state and the local authorities must set an example and create the right conditions for more sustainable solutions. The Government suggests that, to achieve climate targets, it is important to improve the energy efficiency of existing buildings, replace fossil fuels with renewable sources of energy, and alter practices and lifestyles. The aim is to improve the quality of life and the environment and create new opportunities for a 'green economy'. The ministries would develop financing models for energy renovation and examine how inspections and renovation planning that promote energy saving might be covered by the household tax deduction scheme. The ministries will also aim to draw up guidelines on what households and regional actors should take account of in design, (urban) planning and permit processes, when they promote renewable energy. There will also be an investigation into how to make it easier to connect small-scale energy production to the grid.

The Ministry of the Environment is to provide funding for eight projects as part of the programme. These will test eco-efficient solutions in transport, housing and food. The experimental projects will feature local authorities, businesses and research organisations.

Government resolution of 13 June 2013 on the promotion of sustainable consumption and energy solutions (cleantech solutions) in public procurement

The resolution imposes a major commitment on the state and local authorities to promote energy, environmental and cleantech solutions. The state and local authorities would be under an obligation to take green technology solutions into consideration in all public procurement. The Finnish state and local authorities spent more than EUR 35 billion on public procurement in 2012. The aim of the resolution is for a percentage of this amounting to EUR 350 million to be used for new cleantech solutions. The priorities are waste management, transport solutions, energy production and the energy efficiency of buildings. The goal is to reduce the consumption of energy and materials and the overall adverse impact on the environment throughout the serviceable life of a product, service or building. Another aim is to establish incentives for the creation and deployment of new cleantech solutions. The resolution places an obligation on state procurement departments and at the same time acts as a recommendation for other public procurement departments. The state's aims and principles

are such that the state procurement departments should acknowledge at least the following objectives in all areas of public procurement:

- In new construction projects, buildings for public use will have to aim to be virtually zero-energy buildings after 2017.
- The target in buildings to let must be at least energy class D.
- The aim in renovation projects would be to cut energy consumption by 15 % compared to what is required under the (Finnish) Decree on improved energy efficiency in buildings in renovations and conversions (4/2013).
- Special attention to be paid in repair/renovation projects to the prevention of waste generation and the recycling of rubble.
- In new construction and renovation projects provision should be made for arrangements for the placing of electric car charging points and energy measurement facilities for individual buildings. Planning should focus very much on the sanitary conditions of the areas concerned, their safety, security and adaptability, and the efficient use of space. With new construction ventures, the materials should be considered as part of the building's carbon and environmental footprint. Where possible, heating and cooling solutions should take advantage of existing district heating and cooling networks as well as renewable forms of energy.
- More attention should be given to the quality of construction in planning and in the management and supervision of building work, to achieve the targets set for standards of sanitation, safety, security, energy use and the environment.
- In construction and building procurement at least 10 % of the expenditure for the construction above ground of a building must be for cleantech solutions such as environmentally friendly choices of materials and solutions that promote material and energy efficiency.
- Attention should be paid in the procurement of property service and maintenance to the expertise the service provider possesses in the area of energy efficiency, and it must be ensured that building service systems function correctly.

Renovation group

Pia Viitanen, Minister of Housing and Communications, set up a working group called the 'Renovation Group' in August 2013. Its task was to assess the need for repairs to suburban housing and make a proposal for the tools and systems that would be needed to carry out repairs. The Group's final report in March 2014 contains proposals for measures to reduce the repairs deficit for suburban housing in Finland in the period 2015-2025. The Renovation Group suggests that the state should facilitate borrowing for renovation projects by providing a deficiency guarantee for such loans, the application process for which would be straightforward. Under the proposals, the state's renovation requirements should in future focus on the drafting of strategies and improved energy efficiency.

Roadmap 2050

On 27 June 2013, the Government set up a parliamentary energy and climate committee to draft Finland's energy and climate roadmap for the period up to 2050. The work is based on the EU target of an 80-95 % reduction in greenhouse gas emissions by 2050, compared to the level as at 1990. The roadmap assesses the means employed to achieve targets and the costs involved.

The work is still under way. It incorporates an element relating to the built environment and construction, one that focuses on social integration and making communities more tightly knit through urban planning and various instruments of land policy. The debate also highlights the growing importance of renovation projects and related potential new instruments.

Roadmap 2050 is in preparation and the committee intends to submit its proposal to the Government's energy and climate policy ministerial working group in summer 2014.

Climate Change Act

The Government has been drawing up a proposal for a Climate Change Act, which was presented to Parliament in June 2014. The Act would contain a target of at least an 80 % reduction in emissions by the year 2050. It would mainly function as a tool of the Government and Parliament to achieve emission reduction targets as cost-effectively and systematically as possible. It would make the work of the public sector more efficient in the achievement of these targets and in building the low-carbon society, but would not impose any new obligations on businesses or other actors. The Climate Change Act would also apply to the built environment. Under the Government proposal, the Act would enter into force in spring 2015.

2. Financial incentives and financial instruments

2.1 Aid schemes for residential buildings

When residential buildings are being constructed or renovated, the public sector uses various financial incentives to encourage energy-efficient construction and a reduction in emissions in new and renovation construction projects. The financial incentives have varied quite a lot from year to year, depending on the state of public finances and the economic situation.

Energy subsidies

In 2011, a total of EUR 44 million was allocated to energy-saving renovations of residential buildings. Of this amount, EUR 30 million was intended for changes to heating methods, which were mainly those that involved the use of renewable energy. EUR 12 million went on renovations that improved energy saving in apartment blocks and terraced houses, and EUR 2 million was for energy-saving repairs to the houses of those on low incomes and state assistance.

In 2012, EUR 18 million was spent on energy subsidies. Of this sum, EUR 10 million went on assistance in switching to renewable energy, EUR 6 million on renovations that improved energy saving in apartment blocks and terraced houses, and EUR 2 million on energy-saving repairs to private houses.

In 2013, EUR 13 million was allocated to energy subsidies. EUR 11 million was spent on energy saving in apartment blocks and terraced houses, and EUR 2 million on energy-saving

repairs to private houses. In 2014, EUR 2 million has gone on energy-saving repairs to private houses.

Repair subsidies

When granting subsidies for repairs to residential buildings a good deal of importance is attached to improved energy efficiency, even if the assistance is mainly based on other objectives, such as improved accessibility or the elimination of health hazards. In 2011, EUR 46.5 million was set aside for repair subsidies. In 2012, that figure was EUR 38.3 million; in 2013, EUR 37.5 million; and in 2014, EUR 38.5 million.

Cyclical subsidies

Owing to poor economic conditions, the state budget has incorporated funding for assisted repairs and renovations to revive the construction sector, in addition to previous subsidies. Such subsidies were granted in 2013 and 2014. The appropriation for assistance is worth EUR 115 million. Part of it is used for subsidising repairs where improvements are being made to the energy efficiency of residential buildings.

Interest-subsidy loans

Each year a decision is taken in the state budget on how much should be granted in interest-subsidy loans for residential construction. Interest subsidies are paid out of the Housing Fund of Finland. The relevant amounts depend on what sort of interest is being paid out of interest-subsidy loans to the credit institution.

In the production of housing in receipt of state assistance, the preference is for good quality and energy efficient residential buildings that make for a tightly knit community. With new production ventures, interest-subsidy loans tend to be used to aid the production of housing that is based on such considerations as positive economic lifecycle and energy savings. Support for refurbishments is channelled in such a way that the energy efficiency of the housing stock is improved cost-effectively when renovations are being carried out.

Conditions have also been imposed for certain interest subsidies among the criteria for granting them and these are meant to encourage the promotion of energy efficiency in new or renovation projects.

Interest-subsidy loans for detached houses are only granted if the overall energy efficiency of the building is satisfactory. The total energy consumption of a detached house in the planning stage may not be more than 85 % of the maximum figure in the building regulations for that building.

An interest-subsidy loan for the refurbishment of housing association buildings may not be any more than 40 % of the costs incurred. However, it may be as much as 50 % of the costs if the refurbishment project succeeds in improving the building energy-saving capacity, cutting emissions from the use of energy or making use of renewable energy sources.

2.2 Subsidies for non-residential buildings

Discretionary energy-saving aid may be granted by the Ministry of Employment and the Economy to businesses, local authorities and other organisations for climate and

environmentally friendly investment projects and surveys that promote the production or use of renewable energy, boost energy savings, make the production or use of energy more efficient, or reduce adverse environmental impact. In 2014, EUR 147.5 million was set aside for discretionary energy-saving aid, and the figure was the same for 2013. The amount set aside for energy efficiency investment and energy audits in 2014 is EUR 15 million. As an exception, there has also been support for new construction sites involving solar power projects, as in the previous year.

Subsidies are a way to try, in particular, to promote the introduction of new energy technology and bring it to market. The percentage for aid granted for new technology projects is a maximum of 40 % of the costs. In practice it is generally 25-35 %. Companies and organisations that are linked to the energy efficiency agreement scheme in Finland can also receive support on a case-by-case discretionary basis for energy saving investment ventures using conventional technology.

Investment subsidies can also be granted to businesses and organisations not part of the energy efficiency agreement for projects using conventional technology based on the ESCO service. In such cases, the maximum amount paid is 15 %. Support for energy saving projects using conventional technology may be no more than 20 % for businesses and organisations linked to the energy efficiency agreement scheme. If a company or organisation so associated delivers a project using conventional technology using the ESCO service, the aid contribution can be a maximum of 25 % (percentages quoted as at 2014).

In the period 1998-2008, EUR 2-4 million was granted each year in energy-saving aid for energy saving investment ventures. The effect of the energy efficiency agreement scheme begun in 2008 on the number of energy efficiency projects in existence has been crucial. In 2009, EUR 5.4 million was granted for energy-saving investment; the figure was EUR 12 million in 2010 and EUR 22.5 million in 2011. The impact of the recession was also visible in the amount for energy-saving aid granted. In 2012, EUR 10.4 in investment aid was granted.

2.3 Other instruments

Subsidies for the housing and construction sector and environmental organisations in 2014

These subsidies are intended for housing and construction sector organisations and other organisations active in the area of the built environment for the purposes of nationwide advice and guidance services. It is intended to contribute to the costs incurred by organisations in providing advice and guidance. The subsidy is discretionary and takes account of such matters as the nature and scope of the applicant’s advice and guidance services, the impact assistance would have on the work, the applicant’s financial position and how motivated they are to seek other funding and sources of income. Special attention is paid to how productive the work is. In 2014, assistance was granted to two national organisations (Finnish Real Estate Federation and Finnish House Owners’ Association), whose consultation priorities for 2014 include renovation projects and energy efficiency.

Household tax deduction

Private individuals may deduct the costs incurred in work that they have carried out in a private household. The system is referred to as the household tax deduction. From the start of

2009 the maximum amount for the deduction was raised to EUR 3 000 per partner, and the restrictions on its use have been lifted. Since the start of 2014 the maximum amount for the deduction has been EUR 2 400. The deduction is available, for example for renovation work that improves the energy efficiency of a residential building.

3. Other procedures that support the implementation of the Directive

Energy audits

Finland has promoted a systematic and first rate energy audit scheme since 1993. The aim of the energy audits is to analyse the total use of energy at the relevant sites, examine the energy savings potential and present suggested measures for saving energy together with statements of cost-effectiveness. The energy audits are also there to examine opportunities for the use of renewable forms of energy, and they report on the effect of the proposed measures on CO2 emissions in addition to the energy savings potential.

The results of energy audits have been monitored since 1994 using a separate monitoring system. The system records key data for all the energy audits started and reported on. Since 1993, almost 1 900 people have obtained professional qualifications for conducting energy audits.

Since 1993 energy-saving aid has been granted by the Ministry of Trade and Industry/Employment and the Economy for energy audits in the private and public service sector, industry and the energy sector. The annual amount for aid in the period 2003-2013 was EUR 1.2-2.8 million, which averages out at EUR 1.7 million a year. Almost 9 200 energy audits were conducted in the sectors referred to in Finland in the period 1992-2013. Of these, more than 5 250 were carried out in local authority service buildings, 2 150 in private sector service buildings, 1 560 in industrial buildings and 210 in energy production plants. In the period 2003-2013, EUR 5.5 million was spent to subsidise energy audits in apartment blocks, and there were around 4 600 sites involved.

Voluntary energy efficiency agreements

Under the National Energy and Climate Strategy, energy efficiency agreements ae intended as a response to Finland’s international commitments in the fight against climate change. These agreements are between the Finnish state and different sectors, are voluntary and are aimed at improving energy efficiency. The first energy efficiency agreements were signed in 2007. Since then, they have become a widespread system of voluntary agreements which by the start of 2011 represented more than half of the end use of energy throughout Finland. The voluntary energy efficiency agreements for the various sectors will remain in effect until 2016 and they cover aspects of business life (industry, the energy sector, services), the property sector, local government, the oil industry, goods and public transport, and agriculture.

Further details on the energy efficiency agreement scheme and the energy saving agreements that were concluded at the end of 2007 can be found at the Motiva Oy website (http://www.motiva.fi/toimialueet/energiatehokkuussopimukset).

Research and development

There have been several national research programmes in Finland to promote the energy efficiency of buildings. There are three main public sponsors in the country for research, development and innovation.

Tekes

Tekes is the main source of public funding for applied research and product development in Finland. Approximately EUR 600 million is used for funding every year, and its target groups are both businesses and public-sector research organisations. Tekes operates under the guidance of the Ministry of Employment and the Economy, and receives funding for its activities out of the state budget. In its strategy, Tekes has pointed to energy efficiency, raw material efficiency, and intelligent energy systems as its particular focal points. The Tekes-funded Sustainable Community Programme (2007-2012) created new, renewable business activities in the planning, construction and maintenance of sustainable, energy-efficient areas and buildings, and in their repairs. The Built Environment Programme (2009-2014) is based on the needs of users and the requirements they have set for the viability and quality of the built environment. The Programme seeks the involvement of actors that are prepared to improve and modernise their practices and processes in the industry. The main focus of interest is construction projects relating to renovations, infrastructure and wellbeing.

Sitra

Sitra, the Finnish Innovation Fund, is controlled by the Finnish Parliament, and its function is to promote stable and balanced development in Finland, the country's economic growth and its international competitiveness and levels of cooperation. Sitra is both an investor and coordinator of fixed-term programmes. It sponsors projects linked to programmes to the tune of around EUR 50 million each year. A key programme relating to energy efficiency in the period 2008-2012 was the Sitra Energy Programme, which aimed at reducing energy consumption and emissions. Sustainable energy solutions are needed in production and distribution, and in new construction and renovation projects and urban planning. If energy efficiency is improved it can result in a reduction in emissions and at the same time improve competitiveness and create new business.

Academy of Finland

The Academy of Finland, which falls under the jurisdiction of the Ministry of Education and Culture, is a key source of funding for scientific research. The Academy provides funding for, inter alia, research projects, research programmes, centres of excellence in research, research posts, researcher training and international collaboration. The majority of the Academy's funding out of the state budget is channelled into research conducted at universities. In 2011, the Academy financed research totalling EUR 327 million. The Academy's key programmes relating to energy efficiency are the *Sustainable Energy Programme (2008–2012),* the *Climate Change – Impact and Management FICCA Programme (2011–2014),* and the *Future of Living and Housing Programme (2011-2015).*

Miscellaneous

Many other actors, such as the various ministries, finance research and development projects relating to the energy efficiency of buildings. In addition, the Housing Finance and Development Centre of Finland (ARA), under the jurisdiction of the Ministry of the Environment, has had available to it EUR 700 000 each year since 2010 for the financing of research and development. In 2014, funding has been provided for the development of the planning and construction of housing and the property stock. The year 2014 has also seen the launch of projects to examine energy efficiency in the home and the success of energy meters installed at sites and energy efficiency solutions.

Communications

Communications and advice on energy efficiency are provided in Finland by a number of consumer organisations and NGOs, federations and associations and regional and local energy agencies. There are ten energy agencies that have started up with support from the EU and several of them are active in their own area. They form part of a network headed by Motiva, a central energy efficiency communications and advice organisation. The Association of Finnish Local and Regional Authorities encourages local authorities to contribute to the climate campaign. Local authority officials are also provided with information and training in activities relating to energy efficiency agreements. Businesses that are involved in the agreement work are given advice. Furthermore, many energy companies have been providing their customers with information on the appropriate use of energy for decades now. This document gives examples of just a few communications measures that are financed by the state.

Motiva

Motiva is an important provider of communications and advice on energy efficiency. It was set up by the Ministry of Trade and industry (now the Ministry of Employment and the Economy) in 1993 as a three-year Energy Savings Service Centre project. Now Motiva is a state-owned limited company that also promotes the use of renewable energy and the sustainable use of materials. Its role corresponds to that of a National Energy Agency. Motiva helps the state to implement the National Climate and Energy Strategy and EU Directives such as the Directive on the energy performance of buildings. One of Motiva's priority areas is communications and advice. In December 2120, the Ministry of Employment and the Economy designated Motiva as a national coordination centre for energy advice for consumers.

For its communications, Motiva uses a range of channels: web services, campaigns to promote energy efficiency, publications and materials, seminars, fairs and networking events. Communications also extend very much to the use of the media. In 2013, almost 78 000 printed publications were distributed. The web services that Motiva develops and maintains received 909 000 hits in 2013.

Energy advice for consumers

The Ministry of Employment and the Economy designated Motiva Oy as a national coordination centre for energy advice and its development in December 2010. The work is sponsored by the Ministry (the Energy Agency as from 1 January 2014). The Regional Councils or regional urban centres have a key role in information and advice for a region. In practice, a number of actors provide advice in many areas covered by their mandate, some of which have long experience of the field in their capacity as a regional or local energy agency.

Advice is organised on the one-stop-shop principle, which means the consumer can obtain advice on energy as comprehensively as possible at one place on everyday matters such as housing, transport, purchases, renovations and building. This system derives support from the eneuvonta.fi portal introduced in 2013 which also improves equal opportunities for citizens to obtain information services provided through social funding. The advice service does not extend to information on individual choices of equipment and it does not offer detailed planning or consultation services.

In addition to the portal, the information service relies mainly on agencies that provide regional advice in different parts of Finland. In 2013, advice was available in 16 areas. In 2013, regional advisors reached more than 38 000 consumers. The energy advice portal is closely linked to other online services and portals, and it helps consumers to contact those offering advice regionally. Further information is available at www.eneuvonta.fi and www.kuluttajienenergianeuvota.fi.

Renovation Advice Network and communications

The Ministry of the Environment coordinates the Renovation Advice Network. The Network consists of agencies providing information and advice on renovations, property maintenance and the features of buildings. At present, some 50 agencies (around 500 individuals) across the regions belong to the network; they include public corporations, local authorities, provincial museums, renovation centres and property and construction actors. The advice service covers the country.

As part of the plan to implement the renovation strategy, the Ministry of the Environment since 2011 has maintained and developed the www.korjaustieto.fi portal to support advice on renovation work. It provides information on repairs to housing association buildings and private houses, official information and details of organisations that give advice on renovations and the advisors themselves with their contact information. The content of the site, which has been compiled by experts, is intended for customers, owners and housing associations as well as property management professionals. Tools, an advice service, the latest news, tips and a search-for-a-professional service provide commercially independent, impartial and timely advice and guidance.

Follow-up report on the equivalence of an alternative procedure for heating systems

FINLAND

30.6.2014

Report to the European Commission under Article 14 of the Directive on the energy performance of buildings (2010/31/EU)

Ministry of the Environment

Foreword

This follow-up report is Finland's notification to the European Commission pursuant to Article 14(4) of the Directive on the energy performance of buildings (2010/31/EU). On 1 October 2013, Finland submitted to the Commission the first report with reference to this paragraph in the article entitled 'Report on the equivalence of an alternative procedure for heating systems. Finland. 28.8.2013' (hereafter the 'Equivalence Report'). This Equivalence Report described and assessed possible mandatory inspections of heating systems, gave an account of Finland's alternative procedure, and showed that its impact would correspond to the effects of the inspection procedure referred to in Article 14(1-3) in the period 2013-2015.

This follow-up report describes how the alternative procedure is being implemented and the results for the period 9 January 2013 – 30 June 2014. The energy savings achieved are compared to the savings estimated for the inspection procedure. An evaluation is also undertaken of the implementation of the alternative procedure itself and the achievement of results in the future.

The report was compiled by Maarit Haakana, Senior Engineer, of the Ministry of the Environment, assisted by Katja Outinen, Senior Engineer, and Pekka Kalliomäki, Senior Construction Adviser, of the Ministry of the Environment.

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1. Introduction

Under the Directive on the energy performance of buildings (2010/31/EU), if Member States decide to implement the requirements under Article 14 of the Directive regarding inspections of boilers of an effective rated output of more than 20 kW using an alternative procedure as referred to in paragraph 4, they must submit to the Commission a report on the measures referred to in paragraphs 1, 2 and 3 of the article no later than 30 June 2011. Member States must submit such a report to the Commission every three years.

Finland is implementing the requirements of Article 14 of the Directive on the inspection of boilers using an alternative method as referred to in paragraph 4 of the article. The Equivalence Report sent by Finland to the Commission on 1 October 2013 described a possible mandatory inspection procedure for heating systems and a method for estimating energy saving, and gave an assessment of the effects of savings themselves. The Equivalence Report also described Finland's alternative procedure and its method for estimating the effect of savings, and gave an assessment of the effects of savings themselves. The Report showed that the impact of the alternative procedure would correspond to the effects of the inspection procedure referred to in Article 14(1-3) in the period 2013-2015

This follow-up report describes how the alternative procedure is being implemented and the results for the period 9 January 2013 – 30 June 2014. The energy savings achieved are compared to the savings estimated for the inspection procedure. The effects of savings are estimated using a method that was described in detail in the earlier Equivalence Report. An evaluation is also undertaken of the implementation of the alternative procedure itself and the achievement of results in the future.

The reference material used in compiling the follow-up report was the Equivalence Report, monitoring data on the alternative procedure and expert opinions.

2. Boilers in Finland

The Equivalence Report submitted earlier described the building stock in Finland, heating systems used, and the numbers of boilers and the use of fuel in different types of building. This follow-up report reproduces just the tables showing numbers of boilers and the fuels used in different types of building.

Tables 2.1 and 2.2 show the number of oil boilers and the amount of fuel used in oil-fired boilers in Finland in 2012. The data is based on that provided by the Finnish Petroleum Federation[1]. Since the mid-1980s, private houses have mainly had oil-fired boilers of an effective rated output of less than 20 kW installed[2].

Table 2.1 Number of oil-fired boilers in Finland in 2012

Building type and effective rated output of oiler	**No more than 20 kW**	**20-100 kW**	**Over 100 kW**	**Total**
Detached/semi-detached house	177 000	31 000		208 000
Terraced housed		4 400	3 600	8 000
Apartment block		900	2 100	3 000
Other	3 900	12 900	13 200	30 000
Total	**180 900**	**49 200**	**18 900**	**249 000**

Table 2.2 Amount of fuel used in oil-fired boilers in 2012

Building type and effective rated output of oiler	**No more than 20 kW GWh**	**20-100 kW GWh**	**Over 100 kW GWh**	**Total GWh**
Detached/semi-detached house	3 800	1 100		4 900
Terraced housed		200	500	700
Apartment block		50	850	900
Other	100	500	5 400	6 000
Total	**3 900**	**1 850**	**6 750**	**12 500**

Tables 2.3 and 2.4 show the number of biomass boilers and the amount of fuel used in biomass boilers in Finland in 2012[3] and [4]. At present in Finland there is no register of biomass boilers under 1 000 kW covering the entire country, so the figures are based on a preliminary survey commissioned by the Ministry of the Environment in 2011 of inspections required under the Directive on the energy performance of buildings for biomass boilers. The data in this report, known as the Kutteri Survey, has been updated using the latest data from Bioenergia, the Bioenergy Association of Finland.

Most biomass boilers burn firewood and do not store energy. Dual-chamber boilers, which use biomass or oil, are regarded in this study as oil boilers. The figures for the number of biomass boilers and the amount of fuel used in them have been updated to reflect the situation in 2012. With respect to biomass boilers, some 20 000 of them with an effective rated output of no more than 20 kW in private houses are excluded from the inspection procedure.

Table 2.3 Number of biomass boilers in Finland in 2012

Building type and effective rated output of oiler	**No more than 20 kW**	**20-100 kW**	**Over 100 kW**	**Total**
Detached/semi-detached house	19 300	148 300	3 700	171 300
Terraced housed		300	700	1 000
Apartment block			300	300
Other		1 600	3 700	5 300
Total	**19 300**	**150 200**	**8 600**	**178 000**

Table 2.4 Amount of fuel used in biomass by building and fuel type

Building type and type of fuel used in boiler	**Firewood GWh**	**Wood chips GWh**	**Pellets GWh**	**Peat GWh**	**Arable biomass GWh**	**Total GWh**
Detached/semi-detached house	3 700	1 710	370	130	30	5 950
Terraced housed		50	10			60
Apartment block		10	10	10		30
Other		1 390	270	150		1 810
Total	**3 700**	**3 160**	**660**	**290**	**30**	**7 850**

Tables 2.5 and 2.6 show the number of gas-fired boilers and the amount of fuel used in them in Finland in 2012[5]. The data for numbers of gas boilers in Finland is based on the latest information from the Finnish Gas Association. Estimates made by experts suggest that around 35 % of the boilers in private houses have an effective rated output of under 20 kW and 65% are in the 20-100 kW range. According to the experts, the energy consumption of gas-fired boilers with an output of more than 20 kW in private houses represents approximately 70 % of that for all gas-fired boilers in private houses[5]. Gas-fired boilers used in buildings other than private houses have an effective rated output of more than 100 kW.

Table 2.5 Number of gas-fired boilers by building type in 2012

Building type and effective rated output of oiler	**No more than 20 kW**	**20-100 kW**	**Over 100 kW**	**Total**
Detached/semi-detached house	1 520	2 820		4 340
Terraced housed			810	810
Service sector building			1 100	1 100
Total	**1 520**	**2 820**	**1 910**	**6 250**

Table 2.6 Consumption of fuel by gas-fired boilers in 2012

Building type and effective rated output of oiler	**No more than 20 kW** **GWh**	**20-100 kW** **GWh**	**Over 100 kW** **GWh**	**Total**
Detached/semi-detached house	400	90		130
Terraced housed			230	230
Service sector building			400	400
Total	**40**	**90**	**630**	**760**

3. Energy savings with the mandatory inspection procedure

The Equivalence Report submitted to the Commission in October 013 described the legally mandatory inspection procedure in place for heating systems that Finland would have adhered to if the procedure had been selected as a way to implement Article 14 of the Directive. The Equivalence Report gave a detailed description of a method for calculating mandatory energy savings from heating systems. The Report also gave details of the raw data used in, and the assumptions made for, the calculation, as well as a sensitivity analysis.

The Equivalence Report assessed energy savings for 2013-2015. This follow-up report presents those energy savings and those estimated for the follow-up period 9 January 2013 – 30 June 2014 based on them. The calculation method and its principles are the same as those given in the earlier Equivalence Report.

Table 3.1 Overall savings effects of the inspection procedure for the period 2013-2015

	Overall energy saving effects of the inspection procedure for 2013-2015 **GWh**
Oil-fired boilers	115 - 173
Biomass boilers	140 - 365
Gas-fired boilers	3 - 4
Total	258 - 542

Table 3.2 Energy savings effects of the inspection procedure for the follow-up period 9 1 2013-30 6 2014

	Energy saving effects of the inspection procedure 1/2013-6/2004
Oil-fired boilers	58 - 86
Biomass boilers	70 - 182
Gas-fired boilers	1 - 2
Total	129 - 271

4. Energy savings with the alternative procedure

4.1 Energy efficiency agreements

The alternative procedure employed by Finland was described in full in the Equivalence Report submitted to the Commission in October 2013.

A crucial point of reference in the alternative procedure is the energy efficiency agreements concluded with actors in the heating sector. One of the aims of the energy efficiency agreements linked to heating systems is to include a voluntary inspection corresponding to the mandatory ones and advice on energy efficiency as part of the periodic service and maintenance procedures to achieve cost-effective results, though without any obligation to conduct statutory inspections, as is the case with the inspection procedure. Furthermore, the aim is to increase the number of yearly maintenance contracts for boilers so that the energy efficiency of heating systems remains at the best possible level and boiler operators regularly receive advice and information on energy efficiency.

The Höylä III energy efficiency agreement for the oil industry

The content and aims of the Höylä III energy efficiency agreement for the oil industry, and the measures under it, were described in detail in the Equivalence Report sent the Commission in autumn 2013. The agreement was implemented in 2013 and in early 2014, as planned. All oil boiler operators, among others, were approached three times in 2013 and twice in early 2014 in the Finnish Petroleum Associations' journal Lämpö (Heat), which contains advice on energy efficiency and other articles on oil heating.

Recommendation TS-9/2014 ('Condition Inspection of Heat Distribution Systems in Private Houses') by the Finnish Heating Energy Association (Appendix 1) was published in April 2014. The recommendation is an attempt to harmonise working practices and methods associated with the inspection and maintenance of heat distribution equipment in private houses. The recommendation also deals with heating technology measurements taken when installation and maintenance tasks are being carried out. It is meant primarily for qualified engineers in heating, plumbing and air-conditioning working for professional outfits. It is also suited to training needs in the industry.

Thanks to the Höylä programme, energy efficiency inspections are incorporated as part of normal regular service and maintenance. The voluntary boiler inspections, carried out during maintenance, also extend to the EPBD advice, as it might be referred to: the advice under Article 14 of Directive 2010/31/EU on the energy efficiency of a heating system. To monitor EPBD maintenance, a special monitoring group has been set up under the Höylä III agreement. In 2013 it consisted of a sample representation of 29 companies. The action taken to improve the energy efficiency of the heating systems in heated buildings in the period 2010-2013 is described in Table 4.1[6].

Table 4.1 Action under the Höylä Programme to improve the energy efficiency of heating systems in oil-heated buildings 2010-2013

Measure	2013	2012	2011	2010
Maintenance and EPBD advice	94 050	63 525	83 260	78 200
Recommendations for refurbishments	19 500	19 727	13 950	19 300
Boiler replacements	2 112	2 600	3 430	3 600
Burner replacements	5 688	5 920	7 578	8 000
Regulator replacements	4 873	4 499	7 030	5 900
Other refurbishments	4 972	4 961	17 260	6 700
Planned refurbishments	1 408	1 155	1 820	2 100

The Höylä agreement has helped to introduce significant measures to improve the energy efficiency of oil boilers generally. The year 2013 saw more than 94 000 services and instances of EPBD advice alone with respect to oil-heated houses. The monitoring data suggests that service and maintenance companies carry out service and maintenance every three years on average in oil-heated houses. The increase in the number of maintenance measures in 2013 might suggest that, in the gloomy economic climate, oil boiler operators are having their existing equipment serviced rather than replacing it.

The Kutteri Programme in the bioenergy industry and the energy efficiency agreement associated with it

The Kutteri energy efficiency agreement for the bioenergy industry was described in detail in the Equivalence Report submitted to the Commission in autumn 2013. It in fact implements the Kutteri energy savings programme. The agreement makes advice and guidance on the use and maintenance of bioenergy heating systems and replacing equipment to be made available to consumers and users.

Under the agreement, the following bodies commit to the provision of advice and information: the Ministry of the Environment, the Bioenergy Association of Finland, Ariterm Oy, the Central Association of Chimney Sweeps, the Finnish Heating Energy Association, the Finnish House Owners' Association, and the Universities of Applied Sciences of Häme and Jyväskylä. Motiva Oy contributes to the implementation and development of projects and ventures connected with the agreement and the compilation of a yearly report.

The Kutteri agreement was signed on 8 April 2014. It was drafted and the measures under it were implemented in 2013. The actions under the energy efficiency agreement are expected to be up and running as planned towards the end of 2014. The year 2014 saw the publication of the 'Energy Saving Guide for Firewood Boiler Operators' (Appendix 2), designed to help save firewood and cut dangerous emissions that result from the heating process. The section on bioenergy on Motiva's website at www.motiva.fi/tehokaastipuulla also contains a good

deal of information on the efficient use of firewood boilers. The agencies connected with the Kutteri agreement for the bioenergy industry have produced an abundance of information on it: examples are the Motiva Oy bulletin and the Ministry of Environment online news (Appendix 3).

The purpose is to use the Kutteri programme to develop an advice and monitoring system for the biomass heating sector that is as effective and viable as the Höylä energy efficiency programme for the oil industry. Where possible, a further aim is to provide the biomass heating sector with a guide similar to the TS-4 technical recommendation for oil heating produced by the Heating Energy Association for maintenance personnel and engineers. In this way, an attempt is being made to increase the number of ongoing annual service and maintenance contracts with bioenergy operators, the other purpose being to pass on to users advice while service and maintenance are being carried out on how to maintain and improve the energy efficiency of a biomass heating system.

At present, the Bioenergy Association of Finland is compiling statistics with reference to market data on companies connected with the bioenergy industry, to make it easier in future to provide advice and to make that advice more effective.

Gas

The number of gas-heated houses is very small compared to those that use oil or biomass. There are only around 400 houses that are heated by gas, while there are some 171 000 that use bioenergy and about 208 000 that are oil-heated. Gas boilers do not need sweeping, and inspections and maintenance do not result in significant energy savings with these types of boilers. Gas boilers account for only around 5 % of the energy consumption associated with the heating of houses compared to all boilers in existence in Finland.

The Finnish Gas Association’s efforts to promote energy efficiency and their advice to gas boiler operators was described in the Equivalence Report drawn up in autumn 2013. The work is being carried out as planned.

4.2 Other measures aiding the guidance procedure

The Equivalence Report sent the Commission in October 2013 describes the legal provisions, subsidies and assistance in place that represent other ways to aid the guidance procedure, as well as details of taxation and loans. The Report makes no assessment of the savings resulting from these measures and nor does this follow-up report.

There have been no changes in the law since the Equivalence Report was produced.

As regards financial assistance, the Equivalence Report described the discretionary energy subsidies available for private houses and the energy subsidies available for housing associations. The Finnish 2013 state budget made EUR 13 million available for energy subsidies, EUR 2 million of which was for means-tested energy subsidies for private houses. The 2014 budget has allocated EUR 2 million to energy-saving repairs to private houses, though other forms of energy assistance have not been granted. Table 4.2 below gives the data on energy subsidies granted in 2013.

Table 4.2 Energy subsidies in 2013: ARA 2013

Energy subsidies in 2013

	No. of dwellings	No. of sites	EUR
Energy subsidy for a private house	542	531	1 371 363
Corporations (terraced houses and apartment blocks)			
• energy audit under 1 000 m³	1 856	105	298 211
• energy audit 1 000 m³ - 3 000 m³	2 539	98	60 266
• energy audit over 3 000 m³	1 811	33	28 201
• improvements to windows	536	25	134 249
• replacement of windows	15 028	640	5 060 999
• improvements to balcony doors	6 073	205	605 010
• additional outside wall insulation	2 429	168	983 388
• additional roof insulation	7 153	314	297 629
• adjustment of ventilation/heating system	18 683	478	651 482
• installation of radiator and/or balancing valves	6 158	188	363 799
• installation of air vents and bleed valves	1 272	40	33 565
• installation of ventilation heat recovery	5 945	113	1 749 766
• connection to district/local heating facility	2 464	212	841 746
Corporations total	71 947	2 619	11 108 311
Total for energy subsidies	**72 489**	**3 150**	**12 479 674**

There was a description in the Equivalence Report of the household tax deduction and its viability as a support for the guidance procedure. In 2013, it represented a maximum of 45 % of the costs of work and EUR 2 000 per partner. It was EUR 2 400 per household partner[7] in 2014.

4.3 Energy savings

Energy savings from action taken in the alternative procedure for the follow-up period 9 January 2013 – 30 June 2014 is estimated using the same calculation method as in the Equivalence Report. The raw data for the calculation is the follow-up data in the energy efficiency agreement and expert opinions. The same values have been used to determine the impact of measures and the amount of savings expressed as a percentage figure.

The calculation for energy savings from the alternative procedure with regard to oil boilers uses as its raw data the number of measures implemented during the follow-up period (see the data for 2013 in Table 4.1 above). There are no figures available on measures for the first months of 2014. For the purposes of calculating savings, it is assumed that in 2014 there will be as many measures implemented as in 2013. Thus, it may be assumed that 50 % of the number of measures taken in 2013 will reflect the situation in 2014. The energy savings achieved with the alternative method for oil boilers in the follow-up period are estimated at 90-132 GWh.

The energy savings realised with the alternative method for biomass boilers has been calculated in the same way as in the Equivalence Report. In 2013, the number of boiler replacements that were on account of the Kutteri programme and the tax deduction scheme was 2 200 – 2 300, according to the data produced by those implementing the programme. That figure is much less than was estimated in the Equivalence Report. Savings during the follow-up period will therefore be smaller than was predicted in the Equivalence Report. Estimates suggest that energy savings in the follow-up period will be between 51 and 156 GWh.

The fact that the number of replacements of biomass boilers is smaller than the earlier estimate is a reflection of a situation where the alternative procedure has only just got under way, while, at the same time, the financial position of consumers has generally worsened. The number of boilers is expected to increase to that estimated in the Equivalence Report when the energy programme under the Kutteri agreement goes ahead as planned.

Savings with the alternative procedure for the follow-up period 9 January 2013 – 30 June 2014 are shown in Table 4.3. No savings have been estimated for the alternative procedure with gas boilers as they are of only minor significance.

Table 4.3 Energy savings effects of the alternative procedure 1/2013 – 6/2004

	Energy saving effects of the alternative procedure 1/2013-6/2004
Oil-fired boilers	90 - 132
Biomass boilers	51 - 156
Gas-fired boilers	- *
Total	141 - 288

- No savings have been estimated for the alternative procedure with gas boilers as they are of only minor significance

5. Savings with the alternative procedure as compared with those with the inspection procedure

In the follow-up period 9 January 2013 – 30 June 2014, the alternative procedure used with boilers in Finland has achieved at least the same effect in terms of volume of energy savings as the mandatory inspection procedures were predicted to achieve (Table 5.1). Estimates suggest that savings with the alternative procedure total 141 – 288 GWh. If the mandatory inspections had been conducted, the figure would have been around 291-271 GHw in the follow-up period. The alternative procedure used by Finland under Article 14(4) of the Directive therefore corresponds to the inspection procedure referred to in paragraphs 1-3 of the article.

The savings achieved with the alternative procedure for oil-fired boilers in particular are much greater than with the mandatory inspection procedure. The chief reason for this is that in Finland a significant number of oil-fired boilers are boilers with an output of less than 20 kW and thus not covered by the inspection procedure.

At present, the saving effects of the guidance procedure are hard to estimate for biomass boilers, as there are no certain statistics on how many are in existence. In the future, it will be possible to estimate the saving effects of the guidance procedure for the bioenergy industry almost as accurately as those for the Höylä energy efficiency agreement for the oil industry, when action and measures under the energy efficiency agreement will be monitored more closely. If the alternative procedure is implemented as planned in the immediate future, it is predicted that energy savings will be greater.

Table 5.1 Energy savings effects of the inspection and alternative procedures by sector 1/2013 – 6/2004

	Energy saving effects of the inspection procedure GWh	**Energy saving effects of the alternative procedure GWh**
Oil-fired boilers	58 - 86	90 - 132
Biomass boilers	70 - 182	51 - 156
Gas-fired boilers	1 - 2	-*
Total	129 - 271	141 - 288

- No savings have been estimated for the alternative procedure with gas boilers as they are of only minor significance

In the follow-up period from June 2014 onwards Finland will be implementing the alternative procedure as planned. Hitherto, the results for the savings achieved suggest that savings will continue to be realised in the future, and no measures in addition to those now planned will be required. Nevertheless, it must be ensured that the energy efficiency agreements are implemented effectively, with the result that owners of boilers can have comprehensive

access to information and advice on replacing boilers, improving energy efficiency or other changes to heating systems.

6. **Summary**

This follow-up report evaluates and compares the savings achieved with the inspection procedure as opposed to Finland's alternative procedure for heating systems under Article 14 of the Directive on the energy performance of buildings (2010/31/EU) in the follow-up period 9 January 2013 – 30 June 2014.

The calculation method employed for the effect in terms of savings was the one described in detail in the Equivalence Report submitted to the Commission on 1 October 2013. Monitoring data relating to the alternative procedure and expert opinions were also used to calculate savings.

The alternative procedure has been implemented in Finland virtually as planned. Savings with the alternative procedure are expected to increase in future, when the Kutteri agreement for the bioenergy industry, which was initiated in spring 2014, is fully functional as planned.

Estimates suggest that the energy savings achieved with mandatory inspections in the follow-up period will be 129- 271 GWh. The equivalent figure using the alternative procedure is 141 – 288 GWh. The alternative procedure used by Finland under Article 14(4) of the Directive therefore corresponds to the inspection procedure referred to in paragraphs 1-3 of the article.

The effects in terms of savings are expected to be achieved in the future with the measures now planned, so additional measures will not be needed.

List of sources

1. **Finnish Petroleum Federation.** 2013.
2. **VTT Technical Research Centre of Finland.** Preliminary survey on boiler inspections or alternative approaches as required under the Directive on the energy performance of buildings (2002/91/EC). 2001.
3. **Tuomi, Seppo.** Preliminary survey on inspections under the Directive on the energy performance of buildings with respect to biomass boilers. S.l.: Motiva, 2011.
4. **Bioenergy Association of Finland.** 17 June 2013.
5. **Finnish Gas Association.** 1 July 2013.
6. **Finnish Heating Energy Association.** Höylä III report. Promotion of the maintenance of buildings and oil heating systems 2013-2016. February 2014.
7. **Finnish Tax Administration.** The Household Deduction. [Online] https://www.vero.fi/fiFI/Henkiloasiakkaat/Kotitaliusvahennys.

Appendices

Appendix 1. Finnish Heating Energy Association TS-9/2014; Condition Inspection of Heat Distribution Systems in Private Houses, 2014

Appendix 2. Energy Saving Guide for Firewood Boiler Operators. Motiva Oy. 2014

Appendix 3. Information materials on the Kutteri agreement. 2014.

2014

TECHNICAL RECOMMENDATION TS-9

Condition Inspection of Heat Distribution Systems in Private Houses

Finnish Heating Association

2014

TECHNICAL RECOMMENDATION TS-9

Condition Inspection of Heat Distribution Systems in Private Houses

HELSINKI 2014 Finnish Heating Association

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TECHNICAL RECOMMENDATION. 2014. TS

INTRODUCTION

The new part of the technical recommendation series TS-9 is based on the heating development project headed by the Finnish Heating Energy Association. The recommendation is part of a series of technical recommendations published by the Association. This recommendation relates to the Directive on the energy performance of buildings (EPBD 2010/31/EU).

The recommendations have been produced as part of a development project based on studies, inspections and compilations undertaken by the Technical Committee.

On the Technical Committee were leading suppliers of heating equipment and representatives of the oil industry. The Committee also requested statements and opinions from experts and experienced specialists among oil heating contractors.

The recommendation is an attempt to harmonise working practices and methods. The aim is to allow equipment to function economically, reliably and with as few adverse effects on the environment as possible. If inspections, services and maintenance are carried out in the way described in the recommendation, a heating system will be economical and reliable.

The recommendation also covers heating technology measurements taken when installation and maintenance tasks are being carried out. Here the aim is to standardise methods and measuring equipment and raise minimum standards. If maintenance and installation work is carried out professionally, using the appropriate working methods and practices, heating systems will function optimally.

The priority is to guarantee reliability.

If this recommendation is complied with, the requirements of the Directive will therefore be met in a manner that is independent of any inspection carried out.

The recommendation is meant primarily for qualified engineers in heating, plumbing and air-conditioning working for professional outfits. It is also suited to training needs in the industry.

The Finnish Heating Energy Association is happy to answer any questions about the recommendation.

Helsinki, April 2014

FINNISH HEATING ENERGY ASSOCIATION

TECHNICAL RECOMMENDATION. 2014. TS

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QR CODES

The internet links in this publication are a new service and are also given as QR codes; see page 32.

Terms used

Tukes is the abbreviation used for the Finnish Safety and Chemicals Agency.

With respect to approved business terms, the name ‘operator’ is used from time to time.

GENERAL

This recommendation provides guidelines for professionals working for service and maintenance companies or contractors in the heating, plumbing and air-conditioning sector on matters to be considered in terms of the heating network.

The inspection project relies on the assumption that customers want an assessment of the condition of their heating equipment. Customers readily take an interest in this when a professional raises the subject, for example, when heating equipment is being serviced. It is also worth examining the condition of equipment when house-buying. It is nevertheless most important that the owner of a property should know and understand that, not just the condition of heating equipment, but also that of the heat distribution network, is crucial to the energy efficiency of a building.

When customers ask for a condition inspection of their equipment to be undertaken, it is important to draw up a written agreement of what the inspection is to consist of and whether it will include an examination of a heat source (oiler, heat pump, electrical resistance device). It is also important right from the start to note whether the flow rate of the old heating network can be measured and whether there are adjustment values built into the design. After this, customers are asked about what they themselves have noticed about the heating system being assessed.

When the inspection is over, a written report is produced on the results. This serves as a basis for a repair and refurbishment plan covering any urgent needs for repairs to the heating network, preventive repairs or measures to improve energy efficiency.

The inspection will at the same time specify whether a plumbing, heating or air-conditioning engineer is required to produce a plan. The replacement of parts does not require such a person, but larger projects, such as the replacement of pipes, require the professional skills of a design engineer. The new parts have to be documented at the same time. A condition inspection of a heating network should only be undertaken if the heat source is to be replaced or the heating system is to be changed in any other way, e.g. by adding a heat source to back up an oil boiler, such as solar collectors, a heat pump or something similar.

A condition inspection of a heating network should be conducted before the property is put on the market or if energy consumption differs significantly from that for similar properties. It is recommended that an inspection be carried out every ten years. Then the equipment can be kept in satisfactory condition and energy consumption can be maintained at an acceptable level the whole time, with no excessively large repair bills to be paid all at once. An inspection carried out at regular intervals is also a way to prevent the occurrence of major damage.

2. EPBD 2010/31/EU

This concerns the application in Finland of Article 14 of the reformed Directive on the energy performance of buildings (EPBD 2010/31/EU). Under Article 14, Member States may achieve an overall improvement in energy performance in two ways. They can be obliged to conduct regular inspections of the parts of heating systems of buildings, or, alternatively, advise users in the inspection of equipment.

Like several other Member States, Finland has decided to apply the article using measures relating to this guidance procedure. A key role here is played by installation and maintenance companies in the industry, experts from which can provide advice on energy efficiency

associated with technical heat supply equipment as part of the customer service. The advice is based on the data obtained from measurements taken during normal service and maintenance and from visual inspections of systems made by professionals. Users are thus given written and/or verbal advice and instructions on how to maintain and improve the energy efficiency of their heating system.

Adherence to the guidelines is a way to ensure that the required level of efficiency is achieved. Inspections and measurements can help provide users with the information required under the Directive on the energy efficiency of buildings concerning the energy performance of equipment, and advice on the replacement of boilers and on other changes to heating systems as well as alternative solutions.

3. CONDITION ASSESSMENT, CONDITION SURVEY OR CONDITION INSPECTION?

3.1 Condition assessment

A condition assessment is one performed by a specialist on the condition and need for repair of the different parts of a heating system and its components. It is mainly sensory in nature and its reliability depends on the professional skills and experience of the person concerned, and their ability to compare what is being assessed with the available statistics. A condition assessment can also be carried out one just one part of a system.

3.2 Condition survey

A condition survey is based on measurements taken by an expert in the system being assessed. Different equipment is used for the measurements, as required. This may include a vernier calliper, temperature gauges, flow meters or x-ray equipment. The reliability of a condition survey relies not just on the documented results of the measurements taken but also the specialist's analysis of them and of the proposals for action to be taken based on them. A condition survey can also be carried out one just one part of a system.

3.3 Condition inspection

A condition inspection is a combination of the two previous procedures and requires of the person undertaking it professional skill and a thorough approach. Assessments and measurements carried out thoroughly will result in a reliable picture being formed of the condition and viability of a system. A condition inspection is performed for the entire system and can serve as a basis for a reliable proposal concerning repairs or how to improve energy efficiency.

A condition inspection is meticulously documented and a copy is also drawn up for the customer. This technical recommendation looks at a condition inspection carried out by a plumbing/heating/air-conditioning specialist. The recommendation is accompanied by a guide to help owners of private houses to carry out service and maintenance themselves and document the work.

4. ASSESSING THE CONDITION OF A HEAT SOURCE

4.1 Boiler

Energy efficiency inspections of an oil boiler are covered under the EPBD Directive. There is additional information on this in the technical recommendation *'TS-4: Periodic maintenance work on oil-heating equipment, measurements of heating technology, and energy efficiency inspections'*.

Oil boiler inspections are carried out by EPBD-certified boiler inspectors, who can be located at www.ley.fi (homepage CONTRACTOR SEARCH).

4.1.1 Oil storage tank

When visiting an oil-heated property to conduct a condition inspection, it is a good idea to check when the oil storage tank was last inspected. Oil storage tanks should be inspected and cleaned regularly. Recommendations on them are to be found in the technical recommendation *'TS-&: Inspection and service of tanks – Liquid fuels for heating'*.

4.2 Heat pumps and other heat sources

All heating equipment should be serviced periodically. There is no such thing as maintenance-free equipment. If the manufacturer's guidelines on maintenance and service intervals are properly followed, a heating system can be kept in good condition and its energy efficiency can be maintained at an optimally satisfactory level. Furthermore, when a heat pump is being serviced, it is worth pointing out to the property owner how important it is to keep the heat distribution network in good condition. The service of heat pumps should focus particular attention on the cleanliness of the filters. Even a partially blocked filter can adversely affect the operation of the entire heating system.

Moreover, heating system refurbishments do not necessarily take account of the size of the radiators or their surface area. Badly designed radiators impair the efficiency of a ground source heat pump.

District heat exchangers should also be serviced and inspected regularly in accordance with the manufacturer's instructions.

5. PARTS OF A WATER-CIRCULATION HEAT DISTRIBUTION NETWORK, ASSESSMENT OF THEIR CONDITION AND REPLACEMENT INTERVALS

5.1 Temperature regulation system

Temperature regulation is the most important factor affecting the energy consumption of a heat distribution system. Houses and buildings that use old technology have a manually temperature regulating valve (shunt). Manual regulation wastes energy, because more hot water than is actually needed to heat the building usually gets into the network.

If temperature regulation is performed using automatic systems, the water entering the network is always just the right temperature. Heat regulation automatic equipment monitors the outdoor temperature and/or room temperature and possibly the temperature of the return water, and controls the temperature of the water entering the system accordingly. Considerable amounts of energy are saved in this way, because the regulation system is in operation 24 hours a day.

The temperature regulator is located either in the heating equipment (control panel), directly attached to the valve (actuator and control unit jointly installed) or as a separate unit that controls the actuator attached to the valve.

The following section describes options for regulating temperature, features and service and maintenance operations:

5.2 Temperature regulation system control options

Manual

- regulation manually as required using a shunt
- uneconomical and wastes energy

Automatic

- outdoor temperature-controlled (most common)
- indoor temperature-controlled
- return water temperature-controlled
- regulates the temperature of the water entering the system (most common)
- regulates the temperature of the return water

Additional features

- remote-controlled using text messages on a normal mobile phone
- remote-controlled and remote readable online
- smart phone applications available

5.3 Inspection areas and recommendations for action

check temperature range of each circuit	radiator or underfloor heating circuit
check settings for the temperature regulation curve if there is one	correct settings and advise customer on how to do it
temperature sensors: function and location	if necessary, replace damaged sensor
check actuator function and for leaks in the shunt valve	if necessary, contact plumbing/heating/air-conditioning firm to repair

5.4 Replacement interval

1. 10-15 years
2. Technology improves and new systems appear faster than replacement intervals

6. PIPING

This recommendation does not concern itself with the condition survey of piping. That is clearly described in the SULVI (Finnish Association of HVAC Societies) publication: *'Heating, plumbing and air-conditioning ventilation condition survey guide 2013: Guide to surveys of heating, plumbing and drainage system'*.

A list of qualified heating, plumbing and air-conditioning condition surveyors and qualification requirements can be found in the Finnish FISE manual. It is available at www.fise.fi.

The following section takes a look at piping systems and materials, pipe joint options and pipe replacement intervals.

Energy in water-circulation heating systems passes along pipes from the heat source to where the heat is needed. It is mainly just water that is used to transfer the heat. In places where there is the danger of freezing, such as summer homes, anti-freeze such as glycine- and methanol-based agents, can be used. The Rak MK D1 (Finnish Building Code) on the prevention of the contamination of drinking water must, however, be followed.

In buildings that use old technology, the pipes may have large diameters, as heat circulation was produced without a pump and relying on gravity. Nowadays the pipe dimensions in different parts of the network are determined on the basis of calculations. The calculations rely on specifying the rated flow rate, differential pressure, heating requirement and pump rated values.

New buildings these days often have plastic or composite piping. Steel piping with crimp fittings is also common. In buildings that use old technology, the underfloor heating pipes may be of plastic-coated copper.

The radiator and underfloor heating circuits should be separate in terms of their pumps coming from the heat source. In this way the radiators and floor will always have the water at the right temperature.

6.1 Examples of poor connection methods

An underfloor heating circuit may also be its own pump/control circuit branching off from the radiator piping. In such a case the temperature of the water entering the underfloor circuit can fall in relation to the water entering the radiator circuit, though in warm weather in summer, wet areas fail to dry out, because the automatic system makes the water in the radiator circuit too cold. This is therefore a bad option.

An underfloor heating circuit may also be located directly in the radiator circuit. This too is a poor choice. In frosty conditions, water that is too hot enters the underfloor system and there

is a risk that the pipes will melt. In warm weather, on the other hand, damp areas fail to dry out (see previous paragraph).

If a radiator-heated house or building also has an underfloor heating circuit, say in wash rooms, and it is wrongly connected, the recommendation for action should include a separate heating circuit coming from the heat source. In this way the right temperature water is always obtained to reflect the need for underfloor heating at any time of the year.

6.2 Pipe materials and pipe joint options

1. **black steel**

- welded
- threaded fittings
- most common in old buildings

2. **galvanised steel**

- crimp

3. **copper**

- brazed
- crimp
- compression fittings (‘ring’, ‘cutting ring’); not very common in heating pipes

4. **plastic pipe**

- compression fittings (ring’)
- shrink fittings
- most common in new buildings
- no pipe branches: bypass manifolds required instead
- requires dry-block thermostat for pump

5. **composite pipe**

- crimp
- snap-on fittings (attached without tools)
- there are also fittings that can be tightened available
- common nowadays, especially in refurbishments
- requires dry-block thermostat for pump

6.3 Inspection areas and recommendations for action

has air collected in the piping?	bleed the system from the air exit points
is any leakage visible?	plumbing/heating/air-conditioning firm to repair leak
is the pressure in the network diminishing?	plumbing/heating/air-conditioning firm to search for and repair leak
how old is the piping?	If necessary, recommend pipework refurbishment

6.4 Replacement intervals

- steel pipes, 25-35 years
- copper pipes, 25-35 years
- plastic pipes, composites from 25 years upwards
- installation and repair of piping should always be carried out by a professional

7. RADIATORS

Radiators, like piping, are generally ignored when service and maintenance is carried out. For examples, radiators can be bled by the owner. The work nevertheless calls for care and attention, to ensure that no leaks or water damage ensues.

Service and maintenance:

Vacuum dust from areas where there are gaps and spaces.

It is not recommended to paint radiators: they should be washed clean. Painting impairs their ability to transfer heat. If they have to be painted, however, ensure that the right materials are used for a primer/undercoat and topcoat.

The radiator replacement interval is from 40 years upwards.

7.1 Thermostatic radiator valves

Thermostatic radiator valves are used in both single and dual pipe connections in radiator systems.

Pre-set valves are used to guarantee the continual supply of warm water in the best possible way in dual-pipe heating systems.

The ease of the pre-set facility allows for precise settings for estimated flow rates. To ensure that thermostatic radiators valves operate accurately, it should be ensured during installation that the thermostat senses the room temperature without hindrance.

There are also available valves for gravity-flow pipe systems.

The operation of radiator valves and the pre-set values can be checked by detaching the thermostat or manual regulation device. Operation of a needle valve: see if it will move freely in both directions. The pre-set values can be found on the control wheel.

Service and maintenance:

Repair and seal kits are available for most valve models.

Replacement interval: 10-15 years

7.1.1 Thermostats

A broken thermostat should be replaced – they cannot usually be serviced. Furthermore, with models with detachable sensors the capillary tube often stops working. Most manufacturers have a protected model for public areas.

Replacement interval: 10-15 years

7.1.2 Manual controls

Manual controls are used, for example, where there is a risk of freezing if the radiator valve becomes blocked or in wet areas where there needs to be a constant drying process. There is also a lockable version available for the manual control wheel, to avoid unnecessary adjustments.

7.1.3 Smart control systems

There are also more advanced wireless control systems in existence. All units can be controlled centrally. This means that all thermostats can be programmed at one and the same time, but they can be adjusted easily and for individual rooms from the central unit. The temperature can also be controlled from the thermostat.

7.2 Bypass manifolds

In buildings where the heat transfer piping is made of plastic.

Bypass manifolds in underfloor heating systems regulate the flow rate of a pre-set valve in the piping for a specific room. The temperature regulation of a specific room also takes place by means of thermostatically controlled actuators or manual controls from the bypass manifolds.

The regulation of the flow rate for a specific room in radiator heating systems is usually achieved from the thermostatic radiator valve housing. The room temperature is generally controlled by a thermostat attached to the radiator valve.

Smart room temperature control systems are also available for radiator and underfloor heating systems.

7.2.1 Maintenance of bypass manifolds:

- bleed one underfloor circuit at a time
- the pre-set values in bypass manifolds should be checked
- check the adjustment of the bypass manifold balancing valve

8. PUMPS

Water circulating pumps will last a long time as long as they are not allowed to run dry. If necessary, they therefore have to be bled. The pump is generally installed between two shutoff valves. This makes it easier to replace them, without having to empty the system. The valve that lies beyond the pump is often a pump regulating valve, from which a measured amount of water is used to help balance the system. The pumps are either single or three-stage (one and three fuses respectively). This should be taken into account if the pump is being replaced or a faulty fuse is being looked for.

The next section describes the features of pumps and their service and maintenance procedures:

8.1 Control options

1. **on/off**
    a. turned off from a manual switch
2. **temperature-controlled**

a. a temperature regulator controls the pump's operation

b. there may also be timers, for summer start-up periods, for example

3. **dry-block thermostat**

a. necessary is there are plastic pipes in the heating system and if it is possible that the pipes will melt if there is a problem with the heat source

b. the shutdown temperature of the pump is thermostatically controlled; this therefore prevents plastic piping from melting if there is a problem

Pumps can also operate differently.

4. **pumps may be:**

a. of the constant-speed type

b. multi-speed; manually controlled

c. power controlled: output/cycles are automatically altered as required

8.2 Service and maintenance

1. **bleeding**

a. airscrew

b. can be bled automatically

2. **leaks**

a. gaskets

b. rotary seals

c. certain pump manufacturers provide a service and maintenance kit: the pump housing does not need to be detached from the piping; instead just a part of the motor is detached and the serviced or a new replacement part is put in its place

3. **fuses**

a. NB! Three-stage pumps have three fuses

b. and single-stage pumps have one fuse

4. **motor protection device** (if there is one)

a. must be properly regulated according to the electric current required for the pump

5. **fault current protection** (plug-in pumps)

a. the socket the pump is connected to must be protected from fault currents

8.3 Pump replacement interval

- 5-10 years
- when replacing the pump, note the DN, the output/pressure category and whether the old pump is a single or three-stage unit. Also note the length – will it fit in place without changes to the pipework?
- choose a low-energy model
- it is recommended that a new pump should be a single stage permanent magnetic model fitted with an integrated frequency convertor
- pumps should be replaced by a professional

9. FILTERS

It is recommended that a filter is installed before each pump, heat exchanger or other device likely to get dirty is installed. During service and maintenance, filters should be cleaned. A dirty filter hampers flow and increases energy consumption.

10. GAUGES

The most common areas for taking measurements:

10.1 Network pressure gauge

- generally located close to the top-up valve
- may also be located in the boiler/heat pump panel
- may be a model that emits a warning signal

10.2 Temperature gauges

- in the inlet pipe
- in the return pipe
- with more advanced equipment, temperatures are obtained using automatic measurement systems
- may be a model that emits a warning signal

The warning signal can be connected to a warning light outside the heat distribution room or possibly linked to remote monitoring systems.

10.3 Gauge replacement interval

In general, only replaced when necessary, i.e. when the gauge no longer works.

11. EXPANSION AND PRESSURE CONTAINMENT SYSTEMS

These days heating systems are generally closed. Changes to the volume of the liquid caused by a change in temperature are generally compensated for using a diaphragm expansion tank. Fairly large institutions use a pressure containment pump and adjustment valve in conjunction with an additional water tank.

If there are problems keeping pressure in the heating network at the right level, check that the pre-charge pressure in the expansion tank conforms to the design. If the pressure has fallen, it should be adjusted by increasing the amount of nitrogen gas in the tank. The inspection may be undertaken without emptying the heating system if the expansion tank is connected to the network by means of a three-way valve. This allows the expansion tank to be separated from the network and the connector to become depressurised.

11.1 Diaphragm expansion tank

- closed circuit
- relief valve is necessary
- now the most common system

11.2 Open expansion tank

- located at the highest point in the network
- overflow pipe must be close to the top-up valve
- when the system is being filled, you can see when it is full from the overflow pipe
- no need for a relief valve
- generally found in old detached houses
- it is recommended to switch to a closed circuit, as an open tank causes the water to evaporate and oxygen-rich water takes its place, which results in internal corrosion of the network

11.3 Pressure booster station

- common with larger systems
- automatic

12. VALVES

As with other plumbing, heating and air-conditioning equipment, valves comprise several parts that are subject to continued stress and which are prone to wear and tear and so require product service and maintenance. A part usually becomes unusable if it has not been serviced. Regular service and maintenance guarantees that equipment will be trouble-free and lengthens its working life considerably. Service and maintenance must be carried out using suitable tools and spare parts. The replacement of a valve almost always means that the system has to be emptied or cooled to freezing point.

12.1 Types of valve used in heat distribution networks

12.1.1 Shutoff valves

- top-up valves
- network pressure is raised to a suitable level

- generally close to the pressure gauge to make it easy to monitor the pressure

12.1.2 Mixing valves and shunt valves

- mix the incoming water with the right amount of hot water from the heat sourc0e

12.1.3 Control valves

- balancing valves

- in larger systems

- balances the pump flow in different parts of the system

- pump regulating valve

- measures the pump output and possibly adjusts it to the desired level

- pump valves

- intended as a shutoff and non-return valve with a circulation pump for warm process/service water or to be used in places where a shutoff valve and non-return valve are required together

- butterfly valves

- intended for systems where a butterfly valve and non-return valve are required

12.1.4 Relief valves

- used to protect piping and connected equipment from excessive pressure

- are spring-loaded and open when the pressure exceeds the spring's clamping force

12.1.5 Non-return and back-pressure valves

- these prevent backflow, if the pump develops a fault, for example

Non-return valves often contain a mechanical spring and it could break. In such a case, the prevention of backflow will not necessarily work. The valve may also emit a clanking sound, showing that it is broken.

Note the following when installing back-plated valves: the best reliability is achieved if the valve is in a horizontal pipe and the plate is above the pipe. This should be taken into account especially with SDN 25 and larger valves.

12.2 Valve types in a process/service water system

Valve types for heating equipment:

12.2.1 Feed valves

Heating equipment connected to a water supply system must be fitted with a feed valve with relieve valves.

12.2.2 Feed mixing valves

The valve collection features all the functions that the authorities require when a hot water generator is connected to a water supply system. Consequently, it is also possible to use them with hot water coils in boilers.

13. HEATING SYSTEM – MEASUREMENTS AND ADJUSTMENTS

13.1 Adjustment of heating systems and hot process/service water

The purpose of a heating network control device is to keep the temperature of living space at the desired level, as precisely as possible. The temperature of the water flowing into a heating network is generally controlled to reflect the outdoor temperature or by using an electric control device. Another option is to produce water that reflects the outdoor temperature of and the chosen heating curve heat pump (alternating condensation heat pump).

Whatever the method employed, the principle is the same. The sensing device in the inlet pipe provides the regulator or automatic system with information on the setting. The system can also feature a sensing device in a room. It is usually located in a room unit and its function is to regulate the room temperature. For example, in spring the effect of sunshine on the room temperature can be considerable, and if an outdoor sensor is located in the shade, the room temperature can go up to needlessly high levels. The purpose of the sensing device in the room is therefore to bring the temperature down.

If a heat distribution system features both a radiator and underfloor heating, the latter system has its own circuit separate from the heating network. The correct regulation of underfloor heating requires a regulator for its own control circuit or a separate regulator for the system.

Private houses can have more than one heating circuit if the pipelines in the heating network form branches between different rooms and/or floors. In such a case, it must be checked that each circuit has its own control valve to maintain the initial adjustment of the system – i.e. balance.

If diagrams of the heating network show the adjustment or kv values, first check that the valve controls have been installed to reflect the calculated values. If the adjustment values cannot be located, a professional heating/plumbing/air-conditioning engineer should be asked to calculate and incorporate the correct flow rates and adjustment values in the pipe system.

The temperature of hot process/service water is controlled at the desired level either manually or using mixing control valve controlled by an electric regulator. The temperature of the water from water fittings for personal cleanliness must not be higher than 65 degrees. The temperature is restricted by means of a thermostatic mixing valve installed in the water heater (Rak MK D1/2007).

The system for regulating the heating network and hot process/service water should be repaired or refurbished if it does not operate correctly or if the control devices are missing altogether. To examine any need for repairs or refurbishment, establish the presence of control devices and valves, their general condition and their mechanical functions.

13.2 Heating system measurements

Regulating a heating system generally involves the taking of measurements of the network's flow rates and comparing the results with the calculated values in the diagram of the connections. Besides flow, measurements are taken of room temperatures. This is done by

detaching the separate equipment control devices from the heating system – the thermostatic radiator valves or the control devices in the bypass manifolds in underfloor heating systems: in other words by 'opening up' the system. When comparing the viability of the system with reference to the temperatures, note that it can be done in just a few moments. But a good result is achieved by measuring room temperatures for a sufficiently long period; for a week, for example. Temperature gauges are installed in rooms and the set heating curve for the heating system is checked. The temperature of the inlet water in the heating curve must generally be selected so that room temperatures reach 21-22 °C. If they vary considerably – by more than 2-3 degrees, the network should be balanced. This will ensure the correct flow rate for all parts of the system and a steady distribution of heat in all rooms as a consequence.

13.2.1 Adjustment of balancing valves

Balancing valves are used to adjust water flow in the pipelines to values to ensure that the flow rates are sufficient for the required heat output. In this way the water flow in the pipelines is cooled to the same degree.

Designers specify the required water flows with reference to heat output and the temperature difference used.

The differential pressure is measured from the balancing valves. The differential pressure and the valve adjustment position serve as a basis for determining the water flow from the set of curves.

The water flow can also be read using a water flow meter, if the valve's position or its kv value is supplied to it.

13.2.2 Valve's kv value

A valve's kv value refers to the water flow at m^3/h, which passes through the valve with a pressure loss of 100 kPa.

14. DOCUMENTATION

It is worth documenting the site carefully. That makes it easy to make a repair offer. If a report has been carefully compiled, customers are happy to pay the bill, as they see that their money has been well spent. It is also an important part of the whole process to show and explain the documented details and any need for repairs to the customer in a way that is comprehensible.

Reports can be produced on a form such as the one shown in Appendix 1. The form has several sections, where reference can be made to a form giving additional information and photographs taken of the site.

It is worth taking a large number of detailed photographs and placing them on your server. However, it is a good idea to add a hard copy to the documentation given the customer of the main images of faults and perhaps mention whether there are any more photographs of the area if needed.

15. APPENDICES

Appendix 1: Condition inspection: documentation

Heating network condition inspection report, including photographs of problem areas and the general condition of parts.

Details of site	Customer	
	Address	
	Telephone	Email
Boiler or other heat source	Make:	Model:
	EPBD inspection carried out:	
	Burner: separate integrated Make and model:	Recorded classification:
	Date of oil tank inspection:	
Temperature regulation system	Make and model:	Separate integrated
	Year of installation: Condition: Replacement recommended by	Outdoor temperature sensor: Yes No
	Inlet water sensor in good condition there is a return water sensor yes no Remote control with text messages Remote control online Further details:	
	Standby heating resistor control in good condition in poor condition Connected Not connected ----kW no.	
	Miscellaneous	
Piping	Pipe materials:	
	Year piping was installed: Year refurbished: completely partly	
	Condition from visual inspection good poor leaks insulated poorly insulated Number of heating circuits: connections correct wrong Observations:	
	Is there air in the system? yes no	

	Are there enough bleed points? yes no	
	Pressure in the network at the time of the inspection: Recommended pressure:	
Radiators / underfloor heating	Heat release method: radiators underfloor piping both Design temperature of radiators ….; suitable for present heat source yes no Radiator valves and thermostats installed on …. Observations: Number of possible bypass manifolds ….; location for maintenance: good poor Observations: Underfloor heating thermostats and actuators: in good condition in poor condition Observations:	
Pumps	<u>Heating circuit 1:</u> Make, model, date of installation in good condition should be replaced Dry-block thermostat functional not functional adjusted at °C Heating circuit 2: Make, model, date of installation in good condition should be replaced Dry-block thermostat functional not functional adjusted at °C <u>Process/service water circulation pump:</u> Make, model, date of installation in good condition should be replaced pumps have separate fuses: yes no number… pumps have separate safety switches connected at the socket is there any fault current protection? yes no air in pumps: yes no do pumps feel hot/emit a noise? yes no	
Filters	Do the pumps have filters? yes no Are they regularly cleaned? yes no Are there filters elsewhere in the piping? yes no Where: Are they regularly cleaned? yes no	
Gauges	Network pressure temperature of inlet water temperature of return water boiler temperature	
More details		

Expansion	Expansion tank open expansion closed pre-charge pressure
Valves	Function good blocked leaking too few valves further details:
Feed mixing valves	Is the maximum adjustment of hot process/service water possible yes no maximum temperature measured °C
User guide	Is the heating system regulated/balanced? yes no Service and maintenance guide and explanation of how the system operates? yes no Heating system settings? yes no Suggestions for energy saving measures? yes no Action to be taken in the event of faults yes no Has the customer been given a separate recommendation for action to be taken regarding the system's refurbishment? yes no attachments no.
Date and signatures	On this date I am in receipt of a user guide for this heating system and a condition inspection report on it, and it has been clearly explained to me. Customer Place Date

QR CODES

Finnish Heating Energy Association: oil boiler inspections are carried out by EPBD-certified boiler inspectors, who can be located at www.ley.fi (homepage CONTRACTOR SEARCH).

A list of qualified heating, plumbing and air-conditioning condition surveyors and qualification requirements can be found in the Finnish FISE manual. It is available at www.fise.fi.

Heating equipment industry partners

Equipment and energy suppliers

(company details illegible – tr.)

Aimtec Oy

Ariterm Oy

Atlantic Suomi / Costelia Oy

Bauer Watertechnology Oy

Oy Callidus Ab

Danfoss Oy

Gasum Tekniikka Oy

Jakotec Oy

Kaukora Oy

Kouvolan Putkityö Oy

Laatukattila Oy

Li-Plast Oy

Oy Motoral Ab/Motoplast

Neste Oil Oyj

Oilon Oy / Oilon Home Oy

RICA - Riihimäen Metallikaluste Oy

St1 Oy

Oy Teboil Ab

Öljyalan Palvelukeskus Oy (Finnish Petroleum Federation)

Finnish Heating Energy Association

Sitratori 5, 00420 Helsinki

Tel: 010 617-7410

Email: toimisto@ley.fi

www.ley.fi

Finnish Heating Energy Association

The Finnish Heating Energy Association (LEY) was established in 1956 to promote the installation of oil heating systems mainly through the organisation of training and making recommendations to the industry. This resulted in the growing popularity of oil heating and its reputation as a reliable and safe heating option.

These todays the Association has the same essential objective: the improved quality of heating equipment installations. The members are mainly contractors, but also equipment manufacturers and energy suppliers. The Association's main resource is its contractor members, who have the experience to establish expertise and an awareness of local conditions for the work of the organisation.

The Association also provides training and technical advice and works in partnership with the authorities. It is also authorised by Tukes to set examinations to gain qualifications in the field and issue certificates.

Oil heating industry: recommendations and training:

www.ley.fi

Technical advice service:

010 617 7414

ENERGY SAVING GUIDE FOR FIREWOOD BOILER OPERATORS

AGE OF BOILER

BOILER TYPE **USE OF BOILER**

QUALITY OF FIREWOOD **EFFICIENCY OF FIREWOOD BOILER** **SWEEPING**

HEAT USE **MAINTENANCE**

SOLAR HEAR **HEATER**

TO THE BOILER USER

Firewood (chopped wood) is a form of renewable energy. If correctly used, it is economical and environmentally friendly. Most Finns produce the firewood they use themselves, making the heating process very cheap. But it is cheaper still to heat a property correctly and in a way that is energy efficient. At the same time, fewer fine particles enter the atmosphere and the effects of burning wood on the quality of ambient air are reduced.

QUICK TIPS

- When you use heat and warm water sensibly you determine the need for heat enormously, and therefore the need for firewood.
- Use dry fuel. You can make savings of 10-20 % compared to the use of damp fuel.
- Make sure there is a supply of combustion air. The air inlet hole in the boiler room should be around double the surface area of the flue. Follow the boiler manufacturer's instructions on regulating the air intake.
- Take care of your boiler so as not to waste energy. A one-millimetre thick layer of soot on heat exchange surfaces will impair heat transfer by around 5 % and increase fuel consumption by 2-3 kg each time it is used.
- Keeping an eye on the temperature of the flue gas will enable you to see if the boiler is dirty.
- The owner of the property is responsible for sweeping the system. An engineer should be got in to clean the flue once a year.
- Buy a well-insulated, energy efficient water heater. It will significantly improve the way heat is produced.
- Insulate the boiler and the heater's charge pipes properly.
- The heat distribution system's automatic regulating valve (shunt), which controls the temperature of the inlet water, quickly repays itself compared to manually controlled valves.
- The type and age of the boiler determines whether it is worth replacing.
- A solar thermal system or heat pump and water heater save energy and also boost the efficiency of the heat production of a firewood boiler.

THE QUALITY OF THE FIREWOOD IS CRUCIAL

Damp fuel has an enormous effect on the energy efficiency of biomass boilers. The moisture content of new wood is generally about 50-55 %. It should be in the range 15-25 % when used. The calorific value of new wood per unit volume is approximately 5 % lower than that for normal, naturally dried wood. The efficiency of a biomass boiler is also more impaired

the damper the fuel is and the volume of flue gases increases and the boiler's heat exchange (convection) surfaces get dirty accordingly.

KOSTEUSPITOISUUDEN VAIKUTUS KOIVUPILKEEN ENERGIASISÄLTÖÖN

EFFECT OF MOISTURE CONTENT ON THE ENERGY CONTENT OF BIRCH FIREWOOD

kHw/pino-m*(illeg.)* kHw/pile square metre

1 800 – 1 000

10 % 30 % 50 %

Kosteuspitoisuus Moisture content

CHOOSE FIREWOOD SUITABLE FOR YOUR BOILER

Check the boiler's user instructions for the recommended size of firewood. EN 14961-5 is the firewood measurement and quality standard. If the seller of the fuel produces the firewood he sells in accordance with the standard for the product description, the purchaser may be assured about the sort of firewood he is buying.

(in a circle – tr.)

Depending on the quality of the fuel, dry fuel gives a saving of 10-20 % compared with damp fuel.

STORE FIREWOOD IN A SHED

When storing firewood, attention should be paid to retaining its quality and to fire safety. The best way to store firewood is in a shed where it is protected from damp and where the air can circulate freely. If it is stored outside, you must ensure that no moisture from the ground or the atmosphere affects it. However, the piles should only be covered on top, to allow air to circulate from the sides.

Large amounts of firewood indoors or by the walls of the property are a fire hazard. Damp wood can also cause damage from mildew.

(in a circle – tr.)

Keep firewood in a dry and airy location.

USE YOUR BOILER CORRECTLY

LIGHTING AND HEATING

Before you light the boiler, make sure that that the ash pan is not full, to allow the ash to settle. Empty the ash draw if necessary. Light the device in accordance with the manufacturer's instructions. Smaller-sized firewood than that used for heating is normally used to light the boiler.

The combustion process needs air. If there is insufficient air, the burning process will be incomplete and soot will form. If there is too much air, the draught will be too strong and the heat will be lost. Follow the manufacturer's instructions on regulating the combustion air. Remember too that the boiler room needs to be aired.

A CLEAN BOILER WORKS EFFICIENTLY

If a boiler is cleaned regularly the efficient transfer of heat is guaranteed, levels of safety improve and the boiler's working life lengthens. A one-millimetre thick layer of soot on heat exchange surfaces will impair heat transfer by around 5 %. If the burning process is poor, a layer of soot could build up in just a few hours. Keeping an eye on the temperature of the flue gas will enable you to see if the boiler is dirty. If the temperature has risen to 20-50 degrees hotter than a clean boiler, it is time to clean it.

CLEAN THE BOILER REGULARLY

- Remove ash. Remember to use a fire-resistant, lidded container for the removed ash.
- Clean the hearth, furnace, heat exchange (convection) surfaces and other surfaces in accordance with the supplier's service instructions.
- Check the tightness of doors/hatches.
- Check the tightness of plates/panels.

Firewood boilers require servicing and cleaning weekly; a water heater will lengthen the need for cleaning to two weeks. Always follow the service instructions. Suppliers will often answer your questions over the telephone.

(in a circle – tr.)

Regular cleaning and sweeping are a guarantee of safety and efficiency.

SWEEPING IMPROVES SAFETY

The flue should be swept once a year. The owner of the property is responsible for this. The flue and its accessories are swept as is the connection flue pipework. The engineer will

remove the waste and ash that has accumulated and make sure that the soot in the flue is not at risk of catching fire and that there are no leaks in the flue.

ENERGY EFFICIENCY OF A FIREWOOD HEATING SYSTEM

DIFFERENCES BETWEEN BOILER TYPES

The efficiency rating is an indication of what proportion of the heat content of the fuel used can be recovered and used. Firewood boilers divide into different types. The boiler type, its age and condition have a major effect on its efficiency. Modern boiler technology permits the combustion of gases and the regulation of the air supply in the combustion area, which improve the boiler's efficiency rating.

A WATER HEATER IMPROVES THE EFFICIENCY RATING

Water heaters can improve the energy efficiency of a firewood boiler considerably. But you should pay attention to the energy efficiency of the water heater too, because the heat loss in a badly installed water heater may be as great as the need for hot service water in a private house for a whole year. The water heater stores heat, allowing complete loads to be burnt efficiently, which also reduces the workload needed to generate the heat. It is also possible to connect more than one heat source to a water heater. The benefits are considerable, especially with poorly regulated boilers.

THE ENERGY EFFICIENCY OF THE HEAT DISTRIBUTION SYSTEM

The amount of heat wasted in the heat distribution system can be cut by insulating the heat distribution pipes and the pipes between the boiler and the water heater. The system's automatic regulating valve (shunt) controls the temperature of the water entering the heat distribution system. It is often adjusted to reflect the outdoor temperature, to save unnecessary heating. When it is adjusted manually, always remember to use the regulator when the weather changes.

(in a circle – tr.)

More energy efficiency, greater savings

PILKEKATTILOIDEN VUOSIHYÖTYSUHTEET YEARLY EFFICIENCY RATINGS OF FIREWOOD BOILERS

Hyötysuhde % Efficiency rating %

90-0

Kaksoispesakattila Dual-chamber boiler Yläpalokattila Top-fire boiler Akapalokattila Under-fire boiler

Etupesäkattila Front chamber boiler Käänteispalokattila Reverse flame boiler

Old boiler with no water heater

Old boiler with a water heater

Modern boiler with no water heater

Modern boiler with a water heater

WHEN THE EQUIPMENT SHOULD BE REPLACED

The economic wisdom behind replacing an old boiler relies very much on the boiler type and the firewood used. The following section gives a comparison of situations where an old dual-chamber boiler and a reverse flame boiler are replaced by a modern reverse flame boiler. If the dual-chamber boiler has no water heater, its efficiency rating is very poor and it is well worth replacing the equipment. With old reverse flame boilers with a water heater, the efficiency rating is good and the savings made by replacing the boiler are small.

	OLD TECHNOLOGY		MODERN TECHNOLOGY
	1. DUAL-CHAMBER OILER WITHOUT WATER HEATER	2. REVERSE FLAME BOILER WITH WATER HEATER	3. REVERSE FLAME BOILER WITH WATER HEATER
Efficiency rating %	40	75	85
Firewood consumption MWh per annum.	50	27	24
Cost of firewood € per annum.*	2 500	1 333	1 176

SAVING WHEN SWITCHING FROM OLD TECHNOLOGY TO THE BEST MODERN TECHNOLOGY

Saving in firewood MWh per annum.	26	3	-
Saving in firewood costs, € per annum	**1 324**	**157**	-
Cost € **	7 500	5 000	-
Repayment time in years	6	30	-

* Price of purchased firewood 5 cents/kWH = EUR 50/1-m³. Investment costs of sites do not include installation costs.

** Site 1 Investment cost includes water heater.

(in circles – tr.)

If the boiler’s efficiency rating is poor, consider changing it for one that is more efficient.

Using solar energy can produce hot service water in summer.

Buy a water heater and make savings!

NB! All the figures in the table are examples only. The degree of cost-effectiveness varies. Investment costs do not include installation.

(Table)

Below is a comparison of the cost-effectiveness of replacing equipment. The calculations show that acquiring a water heater is a sensible solution if you have an old boiler.

Replacing a boiler with a poor efficiency rating or fitting a water heater is generally cost-effective. When considering a replacement boiler, it is a sensible solution at the same time to buy a hot water heater.

COST-EFFECTIVENESS OF REPLACING OLD EQUIPMENT FOR DIFFERENT BOILER TYPES

Takaisinmaksu aika, vuotta Repayment time in years

40-0

Varaaja Water heater

Nykyaikainen kattila Modern boiler

Nukyaikainen kattila ja varaaja Modern boiler and water heater

Kaksoispesakattilam korvaaminen	Replacement of a dual-chamber boiler
Yläpalokattilan korvaaminen	Replacement of a top-fire boiler
Akapalokattilan korvaaminen	Replacement of an under-fire boiler
Käänteispalokattilan korvaaminen	Replacement of a reverse flame boiler
Etupesä ja kattilan korvaaminen	Front chamber and boiler replacement

The heating need is estimated at 20 000 kWh a year. Price of firewood 5 cents/kWh = EUR 50.1-m³

COMBINE WOOD WITH SOLAR ENERGY OR A HEAT PUMP

For example, a solar collector or an air-to-water heat pump will make it more efficient to heat service water using a firewood boiler in summertime. Solar collectors can be connected to the same energy accumulator as the boiler if there is space for them or a solar coil. There are also outdoor heat exchangers available. An air-to-water heat pump can also be connected to the same water heater as the boiler. There are also solutions for use without a water heater.

Buying collectors and a heat pump is most cost-effective at sites where the boiler’s efficiency rating is poor and in general the annual consumption of heat is great. A solar collector and heat pump will also reduce the workload in summer when the boiler is used less frequently.

The purpose of the Energy Saving Guide for Firewood Boiler Operators is to help them save firewood and cut the dangerous emissions that are produced during the heating process. The guide is part of the guidance procedure for biomass boilers in connection with the Directive on the energy performance of buildings.

Motiva Oy has used the guide to produce the reports by Seppo Tuomi.

The guide's production was sponsored by the Ministry of the Environment.

The following organisations contributed to the guide: the Bioenergy Association of Finland, the Central Association of Chimney Sweeps, the Finnish Heating Energy Association, the Finnish House Owners' Association, Ariterm Oy and the Universities of Applied Sciences of Häme and Jyväskylä.

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Bioenergy industry promotes energy efficiency by providing guidance

8 4 2014; 16:35

There is also scope for the bioenergy industry to increase energy efficiency. Finland has old bioheating systems whose energy efficiency could be improved considerably with a change in the way they are used and by boosting the energy efficiency of equipment.

The EU Directive on the energy performance of buildings calls for the organisation of either mandatory inspections or, alternatively, advice/guidance regarding boilers with an output of more than 20 kW in buildings.

It is the guidance procedure that Finland has opted for in the case of bioenergy boilers.

It is through guidance that the aim to improve energy efficiency is to be realised – through the maintenance of heating systems and the use of good quality fuel, and by connecting a water heater (accumulator) and solar panels to the system. Boiler owners could make clear savings, and a cleaner combustion method will also result in fewer harmful emissions. Guidance and advice will be available in several newspapers and magazines, at fairs and online.

The Kutteri programme agreement has been drawn up to produce advice and guidance, allowing consumers and users to access advice and guidance on the use and maintenance of bioenergy heating systems and the replacement of equipment. The agreement was signed on 8 April 2014 at the Ministry of the Environment.

Besides the Ministry of the Environment, the following organisations are included in the agreement: the Bioenergy Association of Finland, the Central Association of Chimney Sweeps, the Finnish Heating Energy Association, the Finnish House Owners' Association, Ariterm Oy and the Universities of Applied Sciences of Häme and Jyväskylä. Motiva Oy contributed to the implementation and development of projects and ventures connected with the agreement and the compilation of a yearly report. It is hoped that organisations active in the field of bioenergy will also be covered by the agreement.

(captions – tr.)

The Kutteri agreement event was opened and the agreement signed on behalf of the Ministry of the Environment by Helena Säteri (Director-General) and Jussi Paima.

The parties to the Kutteri programme agreement raise a toast to mark the occasion.

Motiva

Bulletins 2014

8.4.2012; 08:00

Bioenergy industry promotes energy efficiency through joint efforts

Bioenergy should be used if the goal is to improve energy efficiency. Finland has old bioheating systems whose energy efficiency could be improved considerably through measures to cut fuel consumption, heating costs and flue gas emissions.

The EU Directive on the energy performance of buildings calls for the organisation of either mandatory inspections or, alternatively, advice/guidance for users regarding boilers with an output of more than 20 kW in buildings. Finland has decided to go with the advice and guidance procedure.

The alternative guidance procedure is more effective in improving the energy efficiency of biomass boilers and reducing heating costs than mandatory inspections.

Advice and guidance first for owners of firewood boilers

The guidance procedure is being applied to fireplaces in private houses, boilers that use firewood and pellets, and boilers that use wood chips. It is firewood boilers that comprise the largest group and so the advice is being targeted at owners of these to start with.

It is through advice and guidance that the aim to improve energy efficiency is to be realised – through the maintenance of heating systems and the use of good quality fuel, and by connecting a water heater (accumulator) and solar panels to the system. Boiler owners could make clear savings, and a cleaner combustion method will also result in fewer harmful emissions. The use of bioenergy is also being promoted and its competitiveness and the services that accompany it are being improved. Guidance and advice will be available in several newspapers and magazines, at fairs and online.

The potential savings are greatest with old boilers whose energy rating is poor. In such cases replacing the boiler is the best option. Many heating systems lack a water heater (accumulator), something that can boost the system's efficiency considerably. Water heaters also allow for the connection of solar panels to the system. The use of good quality fuel and a clean combustion process means the boiler gets less dirty and does not need to be cleaned so much. A clean boiler is better able to recover - and not waste – heat.

The Kutteri agreement brings all the actors together

The Kutteri programme agreement has been drawn up to produce advice and guidance, allowing consumers and users to access advice and guidance on the use and maintenance of bioenergy heating systems and the replacement of equipment. The agreement was signed on 8 April 2014 at the Ministry of the Environment.

Besides the Ministry of the Environment, the following organisations have committed to the guidance procedure under the agreement: the Bioenergy Association of Finland, the Central Association of Chimney Sweeps, the Finnish Heating Energy Association, the Finnish House Owners' Association, Ariterm Oy and the Universities of Applied Sciences of Häme and

Jyväskylä. Motiva Oy is contributing to the implementation and development of projects and ventures connected with the agreement and the compilation of a yearly report.

It is hoped that organisations active in the field of bioenergy will also be covered by the agreement.

Further information on the agreement is available from:

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Article on the signing event on the Ministry of the Environment website

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Equivalence report on the alternative procedure for air-conditioning systems

FINLAND

30.6.2014

Report to the European Commission under Article 15 of the Directive on the energy performance of buildings (2010/31/EU)

Ministry of the Environment

Foreword

This follow-up report is Finland's notification to the European Commission pursuant to Article 15(4) of the Directive on the energy performance of buildings (2010/31/EU). On 1 October 2013, Finland submitted to the Commission the first report with reference to this paragraph in the article entitled 'Report on the Equivalence of an alternative procedure for air-conditioning systems. Finland. 28.8.2013' (hereafter the 'Equivalence Report'). This Equivalence Report described and assessed mandatory inspections of air-conditioning systems, gave an account of Finland's alternative procedure, and showed that its impact would correspond to the effects of the inspection procedure referred to in Article 15 (1-3) in the period 2013-2015.

This follow-up report describes how the alternative procedure is being implemented for the period 9 January 2013 – 30 June 2014. The equivalence of the inspection procedure to the alternative procedure is assessed. An evaluation is also undertaken of the implementation of the alternative procedure itself and the achievement of results in the future.

The report was compiled by Maarit Haakana, Senior Engineer, of the Ministry of the Environment, assisted by Pekka Kalliomäki, Senior Construction Adviser, of the Ministry of the Environment.

Contents

1. Introduction

Under the Directive on the energy performance of buildings (2010/31/EU), if Member States decide to implement the requirements under Article 15 of the Directive regarding compulsory inspections of air-conditioning systems of an effective rated output of more than 12 kW using an alternative procedure as referred to in paragraph 4, they must submit to the Commission a report on the measures equivalent to those referred to in paragraphs 1, 2 and 3 of the article no later than 30 June 2011. Member States must submit such a report to the Commission every three years.

Finland is implementing the requirements of Article 15 of the Directive on the inspection of air-conditioning systems using an alternative method as referred to in paragraph 4 of the article. In 2013, the Finnish Parliament passed Act 52/2013, repealing the earlier legislation on the inspection of air-conditioning systems and opted for an alternative guidance procedure instead of mandatory inspections of air-conditioning systems. The Equivalence Report sent by Finland to the Commission on 1 October 2013 described a mandatory inspection procedure for air-conditioning systems and a method for estimating energy saving, and gave an assessment of the effects of savings themselves. The Equivalence Report also described Finland's alternative procedure and its method for estimating the effect of savings, and gave an assessment of the effects of savings themselves. The Report showed that the impact of the alternative procedure would correspond to the effects of the inspection procedure referred to in Article 15(1-3) in the period 2013-2015

This follow-up report describes how the alternative procedure is being implemented in the period 9 January 2013 – 30 June 2014. The equivalence of the inspection procedure to the alternative procedure is assessed. An evaluation is also undertaken of the implementation of the alternative procedure itself and the achievement of results in the future.

The reference material used in compiling the follow-up report was the Equivalence Report, monitoring data on the alternative procedure and expert opinions.

2. Air-conditioning systems in Finland

The Equivalence Report submitted earlier described the building stock in Finland and its use of energy, various air-conditioning systems and their numbers, and an estimate for energy consumption in different types of building. This follow-up report reproduces just the key data and tables for air-conditioning systems and their energy consumption in different building types.

In the surveys in this report, air-conditioning systems are divided into three categories for output (Table 2.1). The examination of the energy efficiency of an air-conditioning system and its scope very much depends on the equipment's power rating.

Table 2.1 Classification of air-conditioning systems

Classification of air-conditioning systems	
Power rating	**Size of appliance**
12-70 kW	small cooling system
70-300 kW	medium-size cooling system
300 kW	large cooling system

There are no statistics on air-conditioning systems in Finland, and systems are not approved or registered as part of the building permit process for new construction or renovations. Nor is energy used for cooling generally measured in older systems. Since 2012, the Ministry of the Environment Decree on the Energy Efficiency of Buildings (2/11) has provided guidelines on the installation of meters for new air-conditioning systems, so in future there may well be more satisfactory data available on their energy consumption. Expert assessments suggest that nearly all of the medium-sized (70-300 kW) and large (over 300 kW) air-conditioning systems used in Finland feature a monitoring system connected to a building's automation systems.

Cooling systems in Finland are mainly used in the four warmest months of summer. The annual energy consumption for cooling systems in Finland is estimated at 377 GWh overall, corresponding to 0.4 % of all electricity consumption in the country and 0.9 % of the power consumption of buildings. The consumption of energy used for cooling mainly consists of that for 123 kW air-conditioning systems (heat pumps), air-conditioning systems with an output of more than 12 kW and district cooling energy (Table 2.2).

Table 2.2 Consumption of electricity used for cooling in air-conditioning systems by cooling system

Consumption of electricity used in air-conditioning systems in Finland in 2012	
	Consumption of electrical energy used for cooling
Cooling system	**GWh**
Air-conditioning system with an output of more than 12 kW (= target group for the inspection procedure)	279
Air-conditioning systems with an output of no more than 12 kW (heat pumps)	46
District cooling	52[1]
Total	**377**

[1] corresponds to the sale of 131 GWh of district cooling

Air-conditioning systems with an output of no more than 12 kW are in practice heat pumps in private houses. The volume of the consumption of electrical energy for cooling systems in private houses, 46 GWh, is based on a study of the consumption of electricity by households.[1]

The energy consumption of other cooling systems (air-conditioning systems with an output of more than 12 kW and district cooling) and cooled gross floor area were calculated with reference to expert opinions and statistics on the building stock. The calculation is given in detail in Appendix 3 to the Equivalent Report. The expert opinions related to the more prevalent use of cooling by building type in the building stock representing different age. The assessments and statistics on surface area of the building stock of different ages enabled an evaluation to be made regarding the cooled gross floor area in each building type. The typical electrical energy consumption for cooling systems for each building type was determined through simulations of sample buildings. The results of the exercise are given in Appendix 4 to the Equivalence Report. The annual energy consumption from cooling by building type was obtained by multiplying typical consumption by the cooled floor area (Table 2.3).

Table 2.3 Gross floor area cooled using air-conditioning systems with an output of more than 12 kW and district cooling and the annual consumption of electrical energy in cooling systems

	Floor area cooled using air-conditioning systems	Prevalence of cooling systems	Typical consumption of electrical energy in cooling systems	Annual consumption
Building type	**Million square meters**	**%**	**kWh/floor -m²**	**GWh**
Commercial buildings	13.47	47.5	13.0	175.0
Office buildings	4.70	24.5	15.3	71.9
Transport buildings	0.00	0.0	14.0	0.0
Care sector buildings	3.53	30.3	19.6	69.3
Assembly rooms/conference centres	0.69	7.5	14.0	9.6
Educational buildings	0.83	4.6	6.0	5.0
Industrial buildings	0.00	0.0	14.0	0.0
Warehouses and stores	0.00	0.0	14.0	0.0
Total	**23**			**331**

The energy consumption figure of 331 GWh for cooling systems in buildings other than private houses obtained from the calculation was divided between systems that use district cooling and air-conditioning systems with an output of more than 12 kW. This division was undertaken with reference to the sales statistics for district cooling in the energy industry. The annual consumption figure for district cooling was 131 GWh in 2012[2], which corresponds to around 52 GWh of the consumption of electrical energy by cooling systems.

Article 15(1) of the Directive calls for an inspection of air-conditioning systems with an output of more than 12 kW. If the electrical energy consumption from cooling equivalent to district cooling is 52 GWh, that for the cooling systems that the inspection obligation relates to is 279 GWh (221 – 52= 279). Thus, the consumption of electrical energy for the air-conditioning systems included in the inspections in Finland is very low (0.65 %) compared to that for buildings generally.

The number of air-conditioning systems included in the inspection procedure for buildings is currently around 37 000 (Table 2.4). The figures are based on a preliminary survey that the

Ministry of the Environment had carried out in connection with the implementation of Directive 2002/91/EU.[3] The data in the preliminary survey has been updated using expert estimates of air-conditioning systems installed in the period 2002-2012.

Table 2.4 Number of air-conditioning systems and the consumption of electrical energy in cooling systems by power rating

Power rating	Size of appliance	Number of air-conditioning systems in the preliminary survey	Number of air-conditioning systems in 2012
kW		**No.**	**No.**
12-70	small cooling systems	19 000	21 000
70-300	medium-size cooling systems	10 000	12 000
300-	large cooling systems	3 500	4 000
Total		**32 000**	**37 000**

In the future, the consumption of energy in cooling systems is expected to rise steadily, because today users are opting for more stringent conditions regarding indoor air and the efficient use of space in buildings is improving. The current speed of growth can be expected to continue over the next five years. The increase in the use of energy used for cooling by air-conditioning systems is estimated in Table 2.5. The estimate is based on the volume of construction work in the period 2013-2015 and expert opinions on the overall share of cooling in new buildings.

Table 2.5 Annual increase in the consumption of electrical energy for cooled floor areas and cooling systems 2013-2015

	Trends in cooling 2013-2015				
	Estimate of the volume of new construction work each year in the period 2013-2015	Overall share of cooling in buildings completed in 2012-2012	Annual increase in the cooled floor area	Typical consumption of electrical energy in cooling systems	Annual increase in consumption
	Million square meters	**%**	**Thousand square meters**	**kWh/floor - m²**	**GWh**
Detached and semi-detached houses	1.77	5	88.38	1.0	0.09
Terraced houses	0.34	8	26.92	1.0	0.03
Apartment blocks	1.32	1	13.19	1.0	0.01
Commercial buildings	0.73	95	693.04	13.0	9.01
Office buildings	0.27	95	255.64	15.3	3.91
Transport buildings	0.23	0	0.00	14.0	0.00
Care sector buildings	0.22	95	206.89	19.6	4.06
Assembly rooms/conference buildings	0.09	40	36.54	14.0	0.51
Educational buildings	0.21	40	82.68	6.0	0.50
Industrial buildings	0.71	0	0.00	14.0	0.00
Warehouses and stores	0.56	0	0.00	14.0	0.00
Total	**6.44**		**1 403**		**18.1**

Table 2.6 shows the distribution of the annual growth in the use of cooling systems by air-conditioning system. For the trend in district cooling, general developments in the industry in recent years – i.e. about 10 % of the growth rate – have been referred to. The increase in the consumption of electrical energy in cooling systems for air-conditioning with an effective rated output of more than 12 kW or less is divided by the same figure as that for their current consumption of electricity for cooling (Table 2.2).

Table 2.6 Distribution of the annual increase in the consumption of electricity used for cooling by cooling system

Increase in the annual consumption of electricity used in air-conditioning systems in Finland 2013-2015	
	Annual growth in cooling
Cooling system	**GWh**
Air-conditioning system with an output of more than 12 kW	11.1
Air-conditioning systems in residential buildings (heat pumps with an output of no more than 12 kW)	1.8
District cooling	5.2[1]
Total	**18.1**

[1] corresponds to the sale of 13 GWh of district cooling

Further information on air-conditioning systems with an effective rated output of more than 12 kW subject to the inspection procedure and those systems not covered by it (district cooling and heat pumps with a maximum output of 12 kW) are given in the earlier Equivalence Report.

3. Energy savings with the mandatory inspection procedure

The Equivalence Report submitted in October 2013 described the mandatory inspection procedure in place for air-conditioning systems in Finland as from 1 January 2008 with the entry-into-force of the Act on the Inspection of the Energy Efficiency of Air-conditioning Systems in Buildings (489/2007). The inspections, which had begun as a result of Directive 2002/91/EC, were abandoned when Act 52/2013 of 1 June 2013 entered into force. Finland decided to opt for the alternative guidance procedure under Directive 2010/31/EU rather than regular inspections of air-conditioning systems.

The Equivalence Report also described a new draft Act that corresponded to the obligations in Directive 2010/31/EU regarding compulsory inspections of air-conditioning systems. The draft Act would have been followed in Finland had the procedure been selected to implement Article 15 of the Directive.

The method for calculating energy savings as a result of compulsory inspections is described in detail in the Equivalence Report. The Report also gave details of the raw data used in, and the assumptions made for, the calculation, as well as a sensitivity analysis.

The Equivalence Report gave an estimate of energy savings of 5.2-15.7 GWh per annum achieved by means of an inspection procedure of air-conditioning systems with an effective rating output of more than 12 kW. The savings for the entire inspection period 2013-2015 are

expected to be twice the annual saving, i.e. 10.5-31.3 GWh, because inspections under the new draft Act would only be able to be conducted in the summertime in 2014-2015. Consequently, this follow-up report does not contain an assessment of the effects of energy savings of compulsory inspections for the follow-up period 9 January 2013 – 30 June 2014 either.

The savings achieved through compulsory inspections each year and for the inspection period 2013-2014 are given in Table 4.1.

Table 4.1 Overall savings effects of compulsory inspections

	Overall energy saving effects of compulsory inspections **GWh**
Estimate of the annual saving	5.2 - 15.7
Total savings in the period 2013-2015	10.5 - 31.3

4. Energy savings with the alternative procedure

4.1 Measures under the alternative procedure in the follow-up period

All cooling systems in Finland come under the alternative procedure: affected are the users of cooling systems with an output of more than 12 kW, cooling systems with an output of not more than 12 kW (air source heat pumps) and district cooling systems. Owing to the wider target group, the figure for electrical energy consumption in cooling that is the area of focus is 377 GWh per annum, while with the mandatory inspection procedure it was approximately 100 GWh less (279 GWh per annum).

The planned content of Finland's alterative procedure was described in detail in the Equivalence Report submitted to the European Commission in October 2013. The procedure consists of special guidance measures, voluntary inspections of the energy efficiency of air-conditioning systems and many approaches to improving the energy efficiency of an air-conditioning system, such as legal provisions on construction, tax deductions, energy efficiency agreements, energy audits and energy certificates. These measures are not now covered in this follow-up report other than inasmuch as how they were implemented in the follow-up period 9 January 2013 – 30 June 2014.

The legislation on compulsory air-conditioning system inspections was repealed with a new Act entering into force on 1 June 2013. The alternative procedure was introduced that year. To organise its go-ahead, the Ministry of the Environment commissioned the publication of the 'Preliminary survey of the implementation of the alternative procedure for air-conditioning systems' (Appendix 1), which was completed in spring 2014. It finds that there are very many properties covered under the guidance procedure measures and actors associated with them. To make the implementation of measures, communications and monitoring viable and cost-effective, there would need to be one central coordinator in the organisation that would prompt the implementation of measures and communications, and be

responsible for developments in the monitoring of the guidance procedure and for gathering any monitoring data. The Ministry of the Environment has chosen Motiva Oy as that coordinating body.

The Equivalence Report submitted to the Commission earlier described as special guidance measures the effects of ventilation according to need and temperature settings on the energy consumption of cooling systems, night-time ventilation and guidelines on preventive maintenance. Actors in the field have been responsible for communications on these subjects in ways suited to the various target groups. For example, in May 2014 a professional magazine for the heating, plumbing and ventilation industry published as a news item the article entitled 'Summer comes to the Office', which focused attention on such matters as the right temperature in the cooling season, ventilation according to need, night-time ventilation and the service and maintenance to be carried out prior to the cooling season (Appendix 1). In summer 2013 and May 2014, at the start of a warm spell, Motiva provided information on how to avoid cooling, tips on the use of cooling and ventilation equipment, and the energy labels on room air-conditioning appliances.

Consumers have been given guidelines on the use and maintenance of air source heat pumps, ventilation, summertime cooling and night-time ventilation in such publications as Motiva's 'Holiday-home Guide'. The Guide is available at http:/motiva.fi/files/8560/Paranna ja yllapida loma-asumisenebergiatehokuutta.pdf. In summer 2014 a hard copy of the guide was also available.

April 2013 saw the start of Motiva's new energy advice service at www.eneuvonta.fi, which provides impartial and reliable advice on energy online. The service in spring 2014 produced three videos on air source heat pumps that attempt to give guidance on the correct use and maintenance of the equipment (https://www.youtube.com/user/motivaoy/videos). The videos are entitled 1) Energy efficient heating with an air source heat pump, 2) Maintenance of an outdoor air source heat pump, and 3) Cleaning the filter on an air source heat pump.

Voluntary energy efficiency inspections of air-conditioning systems have been developed in the project 'Procedure for the condition survey of ventilation and air-conditioning systems and equipment', which is being implemented together with SULVI (Finnish Association of HVAC Societies) and other operators in the industry partly under the auspices of the Ministry of the Environment. The project is described in the Equivalence Report submitted to the Commission earlier. The condition survey was piloted at the end of 2013 in a few residential apartment blocks, a school building and in an office building that was used by several companies. The project is still receiving the finishing touches. The procedure is to be published in the form of Finnish Building Information Group building service and property cards, which are primarily intended for professionals in the construction industry and are widely used information products. The condition survey instructions are available on SULVI's website. The project has included the organisation of seminars for specialists and professional journals in the field have produced articles on the project (Appendix 2). The expectation stated in the Equivalence Report was that the condition survey procedure would be completed at the end of 2013 and marketing would begin at the start of 2014. However, the project's implementation has been delayed. When the procedure is complete, the intention is to market it to a wide range of building owners.

4.2 Other measures aiding the guidance procedure

The Equivalence Report sent the Commission in October 2013 described other measures under the guidance procedure. They were to do with energy efficiency agreements, energy audits, energy certification and the energy labels on air source heat pumps. The Report also

described other measures aiding the alternative procedure, such as measuring the electrical and cooling energy of systems, structural solutions to reduce the need for cooling, household tax deductions, the use of specialists in the choice of cooling appliances, and guidelines on the correct use of an air-conditioning system. The Report does not assess the savings obtained from these measures and nor does this follow-up-report.

As stated in the Equivalence Report, the current energy efficiency agreements are in force until the end of 2016. Consequently, no further obligations regarding measures to save energy with air-conditioning systems will be added to them before 2017. In 2017, it is likely that the work under the energy efficiency agreements will continue on the basis of new agreements. Talks on the new energy efficiency agreements will be conducted by the Ministry of Employment and the Economy, the Ministry of the Environment and other parties to the agreements, who will examine the possibility of adding energy efficiency obligations for air-conditioning systems to future agreements. It might be possible to require, for example, the use of voluntary inspections for air-conditioning systems or other measures affecting the energy efficiency of air-conditioning systems under such obligations. Talks on the content of the new agreements will start in 2015.

There have been no changes regarding the energy audits since the situation presented in the Equivalence Report. The new legislation on energy certificates for buildings entered into force on 1 June 2013, and in 2014 there will be an information system on them. Motiva Oy has provided information on air source heat pump energy labelling and guidelines to consumers on the selection of more energy efficient appliances.

Other measures aiding the voluntary procedure are the provision of information and advice on buying air-conditioning systems, their use and maintenance. Some of this has already appeared in the form of bulletins and newspaper articles, but otherwise these measures under the alternative procedure will be introduced in 2014.

4.3 Energy savings in total under the guidance procedure

The Equivalence Report submitted to the Commission in October 2013 estimated yearly savings of 6.5 -17.8 GWh achieved using the alternative procedure. The savings for the entire reporting period 2013-2015 in the energy consumption of cooling systems would be 13.0 - 356 GWh, according to the Report. The estimate for savings throughout the period was obtained by multiplying annual savings by two. The Report suggested that the reason for this is that the guidance procedure had only just got off the ground and would mainly be conducted in the summertime, so the savings were only assessed for 2014 and 2015. The calculation methods and the raw data used in, and assumptions made for it, were described in detail in the Equivalence Report.

In the follow-up period 9 January 2013 – 30 June 2014, Finland saw the commencement of the implementation of the alternative procedure. The procedure will not have been fully implemented until the end of 2014. The measures taken have included information services and the development of the condition survey procedure for air-conditioning systems, the timetable for which has been delayed compared to what was estimated in the equivalence Report. No estimated results for savings have been produced in practice in the follow-up period 9 January 2013 – 30 June 2014. Nor are savings expected to be made in this period, as stated in the Equivalence Report.

The method for monitoring measures under the alternative procedure is being developed in a coordination project run by Motiva. In the future, the savings resulting from these measures can be estimated with reference to the monitoring data.

5. Savings with the alternative procedure as compared with those with the inspection procedure

The Equivalence Report submitted earlier estimated the savings achieved using the compulsory inspection method at 5.2 – 15.7 GWh a year and those under the alternative procedure at 6.5 – 17.87 GWh (Table 5.1). The total savings estimated in the period 2013-2015 using the compulsory inspection were 10.5 – 31.3 GWh. The energy savings for the same period using the alternative procedure were 13.0 – 35.6 GWh.

Table 5.1 Total energy savings achieved under the inspection and guidance procedures

	Inspection procedure	**Guidance procedure**
Estimate of annual energy savings GWh per annum	5.2 - 15.7	6.5 - 17.8
Estimate of total savings in the period 2013 – 2015, GWh	10.5 - 13.3	13.0 - 35.6

The total savings resulting from compulsory inspections and the alternative procedure were estimated in the Equivalence Report with reference to savings for just two years (2014 and 2015), as the inspections under the new legislation would only be able to be conducted in summer 2014 and 2015. The alternative guidance procedure was commenced in 2013, when the former law on compulsory inspections was repealed. The alternative procedure was not expected to be fully under way until 2014, and more particularly in the summer of that year, so the first results would not be obtained until the end of 2014. Consequently, neither procedure was expected to make energy savings in the period 9 January 2013 – 30 June 2014, and so this follow-up report contains no data on savings for this period.

The alternative procedure is to go ahead in the future as planned, and no new additional measures will be required according to present estimates. Nevertheless, if energy savings are to be achieved, it is essential that advice reaches the target groups and that measures are implemented to improve the energy efficiency of air-conditioning systems. It is also important that planned measures are not subject to delay.

As the Equivalence Report stated, savings with Finland's alternative procedure will be greater than those achieved using compulsory inspection procedures. Thus, the alternative procedure undertaken by Finland under Article 15(4) of the Directive corresponds to the inspection procedure referred to in paragraphs 1-3 of the article.

6. Summary

This follow-up report evaluates the equivalence between the inspection procedure for air-conditioning systems under Article 15 of the Directive on the energy performance of buildings (2020/31/EU) and the alternative procedure referred to therein in the period

9 January 2013 - 30 June 2014. The reference material used was the Equivalence Report submitted to the Commission in October 2013, which described the compulsory inspection procedure and the alternative procedure, the methods for estimating the savings gained for each, and an estimate of savings in each year and for the period 2013-2015 in total.

The annual energy savings achieved using the alternative procedure are estimated at 6.5 - 17.8 GWH, and, using the compulsory inspections, 5.22 – 15.7 GWh. Savings over the entire period 2013-2015 are 13.0 - 25.6 GWh under the alternative procedure and 10.5 – 31.3 GWh under the inspection procedure. It was assumed when making the estimate that savings with either procedure would not be gained until 2014 and 2015, mainly on account of the fact that measures would be implemented mainly in the summer of 2014. Accordingly, no results for savings are estimated for the period 9 January 2013 – 30 June 2014 from either procedure. The overall savings with Finland's alternative procedure will nevertheless be greater than those achieved under the compulsory inspection procedure, according to the Equivalence Report, so the alternative procedure undertaken by Finland under Article 15(4) of the Directive corresponds to the inspection procedure referred to in paragraphs 1-3 of the article.

The alternative procedure has been implemented in Finland virtually as planned. The guidance procedure will be fully under way towards the end of 2014, when Motiva will be national coordinator and responsible for the launch of measures and communications. The effects in terms of savings are expected to be achieved in the future with the measures now planned, so no additional measures will be needed.

7. Sources

1. **Adato**. Use of electricity by households. [Online] 2011. [Referenced: 6.7.2013.]

http://www.adato.fi/portals/2/attachments/Energiatehokkuus/Kotitalouksien_sahkonkaytto_201l_raportti. pdf.

2. **Energiateollisuus**. Statistics on district cooling. [Online] 2013. [Referenced: 20. 6. 2013.]

http://energia.fi/tilastot-ja-julkaisut/kaukolampotilastot/kaukojaahdytys.

3. **FINVAC ry & Climaconsult Finland Oy**. *Preliminary survey of the periodic inspection of an air-conditioning plant under the Directive on the energy performance of buildings (2002/91/EC). 2004*

8. Appendices

APPENDIX 1 Preliminary survey of the implementation of the alternative procedure for air-conditioning systems

APPENDIX 2 Newspaper/magazine articles on condition surveys of air-conditioning systems and on advice and guidance

Preliminary survey of the implementation of the alternative procedure for air-conditioning systems

Not available as a printed publication

Preliminary survey of the implementation of the alternative procedure for air-conditioning systems

Motiva OY

Ministry of the Environment

March 2014

Foreword

This preliminary survey explores the potential for measures under the alternative procedure for air-conditioning systems, especially from the perspective of communications. The alternative procedure for air-conditioning systems has been selected nationally for the implementation of the Directive on the energy performance of buildings (2010/31/EU). Chapter 1 gives a more detailed description of the background to the alternative procedure.

The preliminary survey was commissioned by the Ministry of the Environment and is the work of Motiva Oy, where Communications Manager Kirsi-Maaria Forsell coordinated the project. Leading expert Tapio Jalo and Head of Unit Päivi Laitila also made a contribution. Senior Engineer Marit Haakana was the person responsible at the Ministry of the Environment. The survey was mainly conducted in January – February 2014. We would like to thank all those who participated and, with respect to the condition survey of ventilation and air-conditioning systems especially, SULVI (Finnish Association of HVAC Societies), Markku Rantama and Hannu Sipilä.

The aim of this preliminary survey is to support and expedite the implementation of the alternative procedure in Finland. The Survey describes the actual measures and their scope for implementation, other secondary measures and an action and communications plan. It also proposes future measures. The Survey does not actually guarantee that the measures will all go ahead: they will need prioritising and require responsibility, given the resources that are available.

Contents

1. Background and objectives

In order to implement Article 15 of the Directive on the energy performance of buildings (2010/31/EU), Finland has opted to introduce the 'alternative procedure' for air-conditioning systems.[1]

The Ministry of the Environment has decided that the following measures correspond to the procedure:

- the condition survey procedure for ventilation and air-conditioning systems and equipment
- effect of the temperature setting on the consumption of energy in cooling
- effect of ventilation according to need on the consumption of energy in cooling
- night-time ventilation
- guidelines on preventive maintenance

Other secondary measures aiding the guidance procedure would include:

- energy efficient agreements
- energy audits
- energy certificates
- air source heat pump energy labelling
- measuring and monitoring the electrical and cooling energy used in cooling systems
- structural solutions to reduce the need for cooling
- the use of specialists in the choice of cooling appliances
- guidelines on the correct use of air-conditioning systems
- use of a household tax deduction scheme when introducing solutions

Information on the various measures will be provided to designers, planners, builders, building operations and service and maintenance personnel, and the owners of buildings. Advice and guidance will take the form of guides and training events for professionals, the provision of information in the wider context and the use of relevant internet services.[2]

Objectives of the preliminary survey and its results

The aim is to examine the implementation of the alternative procedure for air-conditioning systems in terms of:

[1] Equivalence Report on the alternative procedure for air-conditioning systems; report to the European Commission under Article 15 of the Directive on the energy performance of buildings (2010/31/EU); Ministry of the Environment 2013

[2] Equivalence Report on the alternative procedure for air-conditioning systems; report to the European Commission under Article 15 of the Directive on the energy performance of buildings (2010/31/EU); Ministry of the Environment 2013

- the scope for the implementation of measures
- the operators and agencies that may be involved in its implementation, such as training establishments and professional organisations
- the development and future measures that may be required for the implementation of measures

The measures relating to air-conditioning systems will involve the collaboration of organisations associated with the development of the condition survey procedure for ventilation and air-conditioning systems and equipment.

This preliminary survey will therefore serve as a basis for an Action and Communications plan and propose further measures to ensure that the alternative procedure for air-conditioning systems is introduced.

The project will not involve the production of training, guidance or online materials. There will be no measures or materials either relating to communications.

2. Scope for the implementation of measures

Chapters 2 and 3 present the measures described in the Equivalence Report for the alternative procedure for air-conditioning systems and assess their scope for implementation. The actual measures in the Report are given in part 2 and the secondary measures are set out in Chapter 3.

There is a large number of measures in the Equivalence Report and their secondary measures aiding the process and they are the responsibility of very many operators – depending on property types and the implementation stage of measures. It is a challenge to produce a clear Action and Communications plan, but it is vitally important if the objectives under the Directive on the energy performance of buildings are to be achieved. The Plan's implementation must be assured centrally/coordinated, so that the measures can go ahead systematically and cost-effectively and to make it possible to monitor them.

2.1 Prioritisation of measures

The scope for the implementation of measures and their prioritisation have been assessed on the basis of what property types and what stage of construction – new builds, existing use or renovations – to which they relate. Because the measures aim to reduce energy consumption associated with cooling systems, certain groups of building are ruled out of the scope for implementation on the basis of either age or use.

The implementation of measures among the target groups has been prioritised by property type in accordance with how many air-conditioning/cooling systems are used in the property type in question. Consequently, many measures targeted at existing private houses and large residential properties may be implemented, for example, by the summer of 2014: they are technical in nature and require no investment. But this target group is small and even difficult to identify, as is its impact on energy consumption.

Limitations with regard to property types

- **Private houses**: old private houses (built before 1970) are not included in the study or may be only if a mechanical ventilation system (very rarely) or an air source heat pump (frequently) are installed.
- **Residential properties (terraced houses)**: included in the study are buildings with mechanical ventilation (mechanical extract or mechanical supply and extract ventilation) and those with an air-conditioning/cooling system built into the system (either connected to the ventilation, or by means of cooling beams in the rooms or a convector). Cooled systems in residential properties are still very rare and are only to be found in very new buildings. The replacement of a mechanical ventilations system in residential properties and the use of a proper air-conditioning appliance should be considered when renovations are being carried out.
- **Commercial buildings**: special requirements for commercial buildings are imposed by properties where there are a lot of cold areas (large shops, shopping malls).
- **Office buildings**: old office buildings tend to have more appliances merely for ventilation rather than proper air-conditioning (built-in cooling system). The replacement of a mechanical ventilation system and the use of proper air-conditioning/cooling should be considered when renovations are being carried out.
- **Care sector buildings**: old buildings tend to have more appliances merely for ventilation rather than proper air-conditioning (built-in cooling system). The replacement of a mechanical ventilation system and the use of proper air-conditioning/cooling should be considered when renovations are being carried out.
- **Other service buildings** (such as educational buildings, assembly rooms and conference centres): the consumption of energy due to cooling is minimal and more reliant on ventilation systems than proper air-conditioning/cooling. The replacement of a mechanical ventilation system and the use of proper air-conditioning/cooling should be considered when renovations are being carried out.

2.2 The condition survey procedure for ventilation and air-conditioning systems and equipment

The condition survey procedure for ventilation and air-conditioning systems and equipment is a project involving SULVI (Finnish Association of HVAC Societies) and other actors in the field, partly under the auspices of the Ministry of the Environment. The project represents the attempt to develop a large-scale and hopefully cost-effective voluntary inspection procedure for ventilation and air-conditioning systems in buildings, one that covers European standards CEN 15239 and 15240 for checks on such systems. The project ended this year (2014).

The inspection aims to discover the general state of the system in question, faults requiring immediate repair, the repair needs and their priority, the consumption of energy and water by the property and system, and the potential for improving energy efficiency, and compares the general state of the property with equivalent properties. The inspection procedure is being

developed for separate systems (ventilation and air-conditioning), so that it can also be applied separately to individual parts of the system.

2.2.1

Further action and development measures

Further action

Finishing touches: the introduction of the ventilation condition survey completed at the start of 2014 itself requires an inspection model, its data to be completed and the publication of guidelines.

- Finnish Building Information Group building service and property cards, which are primarily are being introduced (in partnership with SULVI, the Finnish Association of HVAC Societies)
- SULVI (Finnish Association of HVAC Societies) is planning the publication of a guide

Training and qualifications: The training of qualified personnel will be organised and a qualifications system started.

Piloting: For the model to be fully deployed, a pilot project that is broader in scope is required to reach more customers and inspectors. Piloting will highlight the existence of the necessary sample sites and the model can be marketed more widely.

Other matters arising:

- the branding/pricing/possible potential for support regarding the inspection (cf. energy audits)
- monitoring/reports: how to monitor the inspections and evaluate their impact? Is it necessary to monitor who gathers the date, etc.?
- how can good results and good examples be found in the future?
- how can the results and good examples of the inspection procedure and the inspections themselves be used more widely at different sites?

Communications:

The pilot sites in the development project should be used as examples in bulletins and newspaper articles and it should be ensured that the results of the wider pilot project can be used to market the model.

The inspection model must be presented to different target groups: e.g. to the companies and local authorities that have signed energy efficiency agreements at special events, in the energy efficiency agreement online service (especially for the property and local government sectors), in the property and local government media, and at other functions.

The introduction of the training and qualifications system will also require communications and marketing activity.

2.2.2 Possible actors

Pilot project: SULVI (Finnish Association of HVAC Societies), Association of Finnish Local and Regional Authorities, Confederation of Finnish Industries (companies associated with the energy efficiency agreement in business), RAKLI (companies associated with the energy efficiency agreement for office premises and the Energy Programme for Rented Dwellings), Finnish Real Estate Federation.

Training and qualifications programme: SULVI (Finnish Association of HVAC Societies), FISE, KIINKO Real Estate Education, the Finnish Property Training Foundation, AEL (training events organiser), Amiedu vocational adult education centre.

Marketing, communications, implementation: RAKLI, Finnish Real Estate Federation, property management companies such as Sponda, Ovenia, Aberdeen, the Real Estate Employers association, SULVI (Finnish Association of HVAC Societies).

2.3 Effect of a temperature setting on the consumption of cooling energy

The temperature setting for cooling refers to the room temperature above which the cooling system kicks in. Raising the accepted indoor temperature during hot weather by a degree or two saves energy and can make the area feel more comfortable for users, when the indoor and outdoor temperatures are closer to one another. Indoor air cooled to 25-26 °C feels agreeable, because the cooling of the air in the room has taken away the moisture.

Communications speak about the effect of the temperature setting on the consumption of energy due to cooling and sensible temperature settings for cooling and advise those responsible for a property's ventilation to raise the temperature setting for cooling, especially in warm weather.

2.3.1 Further action and development measures

Communications and guidance are targeted at residents of private houses and the operations and maintenance personnel in large properties (large residential buildings and office, commercial and care sector buildings) as well as the owners of property and those responsible for the use of space.

Seasonal summer information sheets advise on the raising of temperature settings for the residents of private houses. One example is the Guidelines Accompanying the Private House Service Manual. There is also a need for guidelines on the use of heat pumps: those produced by manufacturers/importers, fitters and engineers as well as the training given by them are important sources of information.

The operations and maintenance staff of large properties should be provided with materials adapted according to the property type that can also be used for training purposes.

2.3.2 Possible actors

The organisations associated with temperature settings are the Finnish House Owners' Association, Association of Finnish Local and Regional Authorities, Confederation of Finnish Industries (companies associated with the energy efficiency agreement in business), RAKLI (companies associated with the energy efficiency agreement for office premises and the Energy Programme for Rented Dwellings), Finnish Real Estate Federation, The Real Estate Employers association, SULVI (Finnish Association of HVAC Societies), KIINKO Real Estate Education, AEL, Amiedu and Finnish Heat Pump Association SULPU.

2.4 The effect of ventilation according to need on the consumption of energy in cooling

Ventilation according to need is that where the volume of supply air remains based on a prevailing parameter in a room (e.g. air temperature, CO2 content or moisture). The technique makes considerable savings in costs in the use of energy in blowers and cooling, because the energy is used only when required.

Information on this is to go to users of air-conditioning systems with an output of more than 12 kW and those based on district cooling (with new buildings the coverage will be 5-10 % of the user groups mentioned; that for the existing building stock will be about 1-2 % in the form of steps take when properties are being refurbished). In the case of new construction and refurbishments, it needs to be ensured in the design solutions that ventilation is used according to need.

2.4.1 Further action and development measures

In order for ventilation according to need to be taken into account in new construction or refurbishment projects, data needs to be produced that helps the designer, builder and contractor. The role of operations and maintenance personnel is also important.

- Development of data for new construction and refurbishment projects by building type
- Materials on the use of ventilation according to need for operations and maintenance personnel in properties

2.4.2 Possible actors

The actors associated with ventilation according to need might primarily be the owners of buildings or hose occupying them and the designers of buildings: Senate Properties, the Association of Finnish Local and Regional Authorities, Confederation of Finnish Industries (companies associated with the energy efficiency agreement in business), RAKLI (companies associated with the energy efficiency agreement for office premises and the Energy Programme for Rented Dwellings), Finnish Real Estate Federation, property management companies such as Sponda, Ovenia, Aberdeen, The Real Estate Employers association, Finnish House Owners' Association (private houses), SULVI (Finnish Association of HVAC Societies), Finnish Association of Architects (SAFA), Finnish Association of Civil Engineers (RIL), etc.

2.5 Night-time ventilation

Night-time ventilation refers to the improved efficiency of ventilation in summer using a ventilation appliance or window ventilation during the night, when the outdoor temperature is lower than that indoors. The more effective exchange of air represents the attempt to taking the heat energy stored in structures during the daytime out of the building merely by having the cool outdoor air circulate in the building. Night-time ventilation with a ventilation system fitted in a building's automation systems can be achieved using function settings.

Information on air-conditioning systems with an output of more than 12 kW or based on district cooling contains advice on how to achieve night-time ventilation in an air-conditioning system controlled by the building's automation system (in particular office and commercial buildings).

Furthermore, it is easy to achieve this in residential buildings too: customers are advised to keep windows open and/or, if there is a mechanical ventilation system, the volume of air can be increased during the night.

Customers residing in private houses can be given information on the effect of night-time ventilation on a dwelling's daytime temperature and they can be told about the savings to be made compared to using an air source heat pump.

2.5.1.1 Further action and development measures

To achieve night-time ventilation, especially in office and commercial buildings, guidelines need to be produced for property operations and maintenance staff.

2.5.2 Possible actors

The possible actors associated with night-time ventilation might be Senate Properties, the Association of Finnish Local and Regional Authorities, Confederation of Finnish Industries (companies associated with the energy efficiency agreement in business), RAKLI (companies associated with the energy efficiency agreement for office premises and the Energy Programme for Rented Dwellings), Finnish Real Estate Federation, property management companies such as Sponda, Ovenia, Aberdeen, The Real Estate Employers association, Finnish Energy Industries (district cooling) and companies in the energy sector that supply district cooling, Finnish Real Estate Management Federation (residential properties), Finnish House Owners' Association (private houses), etc.

2.6 Guidance on preventive, regular maintenance

Switching from maintenance when the air-conditioning system develops a fault to preventive (periodic) maintenance reduces the incidence of faults caused by the misuse of the equipment and damage to the appliance and lengthens the working life of existing equipment. The correct operation and use of an air-conditioning system is also a fundamental consideration when aiming for a satisfactory and healthy indoor climate. If the temperature is planned it

also improves general comfort. One measure in the guidelines would be the recommendation for a condition survey of the ventilation and air-conditioning system.

Preventive maintenance is important with air-conditioning systems with an output of more than 12 kW or based on district cooling. The preventive maintenance of air-conditioning systems with an output of no more than 12 kW, i.e. mainly air source heating pumps in fact, is fairly unimportant, because the only maintenance procedure involved is the vacuuming of the filters (should be done about once a month), and this the consumer can do himself/herself.

2.6.1 Further action and development measures

Guidelines/recommendations for operating and maintenance personnel in properties and for the owners of properties should be produced on preventive maintenance, which would also incorporate a recommendation for a survey of the condition of the ventilation and air-conditioning system. The preventive maintenance guidelines could contain checklists to aid the inspection of the property to discover the system's viability and to assess the need for service and maintenance.

2.6.2 Possible actors

The possible actors associated with preventive maintenance might be Senate Properties, the Association of Finnish Local and Regional Authorities, Confederation of Finnish Industries (companies associated with the energy efficiency agreement in business), RAKLI (companies associated with the energy efficiency agreement for office premises and the Energy Programme for Rented Dwellings), Finnish Real Estate Federation, property management companies such as Sponda, Ovenia, Aberdeen, The Real Estate Employers association, Finnish Energy Industries (district cooling) and companies in the energy sector that supply district cooling, SULVI (Finnish Association of HVAC Societies), Finnish Real Estate Management Federation (residential properties), Finnish House Owners' Association (private houses), etc.

3. Other secondary measures

Secondary measures to aid the promotion of the energy efficiency of air-conditioning systems include:

- more effective guidelines for those associated with energy efficiency agreements on the correct use of air-conditioning systems
- examples of successful energy audits and encouragement for conducting such audits
- notification of the benefits and savings achieved through energy certificates
- details of the energy labelling of air source heat pumps and guidelines in the choice of the most energy efficient equipment
- guidelines on the need for measuring cooling energy and the importance of monitoring consumption

- exploration of structural solutions to reduce the need for cooling
- guidelines on the use of specialists in the design and planning of air-conditioning systems, especially where the system is being replaced or improved
- guidance from the 'Cool wisely' bulletins on the correct use of air-conditioning systems
- motivating consumers through the household tax deduction to maintain their ventilation and air-conditioning systems and attend to the energy efficiency of air-conditioning appliances

The next section examines the relevant measures and proposes further action to the main measures set out in Chapter 2 and, in particular, the procedure for monitoring them.

3.1 Energy efficiency agreements

Energy efficiency agreements have been concluded in Finland for various sectors: included are business and industry, the energy sector, the service sector (including action programmes with the Finnish Hospitality Association MaRa, SEFE, the Finnish Association of Business School Graduates, the Finnish Central Organisation for Motor Trades and Repairs, Finnish General Services), the property sector (including action programmes with the Rented Accommodation and Office Premises Corporations), local government, the oil industry, the freight and public transport sectors and farms.

Energy efficiency agreements constitute a voluntary instrument to meet the needs for energy efficiency and they will remain in effect until 2016. The agreements are intended to achieve an energy saving of 9 % under the Energy Services Directive for target groups outside the Emissions Trading System by 2016 (estimated on the basis of average energy consumption in the period 2001-2005). The agreements reflect the desire also to expedite the deployment of new energy efficient technology and increase the use of renewable energy.

The operators involved produce plans to boost the efficient use of energy, with recommended action (energy audits, etc.).

Further action

- For the period starting after 2016 there should also be a recommendation to conduct surveys of the condition of ventilation and air-conditioning systems, etc. in properties. This should lead to the introduction of other methods and guidelines recommended for the survey. The energy efficiency agreements do not impose obligations with regard to measures; instead, operators have been able to suggest measures themselves, on a somewhat informal basis. Some of the agreements propose types of measure for which the savings potential has also been suggested.
- The yearly report on the energy efficiency agreements and the companies and organisations that have signed agreements may be used to monitor the guidance procedure with reference, say, to reported action taken or by presenting them with questionnaires on measures under the guidance procedure.

3.2 Energy audits

The aim of energy audits is to analyse the total use of energy at the relevant sites, examine the energy savings potential and present suggested measures for saving energy together with statements of cost-effectiveness. The energy audits are also there to examine opportunities for the use of renewable forms of energy. They rely on data on production, energy consumption and use at the time they are undertaken.

They report on the effect of the proposed measures on CO2 emissions in addition to the energy savings potential.

The Ministry of Employment and the Economy provides support for the performance of energy audits in the service, industrial and energy sectors. The Ministry also supports energy audits relating to renewable energy. Other energy audits include those for residential buildings.

Further action

- State support should be considered for condition surveys and energy audits of ventilation and air-conditioning equipment
- The measures set out in Chapters 2 and 3 should be included in the proposals for action in the energy audits: further details on the savings potential of measures and of the costs involved should be available to those conducting energy audits.

3.3 Energy certification

Energy certification is a tool for comparing the energy efficiency of buildings and improving it when they are being sold or let. They make it easy to compare different buildings as they are based on the features of the building and the energy consumption resulting from them. The energy efficiency classification shown on the certificate is based on estimated consumption.

Energy certification also extends to recommendations for savings made by a professional, which can help improve a building's energy efficiency.

Energy certification should be proposed for new construction ventures when a building permit is being applied for and when existing buildings are being sold or let. The requirement would not apply to all buildings or situations.

Further action

- Where possible, the measures set out in Chapter 2 should be taken into account when proposing suggestions for action in an energy certificate for a building. The suggestions can be monitored via the future energy certification register held by the Housing Finance and Development Centre of Finland, ARA.

3.4 Energy labelling of air source heat pumps

The energy labelling of air source heat pumps has been practised since 2002. At the start of 2013, the EU Regulation on energy labelling for room air-conditioning equipment entered

into force. Labelling applies to all room air-conditioning equipment using mains electricity as an energy source and air as the heat transfer agent with an effective rated output of no more than 12 kilowatts.

Energy labelling relates to two groups of equipment depending on their features: 1) both dual-function and just cooling/heating equipment, and 2) both dual-function and just cooling/heating single or dual-channel air-conditioning equipment.

For a purchaser of air source heat pumps, a label provides excellent information on the appliance's properties in different climactic localities and describes the equipment's power rating when used for both heating and cooling.

Further action

- Purchasers of air source heat pumps should be provided with information on the purchase and energy efficient use of equipment. More guidelines in particular are required on the use of cooling systems in the summer (connected with temperature settings).

3.5 Measuring and monitoring electrical and cooling energy with cooling systems

The Finnish Standards and Building Code regulates on the measurement of energy consumption in cooling (section D3 2012). Measuring must apply to all cooled buildings (except for detached and terraced houses), and the cooling system must be designed and built in such a way that its electrical output and cooling energy can be easily measured.

Further action

- measuring should be an element in renovation work when an air-conditioning system is being installed as part of the general refurbishment of ventilation at a site
- the energy consumption of a cooling system should be monitored and reported on separately as part of the exercise to measure the energy consumption of a building (heat, electricity and water). The monitoring procedure can also help verify the effects of measures other than those set out in Chapter 1.

3.6 Structural solutions to reduce the need for cooling

The Finnish Standards and Building Code calls for buildings to be designed to prevent the unnecessary heating of areas mainly through structural and other passive solutions and more efficient ventilation at night. The obligation applies to new buildings. The regulation took effect in 2012 (Source: Finnish Standards and Building Code section D3 [2012], chapter 2.2).

Structural and passive solutions include windows (reflectivity of window-panes, window size and location and ways to produce shade: blinds, awnings, canopies, lattices), and the direction a building faces on a plot, noting the position of trees on a plot, etc.

Further action

- New construction projects should pay more attention to structural solutions right at the planning stage. Information on solutions, how to employ them, and energy savings should be produced for builders, contractors, planners, designers, professionals in the construction sector and the house building and construction industry.
- There should be information available on structural solutions and their benefits in renovation work for planners, designers and the owners of properties.

3.7 The use of specialists in the choice of cooling equipment

It is important to use the advice of specialists in the choice of cooling and air-conditioning equipment to ensure that appliances and systems are designed appropriately and that they are installed according to plan.

Further action

- The use of professionals should be recommended especially to the builders, renovators and owners of private houses. On the other hand, it needs to be ensured that there is the necessary number of specialists available for such sites. It is difficult to find such people, and this is evident from the feedback received by Motiva and PRKK (Finnish Development Centre for the Construction of Private Houses) (Motiva guidelines, PRRK renovation surveys).
- To make the use of professionals more widespread at the design stage, the planning work should be subject to the household tax deduction (see also 3.9).
- The unclear branding and pricing for the work of professionals in the heating, plumbing and ventilation sector (hourly or contract-based billing, complication or vagueness associated with billing criteria) is one of the drawbacks in hiring a design specialist. (Source: feedback on Motiva's guidance, PRRK renovation survey). It is also a problem finding the right people, one that should be solved with the use of a general register, for example (cf. the Sähkötreffit service in the electricity sector that gives the contact details of electrical engineers and contractors and other information on the company in question).

3.8 Guidelines on the correct use of air-conditioning systems

Guidelines on the correct use of air-conditioning systems can achieve benefits both in the form of more efficient energy consumption and improved indoor air conditions.

Further action

- Guidelines on the use of air-conditioning systems should be available by property/system type. They should pay particular attention to commercial buildings, for example, where there are cold areas.
- Consumers should be provided with user guides when they move into a building, e.g. the system supplier's guidelines and seasonal publications (in summer, autumn,

winter and spring) and should also be included in the Private House Maintenance Manual (Finnish House Owners' Association).

3.9 Use of the household tax deduction when employing solutions

Household tax deductions can be used when solutions are employed and they are a form of compensation for the work carried out, not for the equipment purchased. Priority areas in ventilation and air-conditioning solutions are good planning by an expert prior to installation and the right design of equipment, to guarantee both energy efficiency and good indoor air conditions and to avoid damp and mildew resulting from poor ventilation.

Further action

- Making good design and planning eligible for the household tax deduction in addition to installation work is vitally important if ventilation and air-conditioning solutions are to be designed and employed in private houses in a way that relies on expertise and professional skill.
- The household tax deduction can now be used for maintenance and installation. The use of specialists for service and maintenance tasks in particular can be increased if there is greater awareness of how to benefit from the deduction.

4. Content of the Action and Communications Plan

To be able to employ all these measures and secondary measures in properties, it is necessary to obtain a realistic picture of what the functions are and exploit the synergy gain from combining measures. Grouping the measures by property type and in stages (dividing them into new construction and renovations projects and use and maintenance of property) is a profitable exercise to be recommended from the perspective of their implementation and communications about them.

In the scheduling of measures, the further action and development measures given in Chapters 2 and 3 should be taken into account. They will take time and resources to introduce.

4.1 Areas of focus in combining measures

In estimating the savings in energy made with the alternative procedure, the Equivalence Report proposed a plan for the implementation of measures based on the size of the system.[3] This plan has also been utilised when the measures were combined for the Action and Communications Plan.

[3] Equivalence Report on the alternative procedure for air-conditioning systems, Chapter 5.5, Min. Env. 2013

With **air-conditioning systems with an output of no more than 12 kW**, i.e. mainly heat pumps, savings would be 0.51 – 1.39 GWh a year. Measures employed:

- survey procedure for the condition of ventilation and air-conditioning systems
- raising the temperature setting for cooling systems
- night-time ventilation

These measures would be backed by guidelines on preventive maintenance, energy certification, the energy labelling of air source heat pumps, the household tax deduction for the maintenance of equipment and the replacement of air source heat pumps, the use of specialists in the choice of cooling appliances and guidelines on the correct use of air-conditioning systems.

With **air-conditioning systems with an output of more than 12 kW**, the savings achieved would be 5.00 – 13.65 GWh a year. Measures employed:

- survey procedure for the condition of ventilation and air-conditioning systems
- raising the temperature setting for cooling systems
- ventilation settings to reflect need
- night-time ventilation
- guidelines on preventive maintenance

These measures would be backed by energy efficiency agreements, energy audits, energy certification, the measurement of cooling systems and monitoring of consumption, exploring structural solutions to reduce the need for cooling, the use of specialists in the design of cooling systems and guidelines on the correct use of air-conditioning systems.

With **district cooling**, the savings achieved through the guidance procedure would be 1.01 – 2.74 GWH a year in terms of the need for electrical energy, which would correspond to 2.53 – 2.85 GWH a year in terms of the energy sold for district cooling. Measures employed:

- survey procedure for the condition of ventilation and air-conditioning systems
- raising the temperature setting for cooling systems
- ventilation settings to reflect need
- night-time ventilation
- guidelines on preventive maintenance

These measures would be backed by energy efficiency agreements, energy audits, energy certification, the measurement of cooling systems and monitoring of consumption, exploring structural solutions to reduce the need for cooling, the use of specialists in the design of cooling systems and guidelines on the correct use of air-conditioning systems.

4.2 Prioritisation of measures

The implementation of, and communications on, measures should focus on those categories of systems and property types that represent the largest volumes of cooling and savings potential:

- systems with an output of more than 12 kW
- district cooled systems

These systems are mainly used in commercial, office and care sector buildings. Educational buildings, assembly rooms and conference centres account for just a small share of cooled systems, so they would not constitute the main target groups.

Measures for systems with an output of less than 12 kW (in apartment blocks and terraced and [semi-]detached houses) could be implemented by means of seasonal information sheets with no more extensive further action. Seasonal communications and accompanying action, however, should be taken into account in the Action and Communication Plans.

More specific plans for measures and communications on them should be drawn up on the production of materials, communications measures and scheduling, as long as the appropriate organisation, responsibilities and resources are in place for them.

4.3 Description of the Action and Communications Plan

The Plan should group the measures set out above according to the stage at which the measure can be implemented and the relevant property group.

- **Property groups**: these are private houses (semi-detached, detached, terraced), large residential properties (apartment blocks), commercial, office and care sector buildings, and other service properties (educational buildings, assembly rooms and conference centres)
- **Phasing:** the measures are divided according to whether they apply to new construction projects, renovations or the use and maintenance of existing buildings
- **Stakeholders**: the actors relevant to the property type are included among the stakeholders
- **Target groups**: the actors relevant to planning, design, use, maintenance and construction of buildings and their owners
- **Communications measures and channels**: the key and most relevant measures and channels for communications
- **Scheduling**: the scheduling process needs to include an assessment of the further action associated with a measure, more focused communications and timetabling (are the materials ready or is more work needed on them? is it a one-off measure or one that will be repeated? is it ongoing or seasonal in nature? can the work be done immediately or only after a certain period? etc.)
- **Prioritisation** highlights the order of importance of measures

5 Measures relating to training and training materials in connection with air-conditioning systems

It is also a good idea to take account of measures under the alternative procedure for air-conditioning systems in the training of different professional groups. In particular, there should be opportunities for the training of designers and operations and maintenance personnel as well as further and continuing training for those already employed in such occupations.

5.1 Training in heating, plumbing and ventilation technology and property management and maintenance

Training in building services technology (heating, plumbing and ventilation) is available at schools, vocational colleges, universities of applied sciences and university. Several colleges offer continuing training and the industry provides its own supplementary training courses. Details of training and the relevant institutions are given in Appendix 5.

5.2 Training materials

Training at basic and vocational level often relies on curricula that do not change quickly. Continuing training and the industry's own further training courses are easier to review – especially if they do not lead to examinations or qualifications.

The report on training materials in building services technology (heating, plumbing and ventilation) commissioned in 2011 by SULVI (Finnish Association of HVAC Societies) compiled a collection of materials used by the industry for training purposes[1]. Certain scholarly works are used as study material, but there are also many guidelines produced by the industry, such as the Finnish Building Information Group building service and property cards, SULVI guide, materials produced by companies in the sector, etc. Several teachers also compile their own material packs for study purposes.

5.2.1 Improvements to training materials required

The SULVI report also compiled information on the improvements needed for training materials. Here is a selection of those in connection with air-conditioning systems (cooling) and building services technology:

- comprehensive material on energy efficiency
- material on new energy/construction regulations
- indoor air factors in renovations; generally repairs and energy
- examples of good practices in planning, design and estimates/calculations (various subjects)
- slide shows and video materials
- use of building services technology and related service and maintenance
- life-cycle economics of building services technology
- design and planning of indirect cooling systems in air-conditioning (cooling beams, convectors), district cooling systems
- regulation and automation from the perspective of heating, plumbing and ventilation technology
- design of ground source heat pumps
- heat pump technology

[1] SULVI (Finnish Association of HVAC Societies) report on training materials in building services technology (heating, plumbing and ventilation), 2011.

- cooling technology topics as online materials, planning of air-conditioning cooling plants, cold store design
- textbook(s) on cooling systems for buildings, estimating the need for cooling and a building's thermal behaviour

Further action

- training materials should focus in particular on planning and design – especially in virtually zero-energy construction and renovations – and materials and subject-matter relating to the use and maintenance of existing properties
- the Ministry of Environment's own materials, those of the industry and those produced as a collaboration between them are frequently used by colleges, so training materials on air-conditioning should continue to be developed as a joint exercise
- any materials produced for the implementation of the measures in Chapter 2 should also be available to colleges in future

6. Summary and further measures

The various measures and communications about them should be organised, and responsibility for them taken, in such a way that the process is continuous and long-term. Their organisation should include the clear assignment of responsibility to an agency either by property type or target group (regarding individual areas). But it is just as important that an agency (either the Ministry of the Environment or some other organisation it appoints) is responsible nationally/nationwide for the organisation and implementation of the procedure and coordinates, prompts and monitors the action taken by the various actors involved. It is appropriate and cost-effective to enable communications materials to be used centrally: resources have to be allocated both for the responsibility and for the work undertaken.

The monitoring and reporting of measures must be a part of the process both nationally and in terms of the sectors covered (such as the property sector, local government, etc.), so that the reports to the European Commission can be produced cost-effectively on schedule.

Summary of the needs associated with the implementation of the guidance procedure

- need for clear coordination (e.g. in the production of guidelines and materials) and the prompting of activity/communications centrally at national level, even though the work itself takes place closer to the target groups (e.g. among organisations)
- need at the start-up stage for clear areas of focus and priorities, so that resources can be channelled more appropriately (going where they are needed most or where there is most potential, even though the Equivalence Report proposes an enormous amount of the work taking place over a wide area)
- need for guidance materials for each property type regarding air-conditioning systems, so that the actors representing the target groups can implement the measures effectively (cf. Motiva's publication 'Energy Efficient Electrical Engineering Solutions for Properties [2012], which describes what electrical engineering solutions and choices are good for stepping up the efficient use of electricity in public buildings and proposes ways to promote the energy efficiency

of a property in terms of use and maintenance. The guide is primarily intended for builders, designers and users of public service buildings)

- need for a monitoring procedure/monitoring options: it has to be agreed for each separate measure how it is to be monitored and who will monitor the results. The monitoring process can make use of, say, the survey condition procedure for ventilation and air-conditioning systems, energy efficiency agreements, energy audits and energy certificates. The actual methods and options for monitoring must be agreed separately and it has to be examined as to how the guidance procedure is to be reported to the Commission
- need for specific action and communication plans for each target group after the areas of focus and resources have been decided upon.

The role of the Ministry of the Environment as the ministry implementing the guidance procedure

The role of the Ministry of the Environment and its tasks as the ministry implementing the guidance procedure should be described in terms of what the Ministry's responsibilities and duties are, its role in communications, how the Ministry should allocate resources, and what it role is as regards monitoring and producing reports, etc.

6.1 Proposal for the organisation of measures and communications, their areas of focus and priority, and cost estimates

6.1.1 Tasks of the guidance procedure coordinator

The measures under the guidance procedure cover very many different properties and actors associated with them. To implement the measures and make them, communications on them and their monitoring cost-effective, a central organiser needs to be appointed to organise things, one that would prompt the implementation of measures and communications about them and be responsible for better monitoring of the procedure as well as gathering any monitoring data. The coordinator should make every effort to work closely with actors in the field and establish communications measures with them. The coordinator would also establish communications measures over an appropriately wide area, either himself/herself or using subcontractors. The tasks of the coordinator are presented in Diagram 1.

Diagram 1 Tasks of a coordinator

EU Commission
Reports every three years
Ministry of the Environment
Guidance and communications on legal matters
Monitoring: Survey of sources of monitoring data. Development of monitoring procedures. Ongoing gathering of monitoring data (e.g. energy efficiency agreements, energy audits, energy certificates, separate questionnaires, etc. Impact assessment
Steering group, e.g. 1-2 times a year
Reports annually
Resources

Stakeholders: Commitment of stakeholders and their prompting. Collecting good practices
Target Groups: Production and distribution of data/information materials. Ongoing and seasonal communications aimed a target groups

6.1.2 Requirements for the task of coordinator

The coordinator must be generally reliable and an approved actor in the field. The coordinator will also have to be able to operate nationwide, so needs to have a broad outlook and should not be committed to just one sector or area of operation. Coordinators would have to be basically qualified to do the job: a proven ability to organise, show continuity and demonstrate reliability.

The agency responsible must have the expertise to implement the main measures and must be familiar with the industry/field and its networks and stakeholders. Necessary too are a knowledge and experience of monitoring and the impact assessment, and, in particular, communications going out to consumers and stakeholders.

Different agencies can be approached to act as subcontractors for various functions to a limited extent, although the danger here is the excessive decentralisation of functions and possible additional work and costs.

6.1.3 Options for coordinator

If the Ministry of the Environment does not itself become coordinator and main communicator, the responsibility could well be that of the Housing Finance and Development Centre of Finland (ARA), a Centre for Economic Development, Transport and the Environment (possible one or more specialised in this field), RAKLI or Motiva Oy.

As regards official bodies (ARA and Centres for Economic Development, Transport and the Environment), their suitability for the task should be looked at especially as well as the resources they would need for coordinating the work.

The RAKLI membership includes a large number of property groups and actors affected by the guidance procedure, but does not cover all of them. RAKLI might not be able to undertake the measures and communications under the procedure comprehensively alone, though in any case it is a very important operator and channel in both areas.

SULVI (Finnish Association of HVAC Societies) has been developing a method for conducting condition surveys of ventilation and air-conditioning systems. In particular, it represents professionals in the field and is well networked in many areas. Its resources, however, are small and its field of operation is not really comprehensive.

Motiva Oy is involved in the monitoring and implementation of energy efficiency agreements, the monitoring of work associated with energy audits and guidance and communications on energy certificates. Motiva operates over a range of sectors – property, local government and business and industry – without belonging to any of these target groups. It is a national coordinator for advice on energy to consumers and is responsible for the Energy Efficient campaign that promotes virtually zero-energy construction. Its role in

the various networks in several sectors suggests it would make an excellent coordinator in wide-ranging collaboration with the different target groups and stakeholders.

6.1.4 Proposed areas of focus and their priority

Areas of focus

Guidance, advice and communications should mainly apply to commercial, office and care sector buildings. Educational buildings, assembly rooms and conference centres account for just a small share of cooled systems, so they would not constitute the main target groups. The action should be targeted at the different stages of a building's life-cycle: when it is new, when it is being renovated and in connection with its use and maintenance.

Action in respect of residential buildings (apartment blocks, terraced houses and (semi-) detached houses) could be implemented by means of seasonal information sheets with no more extensive further action. Seasonal communications and accompanying action, however, should be taken into account in the Action and Communication Plans.

Priorities

In order to go ahead with the measures identified in the Ministry's report to the Commission, first there need to be materials specifically produced for target groups to reflect the stage of the life-cycle of buildings, which explain and give the background to the measures (e.g. publications, online articles, etc.). The background materials should serve as a basis for targeted communications (bulletins, information sheets, newspaper articles, presentations, etc.).

More specific plans for measures and communications on them should be drawn up on the production of materials, communications measures and scheduling, as long as the appropriate organisation, responsibilities and resources are in place for them. The plans should also be taken into consideration when the monitoring process is being developed, and monitoring must be taken into account when communications plans are being drawn up and communications channels are being chosen.

6.1.5 Cost estimates

Guideline estimates of costs for the proposed model here extend to the work of the coordinator and that of any subcontractors, for the development of the monitoring process, the collection of monitoring data and reports, as well of the productions costs of guidance and communications materials. It has to be realised that the costs depend largely on how much of what is intended actually goes ahead, the commitment of the parties involved, etc.

Resources should be set aside in the development of monitoring options and procedures especially for the use of background calculations and simulations in the Ministry's Equivalence Report.

Table 1 gives a provisional outline of cost estimates.

Table 1 Cost estimates for 2014-2017 (2016 is a 'normal' year: no developments or reports)

		Working hours: man hours a day	**Labour costs in euros**	**Subcontracting and other costs in euros**	**Total**
2014 and 2015 total	Specific plans Production of materials Development of monitoring Communications 2014-2015	15 30 20 45	93 500	4 000 20 000 20 000 15 000	153 500
2016	Guidance and communications (Communications, repeated events) Collection of monitoring data	40 5	38 250	20 000 5 000	63 250
2017	Guidance and communications (Communications, repeated events) Collection of monitoring data Reports	35 5 15	46 750	20 000 5 000 15 000	86 750

- A daily rate of EUR 820 is assumed for costs

In very rough terms, it will take around one and a half years to start the work and it will cost approximately EUR 150 000. When the venture is up and running, at least EUR 70 000 – 90 in resources will be needed each year and EUR 100 000 in the years in which the reports for the EU are produced.

6.2 Proposed further action after the preliminary survey

So that guidance and communications can get quickly under way, a coordinator should first be selected (see 6.1.1), if the Ministry of the Environment does not assume the responsibility itself.

In the initial phase, the coordinator's task would be to make the action and communication plans specific and verify that the necessary resources are in place.

Following more specific planning and background surveys, the production of background materials, guidelines and communications materials should commence and the main communication channels should be selected. At the same time, the monitoring methods/options should be developed, the monitoring data examined and the measures required to gather the monitoring data determined.

Seasonal communications on residential buildings could be undertaken by autumn 2014 and continued in 2015.

Diagram 2 illustrates how the work might begin, develop and continue in 2016 and 2017.

Diagram 2 Developments

(some of this is illegible – tr.)

(bars left to right and top to bottom)

Preliminary survey
Steering group
Seasonal communications: winter
Steering group
Seasonal communications: summer
Seasonal communications: winter
Steering group

Steering group
Seasonal communications: summer
Seasonal communications: winter
Steering group
Steering group
Seasonal communications: summer
Seasonal communications: winter
Steering group

Scheduled, phased communications for target groups (commercial, office and care sector buildings)

- New builds, renovations, use and maintenance
- Newspaper articles and information sheets on different subjects

Scheduled, phased communications for target groups (commercial, office and care sector buildings)

- New builds, renovations, use and maintenance
- Newspaper articles and information sheets on different subjects

Scheduled, phased communications for target groups (commercial, office and care sector buildings)

- New builds, renovations, use and maintenance
- Newspaper articles and information sheets on different subjects

2016 2017

7 Sources

Equivalence Report on the alternative procedure for air-conditioning systems; report to the European Commission under Article 15 of the Directive on the energy performance of buildings (2010/31/EU); Ministry of the Environment 2013.

Report on training materials in building services technology (heating, plumbing and ventilation), Markku Rantama, SULVI, 2011 Building services technology training.

Finnish Standards and Building Code, D3 (2012).

Appendix 1 Description of the condition survey procedure for ventilation and air-conditioning systems

SULVI (Finnish Association of HVAC Societies) has been developing a condition survey procedure for ventilation and air-conditioning systems and equipment in partnership with other operators in the sector. The project's main sponsor has been the Ministry of the Environment, but funding has also come from foundations and SULVI itself.

The condition of ventilation and air-conditioning systems is examined by means of surveys (ventilation condition survey). At the same time, an examination is conducted of the suitability of the systems and equipment for the building from the perspective of its current or planned use. The ventilation condition survey procedure is also often linked to the identification of problems with indoor air found in the building and a repair or renovations study. A ventilation condition survey can also explore opportunities for improving the energy economics of a building.

The survey supplements and improves the results of a condition assessment and energy audit for ventilation and air-conditioning systems. It is not just one series of procedures of the same kind for all buildings: each survey has to be designed for a specific purpose and building.

There is a need for a ventilation condition survey if:

- the age and wear and tear of the building require more thorough repairs or the purpose of the space is changing
- problems with indoor air have been discovered in the building and these are likely to be linked to the air-conditioning system
- improvements need to be made to the energy efficiency and the ventilation technology is an important element in energy use

General guidelines

- ventilation condition survey; general guidelines for the party carrying out the survey and the customer
- ventilation condition survey; guidelines for the party assessing the condition and the party conducting the energy audit to establish the need for a condition survey
- measuring equipment needed in the ventilation condition survey
- ventilation condition survey; residential buildings

Guidelines for the basic part of the ventilation condition survey

- general assessment of the ventilation and air-conditioning system
- maintenance assessment
- survey of the cleanliness of the ventilation and air-conditioning system
- estimate of the need for energy and power rating

Detailed guidelines on different systems, equipment and components

- cooling equipment

- measuring and regulation devices
- terminal equipment
- ventilation appliances
- heat recovery equipment
- air ducts
- air intake and extraction equipment
- air filters
- measurements as part of the ventilation condition survey
- sound engineering checks

Further information at:

http://www.sulvi.fi/ajankohtaista/projektit/

Appendix 2 Actors associated with the alternative procedure for air-conditioning systems

Authorities:

Ministry of the Environment

- supervision/inspectors of buildings (new construction, renovations)
- Finnish Environment Institute
- Housing Finance and Development Centre of Finland (ARA)

Ministry of Social Affairs and Health
The authorities connected with care sector buildings in particular include:

- Finnish Institute of Occupational Health
- National Institute for Health and Welfare
- National Supervisory Authority for Welfare and Health, Valvira (Valvira register)
- Consortium of National Institutes for Health and Wellbeing (SOTERKO) made up of the Finnish Institute of Occupational Health, the National Institute for Health and Welfare, and STUK - Radiation and Nuclear Safety Authority, Finland

Ministry of Employment and the Economy (energy efficiency agreements, energy audits)

- Finnish Energy Authority

Regional State Administrative Agencies
Centres for Economic Development, Transport and the Environment

Tukes - Finnish Safety and Chemicals Agency (ecodesign of air-conditioning equipment and energy labelling requirements, market surveillance)

Organisations, federations, associations:

Confederation of Finnish Industries

- Finnish Commerce Federation
- Finnish Hospitality Association MaRa

Finnish Energy Industries (district cooling, electricity consumption)
Confederation of Finnish Construction Industries RT (CFCI)
The building services technology industry
The Private House Industry Association

Finnish Association of HVAC Societies FINVAC (umbrella organisation)

- SULVI (Finnish Association of HVAC Societies)
- VVS Föreningen (VSF)
- Sisäilmayhdistys ry (Finnish indoor Air Association)

Finnish Association of HPAC Technical Contractors (industrial and employers' association for companies installing heating, plumbing and ventilation systems; part of Confederation of Finnish Construction Industries RT (CFCI) and the Finnish Federation of Building Services Technology)

The Real Estate Employers association (previously the Real Estate Services Association; property service companies, property owners, managers, management companies and property associations).

Finnish Refrigeration Enterprises Association (FREA)
Finnish Refrigeration Association (training)
Finnish Heat Pump Association SULPU

Owners of buildings, builders:

State properties

- Senate Properties
- Construction Establishment of Defence Administration
- (National Board of Antiquities?)

Association of Finnish Local and Regional Authorities
RAKLI (previously the Confederation for Housing, Office Space and Builders)
Finnish Real Estate Federation
Finnish House Owners' Association
TESO (association for health sector and social welfare entrepreneurs) (lobbying, training)

Finnish Real Estate Management Federation

Professional organisations:

Association of Finnish Architects' Offices
Finnish Construction Managers and Engineers RKL
Finnish Association of Civil Engineers
Finnish Association of Consulting Firms SKOL
The Electrical Contractors´ Association of Finland STUL
Association of Finnish Building Inspectors

Training, information materials, publishers:

Rakennustieto Oy (Building Information Group)
Building Information Foundation
Training Centre for the Construction Industry RATEKO
SIY Sisäilmatieto Oy
KIINKO Real Estate Education
FISE

Other companies:

Motiva Oy (energy efficiency agreements, energy audits, advice and communications on energy certificates, energy advice for consumers, regional coordinator for advice and guidance on energy)

Appendix 3 Communication channels for the alternative procedure for air-conditioning systems (examples)

Online:

Official services

Ministry of the Environment:
www.ym.fi
www.ymparisto.fi
www.korjaustieto.fi (renovations; private houses and large residential properties)

Ministry of Social Affairs and Health:
www.stm.fi

Finnish Institute of Occupational Health: www.ttl.fi
National Institute for Health and Welfare: www.thl.fi
Consortium of National Institutes for Health and Wellbeing (SOTERKO): www.soterko.fi
National Supervisory Authority for Welfare and Health Valvira: Valvira register (www.valvira.fi)

Services in different sectors:

www.sulpu.fi (information on heat pumps, Finnish Heat Pump Association)
www.taloyhtio.net (information for housing associations, Finnish Real Estate Federation [FREF])
www.energiamerkinta.info (Tukes; information on energy labels on equipment, especially for importers and retailers)

www.Talotekniikka.eu

- Sähköinfo Oy and Talotekniikka-Julkaisut Oy
- News in conjunction with the magazines Sähkömaailma and Talotekniikka; included: Federation of Finnish Technology Industries, RAKLI, Taloyhtiö.net, Sähköinfo, Talotekniikka, Sahkömaailma

Motiva's online services:

www.motiva.fi/koti (energy use in the home)
www.motiva.fi/ostajanopas (consumers, equipment and information on buying)
www.motiva.fi/rakentaminen (new builds > The Energy Efficient Home)
www.eneuvonta.fi (consumers, private houses)
www.energiatehokaskoti.fi (new builds)
www.energiatehokkuussopimukset.fi (energy efficiency agreements)

Journals and professional magazines

Talotekniika magazine
TATE
Kiinteistölehti (Finnish Real Estate Federation)

LOCUS

Rakennuslehti
Rakennustekniika magazine
KITA magazine

Rakennettu Ympäristö (Association of Finnish Building Inspectors)

Kuntalehti (Association of Finnish Local and Regional Authorities)
Kuntatekniikka (Association of Finnish Local and Regional Authorities)

Kotitalo magazine (Finnish Real Estate Management Federation)

Omakotilehti (Finnish House Owners' Association)

Channels and actors by property type

The following section describes the actors and channels associated with information on measures for different target groups according to property type and phasing that could be used for advice and guidance and in communications.

Private (semi-)detached houses:

New construction projects: The Energy Efficient Home project: energiatehokaskoti.fi (Motiva Oy)
Renovations: Ministry of the Environment (Korjaystieto.fi; for help with damp and mildew: www.hometalkoot.fi), Finnish House Owners' Association
Use and maintenance: Motiva: consumer energy advice (eneuvonta.fi), Finnish House Owners' Association

Large residential properties:

New construction projects: RAKLI
Renovations: Ministry of the Environment (Korjaystieto.fi; for help with damp and mildew: www.hometalkoot.fi), Finnish Real Estate Federation (Taloyhtiö.net), Finnish Real Estate Management Federation, RAKLI/ Energy Programme for Rented Dwellings, Indoor Air Association, the Real Estate Employers association
Use and maintenance: Finnish Real Estate Federation (Taloyhtiö.net), Finnish Real Estate Management Federation, RAKLI/ Energy Programme for Rented Dwellings, Indoor Air Association

Commercial buildings:

New construction projects: RAKLI, Confederation of Finnish Industries, Finnish Commerce Federation
Renovations: RAKLI, Confederation of Finnish Industries, Finnish Commerce Federation
Use and maintenance: RAKLI, Confederation of Finnish Industries, Finnish Commerce Federation, the Real Estate Employers association

Office buildings:

New construction projects: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties
Renovations: RAKLI (energy efficiency agreements for office properties), Association of Finnish Local and Regional Authorities, Senate Properties
Use and maintenance: RAKLI (energy efficiency agreements for office properties), Association of Finnish Local and Regional Authorities, Senate Properties, the Real Estate Employers association

Care sector buildings:

New construction projects: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties, TESO (association for health sector and social welfare entrepreneurs)
Renovations: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties, TESO (association for health sector and social welfare entrepreneurs)
Use and maintenance: Association of Finnish Local and Regional Authorities, Senate Properties, TESO (association for health sector and social welfare entrepreneurs), the Real Estate Employers association

Other service buildings (educational buildings, assembly rooms and conference centres:

New construction projects: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties
Renovations: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties
Use and maintenance: RAKLI, Association of Finnish Local and Regional Authorities, Senate Properties

Appendix 4 Classification of buildings according to Statistics Finland

A	**Residential buildings**
	Buildings as dwellings, where the living space makes up at least half of the floor area
01	**Detached and semi-detached houses**
011	One-dwelling houses
012	Two-dwelling houses
013	Other detached and semi-detached houses
02	**Attached houses**
021	Row houses
022	Terraced houses
03	**Blocks of flats**
032	Balcony-access blocks
039	Other blocks of flats
C	**Commercial buildings**
11	**Wholesale and retail trade buildings**
111	Shopping halls
112	Shops, department stores and shopping centres
119	Other wholesale and retail trade buildings
12	**Hotel buildings**
121	Hotels, etc.
123	Holiday, rest and recreation homes
124	Rental holiday cottages and flats
129	Other hotel buildings
13	**Residential buildings for communities**
131	Residences for communities, etc.
139	Other residential buildings for communities
14	**Restaurants and other similar buildings**
141	Restaurants and other similar buildings
D	**Office buildings**
15	**Office buildings**
151	Office buildings

	Private and public office and administration buildings, banks, insurance institutions
F	**Buildings for institutional care**
Buildings used for health care and social services	
21	**Health care buildings**
211	General hospitals
213	Other hospitals
214	Health centres
215	Specialised health care buildings
219	Other health care buildings
Buildings used for social welfare where mainly round-the-clock care is provided and where there are permanent beds	
22	**Social welfare buildings**
221	Old-age homes
222	Children’s homes, reform schools
223	Nursing homes for the mentally retarded
229	Other social welfare buildings
23	**Other social service buildings**
Mainly buildings used for daytime social services where normally there are no beds for spending the night in	
231	Children’s day care centres
239	Social service buildings n.e.c.
24	**Prisons**
Prisons and other prison administration buildings, including labour camps	
241	Prisons
G	**Assembly buildings**

Buildings where presentations, celebrations, exhibitions, competitions or other functions are organised for the public of members of an organisation

31	**Theatres and concert halls**
32	**Libraries, museums and exhibition halls**
33	**Association and club buildings, etc.**
34	**Buildings of religious communities**
35	**Buildings for sports and physical exercise**
36	**Other assembly buildings**
H	**Educational buildings**

Buildings for study, education and research

51	**General education buildings**
511	General education buildings
52	**Vocational education buildings**
521	Vocational education buildings
53	**University and research institute buildings**
531	University buildings
532	Research institute buildings
54	**Other educational buildings**
541	Educational buildings of organisations, unions, employers, etc.
549	Educational buildings n.e.c.

http://www.stat.fi/meta/luokitukset/rakennus/001-1994/index.html

Appendix 5 Educational/training courses in buildings service technology and the property sector in Finland

The next section gives details of educational and training programmes in the building services technology field at science colleges and universities of applied sciences and information on basic, vocational and continuing education.

Science colleges and universities of applied sciences:

Aalto University:

Courses in building services technology are provided in two schools:

- School of Science:
- Department of Energy Technology for a professorship in heating, plumbing and ventilation technology
- Department of Civil Engineering for a professorship in building services technology

- The departments of the School of Electrical Engineering offer professorships and associated tuition in lighting technology, electronic building services technology and building automation systems.

In addition to the main subjects of study, students of heating, plumbing and ventilation technology, electrical engineering, automation systems and civil engineering can take building services technology as a subsidiary subject.

Students of architecture belong to the School of Arts and Design (planned). They can take courses in building services technology.

Aalto University's Institute of Building Services Technology attempts to combine research, study and business studies in the field. It is essentially a link in the field of building services technology between Aalto University, Tampere University of Technology and Lappeenranta University of Technology.

Tampere University of Technology

- Department of Energy and Process Engineering for a professorship in cooling and heating, plumbing and ventilation technology and a module in building services technology
- Department of Civil Engineering for a professorship in energy efficiency and the relevant professor also teaches heating, plumbing and ventilation technology
- Training programmes also in civil engineering and architecture

Lappeenranta University of Technology

- Building services technology as a subsidiary subject in the environmental technology degree programme

University of Eastern Finland; Kuopio campus

- Department of Environmental Sciences offers courses in indoor air quality

Universities of Applied Sciences

Courses in building services technology are offered at the following Universities of Applied Sciences:

- Metropolia, Espoo (also a higher degree in building services technology)
- Oulu
- Tampere UAS
- Mikkeli UAS (including sustainable energy economics as an option in a higher degree course in environmental technology, which is close to the subject areas of building services technology)
- Satakunta UAS, Pori
- Seinäjoki UAS

Courses in civil engineering and/or energy technology are offered at the following Universities of applied Sciences:

- Rovaniemi UAS: degree programme in civil engineering – building services and energy technology option
- Arcada, Helsinki: degree programme in Swedish 'Distribuerande Energisystem'.
- Savonia UAS, Kuopio: degree programme in energy technology for industry
- Jyväskylä UAS: degree programmes in energy technology and civil engineering (www.jamk.fi)

Continuing and further education

Aalto University:

- Doctorate in the built environment, with building services technology is a main subject. At Aalto Pro (previously Dipoli Educational Centre), educational development tasks connected with energy efficiency and renovations

Aalto Pro, Tampere University of Technology Continuing Education Centre Edutech and Lappeenranta University of Technology Centre for Training and Development:

- Energy efficiency expertise training

University of Eastern Finland; Aducate (Kuopio):

- Specialists in health issues connected with buildings and other problems with indoor air and damp

Other training organisations providing courses in building services technology, energy efficiency and property management:

- KIINKO Real Estate Education
- Training Centre for the Construction Industry RATEKO
- AEL
- Amiedu
- Adato Energia Oy

The staff organisations Finnish Association of Civil Engineers RIL and SULVI (Finnish Association of HVAC Societies) provide a wide range of training in energy matters in buildings and building services technology.

Sähköinfo provides training in electrical engineering, automation and telecommunications engineering,

Sources: Motiva Oy and the survey of training materials on building services technology, SULVI, 2001

Courses in real estate, building services technology, construction, energy and technology in Finland

Qualifications, degrees and other courses at vocational colleges and universities are provided by the following colleges and Universities of Applied Sciences:

Real estate services

Basic qualification in real estate services, 120 credits

Sataedu, Kokemäki, Ulvila and Kankaanpää
Vaasa Vocational College – Vasa yrkesinstitut, Technology
Helsinki Vocational College, Strurenkatu campus
Tavastia Vocational College, Hämeenlinna
TAO, Turku Vocational Foundation
Vantaa Vocational College Varia, Tennistie campus
Omnia Vocational College, Espoo Centre, Kirkkokatu
Tampere Vocational College Tredu
Keuda Vocational College, Kerava
Oulu Vocational College OSAO, Kaukovainio campus
North Karelia College Joensuu, technology and culture
South Kymenlaakso Vocational College, Koteko campus
Southern Savonia Vocational College

Property management, property manager, 120 credits, Basic course: comprehensive school

Helsinki Vocational College, Sturenkatu campus
North Karelia College Joensuu, technology and culture

Property management, property manager, 120 credits, Basic course: upper secondary/high school syllabus

North Karelia College Joensuu, technology and culture

Office services, office manager, 120 credits: vocational basic qualification as a special subject

Luovi Vocational College, Liperi campus

Property management, property manager, 120 credits: vocational basic qualification as a special subject

Luovi, Liperi, Aalavus, Tampere, Pori, Oulu, Kemi, Rovaniemi, Kuopio and Muhos
Kipula Vocational college, Vantaa campus

Real estate sector training and qualifications:

Finnish National Board of Education Study Path Service: www.opintopolku,fi
www.kiinteistotyonantajat.fi/tietoatoimialasta/koulutus/

Vocational training in building services technology, construction, energy and the environment

University of Applied Science qualifications for young people:

Courses in building services technology

Karelia UAS
Metropolia UAS, technology
Mikkeli UAS
Oulu UAS, Technology Unit
Tampere UAS (TAMK)

Engineer training courses in electrical and automotive engineering

Savonia UAS

Courses in electrical and automotive engineering

Centria UAS, Ylivieska campus
Metropolia
Mikkeli UAS
Oulu UAS
Satakunta UAS, Pori
Seinäjoki UAS (SeAMK)
Tampere UAS (TAMK)
Vaasa UAS

Engineer training courses in environmental technology

Savonia UAS

Courses in civil and municipal engineering, engineer

Häme UAS, Hämeenlinna
Kajaani UAS
Oulu UAS
Saimaa UAS
Satakunta UAS, Pori
Seinäjoki UAS (SeAMK)
Tampere UAS (TAMK)
Turku UAS
Vaasa UAS

Courses in civil and municipal engineering, master builder

Häme UAS, Hämeenlinna
Oulu UAS
Seinäjoki UAS (SeAMK)
Tampere UAS (TAMK)
Turku UAS

Courses in energy and environmental technology

Karelia UAS, Joensuu
Lahti UAS
Metropolia, Vantaa
Oulu UAS
Satakunta UAS, Pori
Tampere UAS (TAMK)
Turku UAS
Vaasa UAS

Engineer training courses in energy technology

Savonia UAS, Varkaus

Courses in energy technology

Jyväskylä UAS, Technology and Transport
Kymenlaakso UAS, Kotka

University of Applied Science qualifications for adults:

Courses in energy and environmental technology

Oulu UAS

Courses in technology

Turku UAS

Courses in building services technology

Metropolia, Espoo
Tampere UAS

Courses in electrical and automotive engineering

Häme UAS, Valkeakoki
Metropolia
Mikkeli UAS
Oulu UAS
Seinäjoki UAS
Vaasa UAS

Courses in civil and municipal engineering, master builder

Häme UAS
Oulu UAS

Courses in civil and municipal engineering, engineer

Seinäjoki UAS (SeAMK)
Kajaani UAS
Oulu UAS

Courses in civil engineering

Lapland UAS, Rovaniemi

Courses in electrical and automotive engineering

Häme UAS, Valkeakoki
Metropolia
Mikkeli UAS
Oulu UAS
Seinäjoki UAS
Vaasa UAS

Courses in civil and municipal engineering, master builder

Häme UAS
Oulu UAS

Courses in civil and municipal engineering, engineer

Seinäjoki UAS (SeAMK)
Kajaani UAS
Oulu UAS

Courses in civil engineering

Lapland UAS, Rovaniemi

University of Applied Science higher degrees/qualifications:

Courses in technology skills management

Centria UAS
Häme UAS
Karelia UAS
Kajaani UAS
Jyväskylä UAS
Turku UAS
Lapland UAS, Rovaniemi
Lapland UAS, Kemi
Tampere UAS
Kymenlaakso UAS
Seinäjoki UAS

Courses in technology business

Oulu UAS

Courses in construction

Häme UAS
Turku UAS
Saimaa UAS

Courses in civil engineering

Metropolia

Metropolia (degree) courses in technology, engineer (UAS)

Savonia UAS

Häme UAS
Oulu UAS

Courses in civil and municipal engineering, engineer

Courses in automotive engineering

Jyväskylä UAS

Courses in environmental technology

Turku UAS

Source: Finnish National Board of Education Study Path Service: www.opintopolku,fi

Latest on the procedure for surveying the condition of ventilation systems

Text and photographs: Tuomo Käyrynen

Finland has opted to employ the voluntary guidance procedure for the inspection of ventilation and air-conditioning systems under the reformed Directive on the energy performance of buildings

Just before Christmas, SULVI (Finnish Association of HVAC Societies) held a seminar with its partners entitled *Air-conditioning Systems – Getting it Right II*, at which the results of the work that had been done were examined. The seminar was opened by Pekka Kalliomäki, Senior Construction Adviser, of the Ministry of the Environment.

Kallkiomäki thanked all those involved in the project and spoke of the latest legislative projects connected with the energy efficiency of buildings and their progress. EU Directives and acts that are making their way into Finnish legislation at the same time include the Construction Products Regulation, the Ecodesign Directive, the Product Labelling Directive, the Directive on the energy performance of buildings and the Directive on the promotion of the use of energy from renewable sources.

'Buildings consume a good deal of energy,' he said. 'So their energy efficiency rating is important. Because energy efficiency also lies at the heart of the matter of the security of the energy supply, it is a tough policy. That is reflected in how much the European Union is investing in it.'

With regard to the Ecodesign Directive, the legislative proposal for ventilation appliances went through at the meeting of the Directive Regulation Committee. The new requirements will take effect at the start of 2016.

'Some of the requirements are tough, and even unnecessarily harsh, and we opposed them. But some, though, will go altogether, such as the tightness standards, so in that respect we will be going back 25 years,' said Kalliomäki.

No compromising on the quality of indoor air

Because of the more stringent requirements for energy efficiency, many are worried that energy will start to be saved at the expense of the quality of indoor air.

'Energy efficiency is an important issue, but the quality of indoor air is still more important. Now we have to make sure that it is not passed over. If we simply concentrate on saving energy, we may well go astray and be faced with the same sort of situation we had in the 1970s.'

The basis for the inspection of ventilation and air-conditioning systems is the reformed Directive on the energy performance of buildings, concerning which Member States can opt to apply a voluntary inspection procedure instead of the compulsory one that was called for in the original Directive, as long as it can be shown that the end result is at least as good. The

earlier compulsory inspection procedure was overturned by Parliament, and it was decided to introduce the guidance procedure mentioned in the new Directive.

‘This project is now introducing a procedure to take this forward,’ Kalliomäki points out. It has to be implemented in such a way that it applies to the whole industry and we have to ensure that the owners of properties adopt it. If things are not dealt with in this way, we will have to go back to the compulsory procedure. The voluntary procedure will hopefully bring cost-effectiveness, and at the same time it will be possible to extend it to all aspects of ventilation, bearing in mind, too, the need for good quality indoor air.’

Kalliomäki also mentioned Article 9-11 of the Directive on the energy performance of buildings, which call for a measurement and billing system for each dwelling.

‘This has been under discussion since the early 1990s, and up till now we have always said that that would not be economical given our circumstances. This also has to do with ensuring air quality indoors.’

The purpose of the building

Markku Rantama, as project coordinator, briefly presented the various aspects of the work. He also stressed the importance if the consideration of indoor air quality and mentioned that the purpose for which buildings are used changes over time.

‘The project started two years ago and was divided into separate tasks. First a comprehensive information survey was conducted, and it was found that there were no models for an equivalent venture to be found anywhere in the world that would be fit for purpose,’ says Rantama.

There are two phases in the action plan for the condition survey of office space: the basic component and detailed surveys. The basic component consists of a general assessment of systems and their maintenance, referring to the documentation, interviewing key personnel involved in maintenance, and assessing a system’s functions there and then. The basic component serves as a basis for taking a decision on what sort of measures should be used to continue the procedure and that is followed by the detailed surveys, on the basis of which suggestions for action to be taken and cost estimates are made.

The systems are evaluated in the reports by means of classification scales, and an essential part of the reports is also a verbal description of what has been observed in the condition survey.

‘One part of the project is making calculations, for which there are to be very comprehensive guidelines. The areas for calculations include the energy balance of the ventilation in buildings, an assessment of the need for cooling, and how the energy efficiency of the ventilation cooling system can be improved,’ said Rantama.

When the procedure has been made ready, the aim is to carry out condition surveys on an intensive basis and commence training courses relating to it. The qualification requirements have not as yet been settled upon, but Rantama thinks they will need to be set at a very high level.

‘At this stage, the thinking is that there will be just one qualification requirement for those conducting condition surveys. They must have an overall grasp of the function of ventilation plants and the use of the building.’

The project is in the finishing stages and the documentation will be published in the form of Finnish Building Information Group building service and property cards. SULVI (Finnish Association of HVAC Societies) will also publish a manual for those who perform condition surveys of ventilation systems for the purposes of training and qualifications. It will contain important guidelines.

(caption)

Markku Tantama

The Ministry of the Environment is watching closely

General assessments will reveal flaws

Harri Ripatti of Kvalitek Finland Oy gave a general assessment of systems under the project entitled ‘Should it all go to landfill or do we get the ventilation system working decently?’

In the general assessment the aim is to see how a ventilation and air-conditioning system reflects the objectives set for its current and future use and to examine how the technical and functional flaws discovered can be eliminated to achieve those objectives. The condition survey can be terminated if it is found that the requirements for refurbishing the system in a way that is technically and economically rational are non-existent.

The general assessment is performed by conducting a needs analysis, examining the systems reference information and carrying out an audit. A report is produced on the assessment containing the conclusions reached and proposing options for measures and further steps. Ripatti went over the details of the general assessment, such as the classification of air-conditioning systems, the suitability of the model for different types of building, an analysis of the raw data, carrying out measurements and conducting user interviews.

‘The idea of the general assessment is that the whole system should be inspected carefully. The competence of the person conducting the inspection is put very much to the test,’ said Ripotti.

(caption)

The viewpoint of the researcher. Mikko Saari, researcher at VTT Technical Research Centre of Finland, sheds light on inspections in his capacity as researcher.

Petri Pylsy of the Finnish Real Estate Federation talked about condition surveys in residential properties focusing particularly on the inspection process. The two main areas for a condition survey of a ventilation system in a residential property are the life-cycle of the building, its ageing process and energy efficiency, on the one hand, and possible problems with indoor air, on the other.

Residential properties have their own procedure

A condition survey in a residential property would be a compact package based on the customer’s needs, consisting of familiarisation with basic information, interviews with owners, property management and residents, an inspection of the property, an analysis of data, proposals for action and a final report.

Pylsy stressed the need for open and proactive communications on the work carried out for the housing association and the residents in the form of information sessions.

‘Progress can be made easier if the problems discovered can be gone over clearly with the customer and in the presence of as many as possible of the residents, including a discussion about what benefits there would be from the measures proposed, not only in terms of energy efficiency but general comfort,’ said Pylsy.

Martti Pennanen of Awilllas Oy described the experiences gained from pilot projects for condition surveys carried out in residential properties. He called for clear instructions for condition surveys, as well as basic models and additional modules for future surveys, so that

customers themselves might adequately appreciate what sort of project they are involved in. The summary at the beginning of the report should be sufficiently clear and informative.

'A ventilation condition survey is based on three considerations: life-cycle, energy and a given problem. These are all different, but they are often connected.'

The initial difficulties encountered in a condition survey, Pennanen thinks, include raising the customer's awareness, the clarity of questionnaires and the attitude of residents to the resident surveys. The questionnaires/surveys should identify each property individually to retain the interest of residents adequately.

Problems also often arise on account of the specifications regarding the scope of service and maintenance contracts and the responsibilities of the various parties. There has to be sufficiently comprehensive information for the different parties on the progress of a condition survey and the work being done in the property, for things to run smoothly.

Mikko Saari and Petri Kukkonen of VTT Expert Service Oy spoke about the progress of drafting guidelines on detailed condition surveys and making calculations. The guidelines can be divided into those for the ventilation appliance and those for the ducts and equipment in rooms. In addition, there are separate guidelines on sound technology inspections. Detailed surveys rely, among other things, on the service and maintenance history of appliances and equipment, field measurements, visual assessments and models for making estimates and calculations.

Separate instructions for the calculation procedure

Separate guidelines on the procedures for making calculations in ventilation condition surveys are being produced, explaining what calculations need to be made and their scope at different stages of the survey. The guidelines cover calculation methods to determine the need for energy and power rating in a building, especially with regard to ventilation and air-conditioning, but they also deal with the need for cooling energy and output.

The purpose of the guidelines is to serve as a tool to aid the estimate for energy use for current ventilation systems and planned adjustments and improvements, clarify the basic instructions for making calculations and facilitate the choice and use of different calculation methods. They are more a checklist than a collection of formulas. The idea is to provide advice to users on matters to take into consideration and guide them, where necessary, towards the sources for the calculation information.

Mikko Keitaanranta of KylmäK Oy talked about inspections of air-conditioning cooling equipment. The process consists of an examination of documents, a pre-inspection on site and more detailed surveys.

With regard to measurements, Keitaanranta thought it was very important to conduct them at a time when the cooling system was working efficiently. Good skills are required for cooling technology, to ensure that the measurements and calculations provide reliable data.

Ismo Marin of Airix Talotekniikka Oy described the condition survey procedure for measuring and regulation equipment. Mari emphasised the importance of using the experience of maintenance personnel to assess the function of this type of equipment. An

analysis of the system should also include the contribution of a specialist in the building's automation systems.

'The values for settings, monitoring of trends and emergency history are very important tools for a monitoring system. Inspections of appliances and rooms should take account of the function of controls actuators, the results of measurements taken and changes in the use of space.'

A pilot study for a ventilation condition survey for workplaces was the theme of a presentation by Marko Björkroth. The site for the pilot was a timber school building dating from the end of the 1980s, and which had suspected indoor air problems.

The site was not in use at the time of the pilot study, so no interviews with the building's users were conducted and there were no results obtained for the viability of air distribution. Furthermore, the documentation on the systems was inadequate.

'The ventilation system on site did not even reflect the requirements in place when the building was constructed, and these days schools function differently. We managed to obtain some results on the function of the system by taking measurements, although the raw data was poor quality. It would have been possible to repair the system otherwise, but the design and measurements for air volumes were well below current standards.'

Marrti Pennanen also commented on the condition surveys for places of work, the site of the pilot project in question being a government office building in Helsinki. The design and usability of the site's ventilation system were mainly good, but there were also problems, principally with the automation system.

Sari Helden of the City of Helsinki 'Tilakeskus' ('Premises Centre') gave a brief description of the condition survey procedure from the point of view of the customer.

'The customer may be an expert able to determine what has to be done about a ventilation system. It is very important for the customer to receive common guidelines for the industry on what needs to be done to service and maintain ventilation systems. The condition survey procedure should be a common practice in the industry, allowing customers to become aware of the survey guidelines and know how to refer to them when inviting tenders, for example,' she said.

The seminar materials are available on the SULVI website at http://www.sulvi.fi/ajankohtaista/projektit/.

Text by Markku Rantama, Rantama Consultations

The condition survey procedure for ventilation and air-conditioning systems

Finland has an enormous number of residential and office/workplace buildings whose ventilation system is not in satisfactory condition according to current standards. In the worst cases, human health is at risk. It is time to change things.

A condition survey is one where a restricted area or part of a building or the equipment in it are examined by an expert employing such methods and to such an extent that their condition, damage mechanisms, suitable repair methods and recommended timeline for repairs are discovered adequately precisely. The survey may also employ destructive testing methods.

Virtually everyone understands why condition surveys are carried out on facades and pipework. However, there has been no such procedure previously in place for such an important component as the ventilation/air-conditioning system.

The initiative to develop a ventilation condition survey started with the Finnish 'Damp and Mildew Association' and SULVI (Finnish Association of HVAC Societies). Slightly earlier the updating of the condition survey guidelines for heating, plumping and ventilation equipment in buildings had got under way. The 'Damp and Mildew Association' had taken on the task of putting the condition survey procedures connected with indoor air in order.

Another starting-point was the need to have guidelines on the compulsory inspection procedure for air-conditioning systems under the Directive on the energy performance of buildings. When the Directive entered into force, a voluntary procedure was made possible (based on guidance and voluntary action) to take the place of the compulsory inspection. The ventilation condition inspection procedure being developed was also felt to be well suited to the situation.

Content of the ventilation condition survey

Inspection tools for property owners have been developed for the systematic maintenance of property. Regular inspections extend to condition assessments and energy audits. These help establish any need for the more detailed condition survey.

There is a need for a ventilation condition survey if:

- the age and wear and tear of the building require more thorough repairs or the purpose of the space is changing
- problems with indoor air have been discovered in the building and these are likely to be linked to the air-conditioning system
- improvements need to be made to the energy efficiency and the ventilation technology is an important element in energy use – as it is always in general

No actual problems with indoor air are studied in the ventilation condition survey: instead, where possible, they are examined before the condition survey is carried out.

General guidelines have been drawn up for the ventilation condition survey procedure, which also contain instructions for customers. In addition to the general guidelines, there are

instructions for assessing systems, assessing the need for maintenance, making calculations during the condition survey and numerous other instructions on detailed condition surveys of various systems and components. There is an illustration of a ventilation condition survey below in diagrammatic form.

For ventilation in dwellings there is a separate, slightly simplified set of guidelines.

The ventilation condition procedure is in two stages. The basic component consists of pre-inspection tasks:

- inspection of documents
- interviews with key personnel
- assessment tour of the building

The basic component consists of a general assessment of systems and this serves as a basis for taking a decision as to whether the entire system must be replaced (in such a case the condition survey is discontinued) or whether detailed condition surveys should be planned. The basic component also extends to an evaluation of the maintenance operation for the ventilation plant.

The condition survey also includes an assessment of the potential for reducing the need for cooling and the energy efficiency of air-conditioning cooling systems.

After the general assessment of systems – if the plant is not found to be impossible to repair – the next stage is detailed condition surveys. These can be for all parts and components in the system.

Development work and guidelines

The development of the ventilation condition survey procedure has been coordinated by SULVI. A broadly based steering group was also set up. Numerous specialists have been commissioned for the separate tasks involved. There was also a special work group set up for some tasks made up of actors well versed in this kind of work.

Altogether, almost 50 people were involved in the work or work groups, and the main sponsor for development was the Ministry of the Environment. Some of the funding for the project came from the Rakennustuotteiden Laatu (‘Quality of Construction Products’) Foundation and some from SULVI.

The guidelines have been published (still as a draft) on the SULVI website and will appear in stages as building service and property cards and in the form of a manual. The structure is in the form of cards because there is bound to be a need to change and supplement the details regarding the new procedure. In this way the guidelines can be corrected and there will be no need to renew the entire content.

Piloting the ventilation survey procedure and future needs

After the guidelines were satisfactorily completed, the project was launched at a few residential and office sites to ensure that the guidelines were adequate and comprehensible. The trial sites showed how apparent the need for a condition survey was. At all of them there was much to repair and improve in terms of use and maintenance.

A larger-scale pilot project, where different types of property, property owners and several people conducting condition surveys were involved, would certainly provide a sound basis for clarifying the guidelines and material for training needs.

The intention is to produce a qualification and the necessary training for the ventilation condition survey. The survey, especially when it relates to office space, is very demanding. It requires sound experience and a good grasp of the potential for improving how the system functions.

Those involved are convinced of the need for such surveys. This type of inspection should be undertaken particularly in residential properties whenever one is faced with a bigger pipeline, façade or window renovation project than normal, or, for example, when considering heat recovery using an exhaust air heat pump.
Further information at:
http://www.sulvi.fi/ajankohtaista/projektit/

Changes to the new design temperatures for district heating

The Finnish Energy Industries publication K1/2013 ‘District heating in buildings, regulations and guidelines’ appeared in august 2013. It spells out the requirements for the design, planning and installation of district heating equipment in a building. The subject has also been raised in Talotekniikka magazine (1/2014).

After the regulations came into effect, however, there was some discussion among building service designers and construction firms concerning the design temperatures of heating systems, in new buildings especially. The flow temperature for radiator heating according to the publication K1/2013 of 45 °C results in a situation where in certain types of building it is awkward to install radiators or even impossible.

Current architectural practice favours high and narrow apertures, under which it is a challenge to install radiators. In such cases there is a risk that the radiators will not give out enough heat at low design temperatures.

The design temperatures for radiators in K1/2013 of 45/30 °C are suited to many buildings, however. The new design temperatures, especially in low energy construction, work better than radiators designed for large temperature differences.

For the regulations not to cause undue problems, the Heat Use Group decided to change the design temperatures, with the temperature of the water entering the radiator network in new buildings being no more than 60 °C. However, it is recommended that a low flow temperature should always apply if it is structurally possible, as then it is good for improving comfort levels. The extent to which radiators can be adjusted and the energy efficiency of the entire system improves if a low flow water temperature is applied.

It is recommended that the flow temperature in radiator heating be as low as possible for the sake of the energy efficiency of the heating network and to improve the extent to which it can be regulated. Exceptionally, a flow temperature of 45 - 60 °C can be applied.

A higher temperature than the recommended 45 °C might apply only if the design of the radiators would otherwise result in unreasonable problems installing and locating them and the pipes. The design value of the return temperature of the radiator network should be no more than 30 °C.

Design temperatures to be re-examined by 2019

The design temperatures of heating conveyors are to be re-examined by the time the Ministry of the Environment next tightens the regulations on energy in buildings and when the switch to zero-energy construction is made.

Ki’s electronic publication revealed a few tiny errors or points that needed clarification, which have now been put right in the design table:

- Point 3.2, paragraph 3: the post-heating radiator is recommended as air-to-water
- Estimate example 5, error corrected (pages 74-75)
- Connection of the recycled air appliance (example connection 9, page 91) corrected

The updated publication K1/2013 (version 31.3.2014) can be found on the Finnish Energy Industries website in electronic pdf format at http://energia.fi/julkaisut/112.

Summer comes to the office

Just who would want to sit in a sweltering office in summer – especially if it feels like a sauna? But it feels just as awful if the cooling system is so vigorous that you have to put on a jumper.

It is important to have the right settings for the temperature and ventilation of an office, not least because they have a major effect on work efficiency. Luckily, there is a solution to these problems – by using modern building service technology properly. More precise room settings and functions that detect presence make it possible to save energy using the controls for lighting, heating and cooling.

'The weather forecast can also be used to judge the need for ventilating a property,' says Simo Tähtinen, Head of Customer Services at Caverion.

Checklist for professionals:

1. Don't be caught out by hot weather. Check that the cooling equipment has been serviced as required under the law and before you start to use it. This way, any problems can be put right before they become serious in the cooling season.
2. Check that the cooling system has the right settings and test it beforehand.
3. Check the system for shutting down radiators in the summer. That will stop it warming the building when it is hot outside. If there is no such system in use, make sure that the control curve is right.
4. Ensure that the indoor temperature is automatically controlled separately for the cooling season and the heating season. That will prevent unnecessary cooling in winter and heating in summer.
5. Use night-time ventilation with an automatic system. You can reduce the need for mechanical ventilation during the day if an area is ventilated using cool outdoor air at night.
6. Use a heat recovery system and cool the incoming air. When the outdoor air is warmer than that leaving the premises, you can use heat recovery to extract the cold from the air leaving the premises and use it to cool the warm incoming air.