Klimaskaerm
Competent tester scheme in Denmark
Status and trends

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Denmark

What is Klimaskaerm?

• The Danish association for testing of building performance especially Air Tightness Testing and Measurement
• Independent non profit association with limited resources
• Founded 2006
• 50 member companies (surveyeing companies, testing equipment suppliers, manufacturers, institutes)
• Platform and society for the testing of building envelope with blowerdoor and/or infrared camera
• Located at the Danish Construction Association in Copenhagen, Denmark
• Homepage www.klimaskaerm.dk
Klimaskaerm - Areas of interest

- Building performance
- Airtightnes mesurement and dokumentation
- Infrared measurement, interpretation and dokumentation
- Thermal performance of buildings
- Leakages in buildings
- Performance and protection of the envelope as a whole
- Quality Assurance of testing

Klimaskaerm - Main activities

- Give third party information on building airtightness, thermal performance and testing as a whole
- Seminars, trainingcourses and education of testers
- Member metings
  - Communicate experience regarding testing
  - Forum for discussion and exchange of views and ideas to improve testing and quality of testing
  - Yearly held conference
- Develop tools (guidelines) for the administration of tests and quality assurance
Klimaskaerm – Mission

- To achieve and promote the highest standards of air tightness testing in DK
- Platform for testing procedure, methodologies and information exchange
- Undertake training of testers
- Provide Good Practice testing and technical guidance
- Give information regarding airtightness testing for the public, builders, contractors, consultants, designers (architects) etc
- Platform for the registration and accumulation of airtightness data of buildings in DK

27/11/2014

What have Klimaskaerm achieved 2014?

- Paradigms (guidelines) prepared for
  - Quality assurance manual for the surveyor company
  - The testing with Blowerdoor in compliance with EN13829 for small buildings, large buildings and passive houses (3 paradigms incl. common test reporting)
  - Local Authority handling of tested building airtightness and reports
- Prepared and executed a education programme for the certification of testers
- Prepared and promoted qualifikation and qualification procedures
- Prepared system for the registration and reporting of tests done and providing a database
How to become a certified leakage tester

- Certification of air tightness testing is possible in DK through Byggeriets Kvalitetskontrol, Danish Standard Certification (DNV GL Business Assurance Denmark) or Bureau Veritas
- The tester company need to establish a quality system (manual) specific for testing in accordance with EN 13829
- The tester is certified on basis of
  - Proof of knowledge (certificate)
  - Examination of practical competence (knowledge and experience)
  - Proof of equipment calibration

What is Byggeriets Kvalitetskontrol?

- The Quality Assurance & Certification for Building and Construction in Denmark certifies businesses within the Danish building and construction sector.
- The certification is conducted in accordance with either ISO-standards or Danish national regulations and encompasses:
  - Authorisations
  - Voluntary quality schemes
  - Schemes for energy marking or review reports for buildings, e.g. air tightness tests
The Certification process

- The company contact the an accredited auditor and enter a written certification agreement
- The company prepare a Quality Assurance System targeted for certification of air tightness testing in accordance with EN 13829
- The company submit its Quality Assurance System to the auditor
- The auditor evaluates the company Quality Assurance System and when appropriate, an audit of the company is executed
- When the Quality Assurance System is implemented an certification audit of the company, the testers knowledge, experience and equipment calibration and evaluation of selected reports will take place
- A certificate with a validity of 3 years shall be issued to companies that implement certification audit with a positive result

Surveillance audit and recertification

- Within the next two years a conducted surveillance audit of the company will take place at intervals of 12 months
- After 3 years a full recertification of the company is nessasary

Note
The certification is voluntary and therefor not mandatory in Danish Building Regulation
Kilmaskaerm - Training of testers is the key

To become a certified tester

• A tester must attend 2 day intensive course to understand the theoretical background of air tightness, building performance and testing

• A tester need to pass
  – a multichoise test to prove his understanding of air tightness
  – a practical test to prove his ability to perform a test in the right way and to handle his own equipment for the testing

• A tester must attend a recertification course and pass a new multichoise test every 3 years

Status

• Paradigms established to support the EN 13829
• Courses prepared and executed with succes
• 30 of 50 members have by now atended basic courses
• 10 members have been audited and are certified by 3rd party e.g. The Quality Assurance & Certification for Building and Construction in Denmark
• Discussions with Danish Energy Agency and Danish Building Research Institute on how to improve the quality of the testing of air tightness
Webinar, 20th November 2014 – Airtightness testing Part 3: Status & trends in competent tester schemes in Denmark, Ireland and Sweden

Mark A. Shirley, 2eva.ie
The National Building Regulations in Ireland are administered by the Department of Environment, Community and Development who through the Planning Standards section devise and implement the Building Regulations.

The Republic of Ireland is a relatively small island nation of 4.6 million persons and the Building Regulations are set at a National level with no ability for regional variations.
Along with the rest of our economy the Construction Industry collapsed in 2007/08 - but due the over-reliance at that time on Construction the industry was hit very badly.
The authorities have since 2007 significantly improved the Building Regulations across all Parts which has coincided with the collapse of the Industry.

This has included recognition of Ireland’s obligations under various EU laws including the EPBD and NZEBs.

It is part of a more than 10 year process towards 2020.
Air tightness up to 2008 was an aspiration but became mandatory with the 2008 Building Regulations and is covered under Part (L) Conservation of Fuel & Energy - Dwellings.

The 2008 regulations set ‘a performance level of 10m³/(h.m²) represents a reasonable upper limit for air permeability’

Therefore the air permeability rate (q50) is the National Standard.
All dwellings in Ireland now must be built to the 2011 Building Regulations.

‘a performance level of $7\, m^3/(h\cdot m^2)$ represents a reasonable upper limit for air permeability’

### Table 4: Number of pressure tests per dwelling type

<table>
<thead>
<tr>
<th>Number of units</th>
<th>Number of tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or less</td>
<td>One test</td>
</tr>
<tr>
<td>Greater than 4, but equal or less than 40</td>
<td>Two tests</td>
</tr>
<tr>
<td>Greater than 40, but equal or less than 100</td>
<td>At least 5% of the dwelling type</td>
</tr>
<tr>
<td>More than 100</td>
<td></td>
</tr>
<tr>
<td>(a) where the first five tests achieve the design air permeability</td>
<td>At least 2% (for dwellings in excess of first 100 units)</td>
</tr>
<tr>
<td>(b) where one or more of first five tests do not achieve the design air permeability</td>
<td>At least 5% of units, until 5 successful consecutive tests are achieved, 2% thereafter</td>
</tr>
</tbody>
</table>
‘Where an air permeability value better than the backstop value of 7 m³/(h.m²) at 50 Pascals is claimed for use in DEAP, a test should be performed on each dwelling claiming that value’

In other words for the EPBD calculation if the basis of the it is better than 7 m³/(h.m²) then each and every dwelling must be tested.

There are 2 other important points relevant to air tightness in the Regulations:

‘The tests should be carried out by a person certified by an independent third party to carry out this work, e.g. National Standards Authority of Ireland certified or equivalent.’
Competent Tester Scheme in Ireland – currently a total of 13 registered testers.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>County</th>
<th>File Number</th>
<th>Certified Air Tightness Tester</th>
<th>Company Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cawood Energy Saving &amp; Building</td>
<td>Co. Westf</td>
<td>1.91.003</td>
<td>Navitas Ltd</td>
<td>Oliver Walsh  <a href="mailto:oliver@navitas.ie">oliver@navitas.ie</a></td>
</tr>
<tr>
<td>Information TDA &amp; Goodbuild</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2eva.ie</td>
<td>Co. Carlow</td>
<td>1.91.006</td>
<td>Mark A. Shanley  <a href="mailto:mshanevap@2eva.ie">mshanevap@2eva.ie</a></td>
<td></td>
</tr>
<tr>
<td>Aerco.ie</td>
<td>Co. Meath</td>
<td>1.91.007</td>
<td>Joe Keanev              <a href="mailto:joes@2eva.ie">joes@2eva.ie</a></td>
<td></td>
</tr>
<tr>
<td>Aerco.ie</td>
<td>Co. Meath</td>
<td>1.91.007</td>
<td>Joe Keanev              <a href="mailto:joes@2eva.ie">joes@2eva.ie</a></td>
<td></td>
</tr>
<tr>
<td>Energy and Engineering Services</td>
<td>Co. Clare</td>
<td>1.91.008</td>
<td>John McEwan              <a href="mailto:johnmcswan@eircom.ie">johnmcswan@eircom.ie</a></td>
<td></td>
</tr>
<tr>
<td>Navitus Ltd</td>
<td>Dublin 15</td>
<td>1.91.009</td>
<td>Steve Walsh  <a href="mailto:steve@navitus.ie">steve@navitus.ie</a></td>
<td></td>
</tr>
<tr>
<td>Irish Energy Assessors</td>
<td>Co. Sligo</td>
<td>1.91.010</td>
<td>Martin Connolly  <a href="mailto:mcconn@irishenergyassessors.com">mcconn@irishenergyassessors.com</a></td>
<td></td>
</tr>
<tr>
<td>Clean Energy Ireland Ltd</td>
<td>Co. Cork</td>
<td>1.91.011</td>
<td>Joe Doherty              <a href="mailto:jay@cleanenergyireland.ie">jay@cleanenergyireland.ie</a></td>
<td></td>
</tr>
<tr>
<td>Newtown Energy</td>
<td>Co. Westf</td>
<td>1.91.012</td>
<td>Deanne McQuaid  <a href="mailto:deanne@newtownenergy.ie">deanne@newtownenergy.ie</a></td>
<td></td>
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<tr>
<td>Shoal Energy Services</td>
<td>Co. Sligo</td>
<td>1.91.013</td>
<td>David Gannay           <a href="mailto:david@shoalenergy.ie">david@shoalenergy.ie</a></td>
<td></td>
</tr>
<tr>
<td>Sholster Energy Services</td>
<td>Co. Kerry</td>
<td>1.91.017</td>
<td>Bernard Sheahan  <a href="mailto:bernard@sholsterenergy.ie">bernard@sholsterenergy.ie</a></td>
<td></td>
</tr>
<tr>
<td>Evolved Energy Solutions Ltd</td>
<td>Co. Dublin</td>
<td>1.91.019</td>
<td>Brian Scavensy  <a href="mailto:brian@evolvedenergy.ie">brian@evolvedenergy.ie</a></td>
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</tr>
<tr>
<td>ABUILD</td>
<td>Co. Donegal</td>
<td>1.91.022</td>
<td>John Conran              <a href="mailto:john@abluild.ie">john@abluild.ie</a></td>
<td></td>
</tr>
<tr>
<td>2eva.ie</td>
<td>Co. Clare</td>
<td>1.91.023</td>
<td>John McEwan              <a href="mailto:johnmcswan@eircom.ie">johnmcswan@eircom.ie</a></td>
<td></td>
</tr>
</tbody>
</table>

Good geographical distribution
Feasibility and further information

For further information or an application form for this scheme please contact patricia.walsh@nsai.ie.

<table>
<thead>
<tr>
<th></th>
<th>Initial Application Fee</th>
<th>Annual Registration Fee</th>
<th>Initial Audit / Annual Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Fan</td>
<td>Waived</td>
<td>€440</td>
<td>€1,100</td>
</tr>
<tr>
<td>Add additional Single Fan registered tester from the same company</td>
<td>Waived</td>
<td>—</td>
<td>€300¹</td>
</tr>
<tr>
<td>Single &amp; Multi Fan</td>
<td>Waived</td>
<td>€440</td>
<td>€1,650¹</td>
</tr>
<tr>
<td>Adding Multi Fan to Single Fan Registration</td>
<td>Waived</td>
<td>—</td>
<td>€1,100 (or €550⁶)</td>
</tr>
</tbody>
</table>

Next Steps...

Continued registration by new testers

Core group of long standing, professionals testers

Inclusion of the ability to tester commercial buildings using a single fan

Multifan testing

Competent Testers Association
QUESTIONS?
Status in Sweden and the new diploma for airtightness testers

Eva Sikander, SP Technical Research Institute of Sweden

Situation in Sweden

Swedish Building Code

- Requirements concerning energy use, no specific requirements concerning airtightness.
- Only for small buildings (less than 100m2) the requirement is specific
- Testing is mandatory in Sweden
Situation in Sweden

The developer
• has the responsibility to fulfil these requirements on energy
• is the actor who can formulate the requirement of the future building’s airtightness (better than the assumed airtightness in the energy calculation)
• has contracts with different actors to make sure that these requirements or even more specific and demanding requirements are fulfilled.
• Decide if the building is going to be tested, and in that case - when and how.

Why do we need the diploma for airtightness testers?
• The building industry (developers/designers/contractors) have a increasing awareness about the importance of airtight building envelopes!
• For Swedish Passivehouses there is a demand – on a voluntary basis (0,3 l/m2s at 50Pa pressure difference)
• More consultants offer the service to do the airtightness tests
• Until this year there was no education or diploma which validates the consultants competeces and ability to do a correct airtightness test
• The first diplomas for airtightness testers were sent in january 2014.
• Today there are 20 (soon 25) diplomas in Sweden.
Diploma for airtightness testers

The diploma shows that the consultant has qualifications to
• do a airtightness test according to EN13829 (mostly according to method B).
• be the expert to help the client to reach the requirement using the method ByggaL.

Pre-qualifications:
• Experience during 5 years from designing/construction or
• Educational background from 3 years at University (building)
• More than 5 airtightness tests

Tester competence - Training and validation

Education content during 2.5 days:
• Why airtight building envelopes?
• The position/role as a diplomed tester
• The standard EN 13829
• building preparation, calculation areas, calibrations…
• The steps of the test and use of equipment on site
• Identify laekage on site
• How to write a report
• The building process and priciples and actions for airtightness
• Requirements
• Method – ByggaL

Validation/evaluation:
• Theoretical examination
• Practical testing with the own equipment including test report
The diplomed airtightness tester and the buildings process:

- The diplomed airtightness tester also get education to follow a method to ensure airtightness during the building process
- This gives the consultant a possibility to give extra value to the client
- The method - ByggaL
Developer’s requirements for good airtightness

Quantify the requirement
Ex. 1: Air leakage < 0.2 l/m²s
Ex. 2: Air leakage < 0.3 l/m²s
Ex. 3: Air leakage < 0.4 l/m²s
m² area of the building envelope

Verify by measurements
At an early stage in the building process (improvements can still be done to a lower cost)
When the building is completed

Developer’s requirements concerning activities for good airtightness

During the design stage the designer shall
• Appoint someone to be responsible
• Perform information/training of designers
• Ensure durable solutions
• Ensure that solutions can be constructed
• Specify and describe details - documentation

During the construction stage the contractor shall
• Appoint someone to be responsible
• Plan the work, together with the designers
• Information/training in the building site.
• Make inspections
• Measure airtightness performance and trace leakage at an early stage
• Measure airtightness when the building is completed
• Documentation
Airtightness requirements and the developers own work

Designing for airtightness

Critical details and descriptions

Measurements

Operation for sustainable airtightness

Byggherre

Projektör

Entreprenör/leverantör

Finvallare

Early planning

Design

Construction

Operation

Designer’s work during design stage - routines

- Appoint someone to be responsible
- Go through and agree on the requirements
- Internal information / training - material is available.
- Design and documentation
- Internal reviews
- Go through and check the completed documents with contractors
- Identify critical production stages together with contractor - checklist
- Record all information and results
- Hand over results and documentation to contractor
To be considered during design stage - examples

- The airtightness of the materials
- Durability of solutions
- Minimise the number of joints
- Minimise the number of penetrations
- Plan details of airtight penetrations, such as ventilation ducts, chimneys, electrical installations etc
- Plan window and door connections
- Plan connections to walls / floors / ceilings
Contractor’s work during construction stage - routines

- Appoint someone to be responsible
- Go through documents with the designers concentrating on critical details and work
- Prepare and follow an inspection plan
  - Internal information, should include subcontractors – education material is available
- Work planning (working methods, materials and critical solutions before each new workmoment)
- Measurements of airtightness at an early stage – work description is available. Measurements and detection of leaks should allow involved on the buildingsite to take part – improves the knowledge about airtight solutions
- Do final airtightness tests
- Documentation
- Feed back of experience to the designers

Future actions in Sweden

- There is a need to define some recommendations and guidelines in connection to EN13829 in the swedish context (areas in multi-family building for example)

- Experience-meetings for diplomed airtightness testers is planned once a year to support knowledge exchange and communication of new information. Starting in 2015.
Thank you for your attention!

Eva.sikander@sp.se