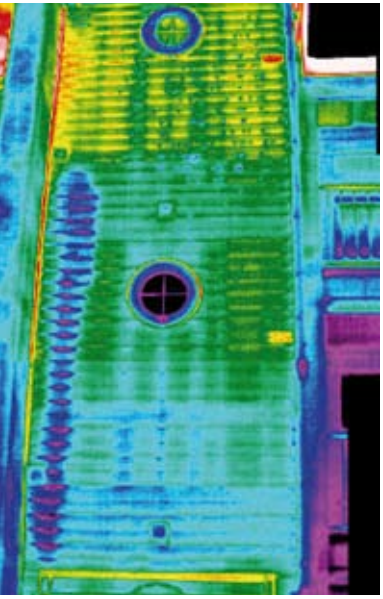
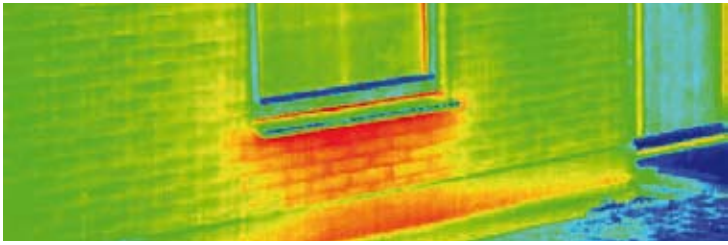
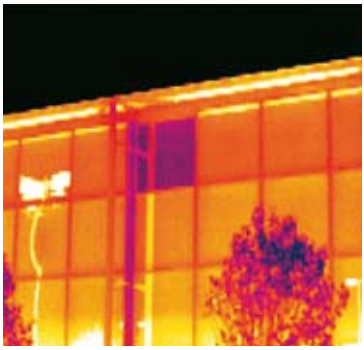
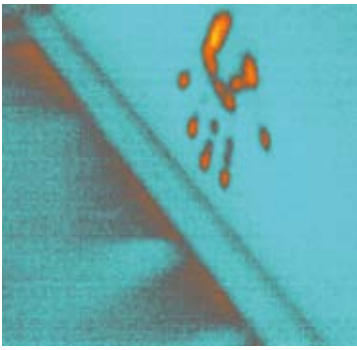
FLIR









INFRARED GUIDEBOOK FOR BUILDING APPLICATIONS

An Informative Guide for the Use of Infrared in the Building Industry

Content

This booklet is produced in close cooperation with the Infrared Training Centre (ITC).

Introduction

Since the 1970s we have become increasingly conscious that energy resources are precious and limited.

The building sector accounts for 40% of the EU's energy requirements and offers the largest single potential for energy efficiency. Due to the huge potential the European commission has formed a directive for energy performance regulation of buildings – on which many national laws are already based. Thousands of European businesses are already affected while the Energy Performance Certificates (EPCs) has become mandatory in many countries in EU for new buildings and large building refurbishments.

This, together with recent economic stimulus packages in many countries, is likely to drive the demand for Air tightness testing and other methods for investigation energy efficiency.

In a longer perspective we are likely to see harsher EU directives for energy savings in buildings exemplified by present discussions about Passive House technology to become standard within the EU. This will have great impact on many professionals working in the building sector.

The use of an infrared camera alone or in combination with other methods, for instance "Blower Door", speeds up the work considerably. Infrared pinpoints exactly where the energy losses are – without the use of any destructive testing.

Thermography is the unique tool to map the energy loss from a building. The method is quick and the IR images along with the IR reports which the camera produces are a precise and convincing argumentation.

This booklet is an in-depth guide for inspections in buildings with thermography. There are many details to pay attention to when carrying out an infrared inspection. As well as knowing how the infrared camera works and how to take images, it is important to know the physics around a building, and how it is constructed. All of this has to be taken into consideration to understand, interpret and judge infrared images correctly.
All principles, concepts and use of systems for analysis of building applications cannot be covered in this guidebook; however there are training courses with ITC (Infrared Training Centre) specifically designed for building applications.

The guidebook will present

- Infrared applications within the building sector
- How the infrared camera works and what to consider when purchasing a camera
- What to consider when taking images
- Software for creating professional reports
- Customer application stories from the field

1. The Infrared Camera and how it Works

An infrared camera does not see temperatures, it records the intensity of radiation in the infrared area. This is radiation which is not visible to the human eye.

The camera converts infrared radiation to a visible image. The images are presented in a grayscale or with different pallets to make it easier to look at. While the human eye can see radiation in the electromagnetic spectrum within 0,4 - 0,7 µm, the infrared area goes from 0,9 - 14 µm. The cameras used for building inspection work within the area 8 - 14 µm.

There is a context between electromagnetic radiation and temperature. That is given in the Stephan-Boltzmann's law:

$$W = \sigma \cdot T^4$$

W = Intensity of radiation
σ = Stephan-Boltzmann's constant = $5{,}67 \cdot 10^{-8}$ W/(m²·K⁴)
T = the temperature measured in Kelvin.

By the help of this formula the camera not only sees radiation from a surface, but it can also calculate the temperature on a surface.

To make infrared images taken of surfaces easier to understand, it is possible to present a digital photo together with the infrared image. This shows the user exactly where the IR image was taken and what it is able to see. Infrared is the perfect tool for building diagnostics.

2

2.Infrared Thermography for the Building Industry

Infrared (IR) inspection is a powerful and non invasive means of monitoring and diagnosing the condition of buildings. An IR camera can identify problems early, allowing them to be documented and corrected before becoming more serious and more costly to repair.

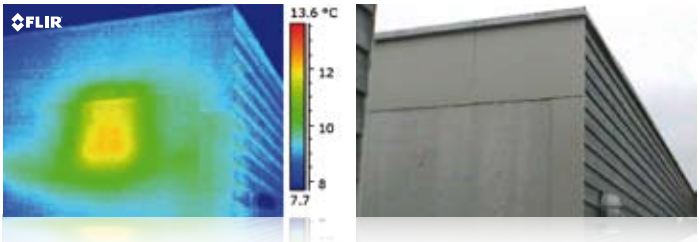
An infrared inspection within building diagnostics help:

- Visualize energy losses
- Detect missing or defective Insulation
- Source air leaks
- Find moisture in the insulation, in roof and walls, both internal and outside
- Detect mold and badly insulated areas
- Locate thermal bridges
- Locate leaks in flat roofs
- Detect breach on hot-water pipe
- Detect construction failures
- Locate radiant floor heating faults
- Monitor the drying of buildings
- Detect electrical faults
- Find faults in supply line and district heating
- Plus much, much more!

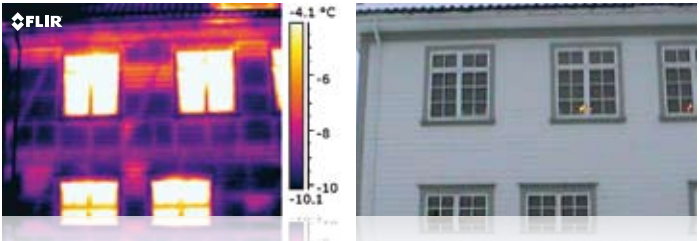
Interpretation of Images for Building Applications

Detecting Poor Insulation and Air Leaks

Infrared thermography (thermal imaging) is an outstanding tool to locate building defects such as missing insulation, delaminating render, condensation problems and "see" energy loss. Thermography also helps assess flat roofs for damaged insulation and trapped moisture.

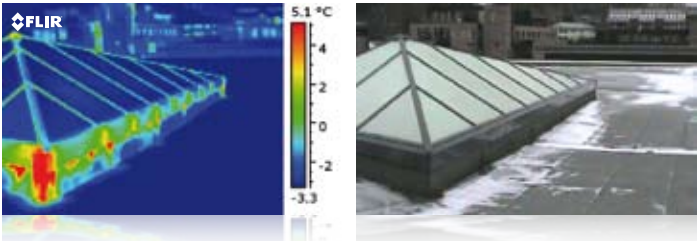


This building is warmer on the inside. It is a sandwich construction, concrete - insulation - concrete. One section of insulation is missing which is not possible to see visually either from the inside or the outside. Here infrared can see what the human eye can't.



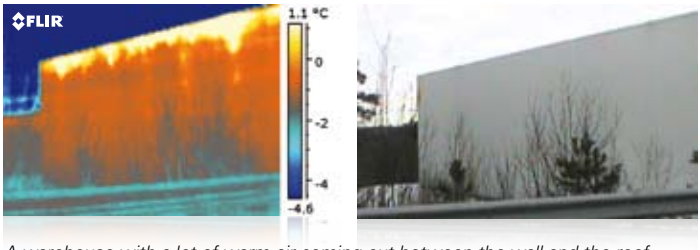
Framework construction. Many of the sections are missing insulation as indicated by the warmer colors.

Bigger office buildings often have an atrium in the middle. These atriums often have a cafeteria at the floor and a glass roof above to let the sunshine in.



Glass roof above an atrium. It is watertight, but not air tight. Warm air goes out because of the over pressure and cold air is coming in at the floor in the cafeteria. The solution is to air tighten the glass roof.

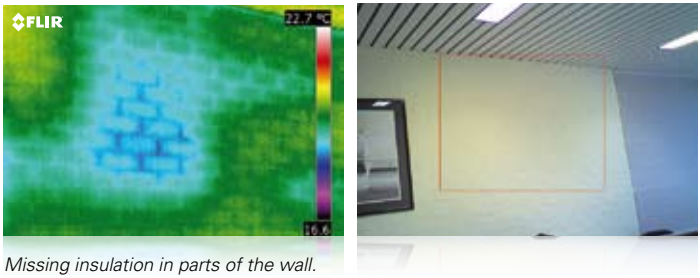
Large warehouses with well insulated prefabricated walls and roof can experience energy loss from the joints between these parts.



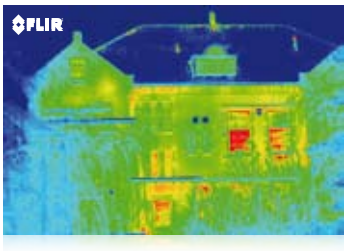
A warehouse with a lot of warm air coming out between the wall and the roof. These joints should be tightened to stop the big energy loss.

Insulation Defects

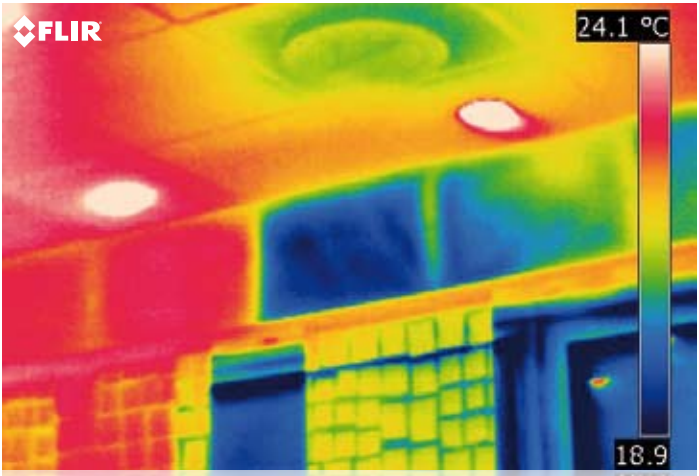
The typical thickness of the insulation varies from country to country. In cold climates the insulation usually is thick. In countries with warmer temperate climates there is less thickness or nothing at all. On the other hand, in warmer climates cooling inside is often used which calls for thick insulation to take care of the energy. Using an IR camera the rule of thumb is that it should be at least 10 °C temperature difference between outside and inside temperature the sides of the wall to get good, easy to see patterns. Using a camera with higher resolution and thermal sensitivity, the temperature difference can be less.



Missing insulation in parts of the wall.



Thermal survey from outside, the red areas represent poor or missing insulation.



The infrared image clearly shows insufficient insulation in wall above window.

Detection of Air Leaks

It is not unusual to find air leaks through the envelope of a building. An air leak leads to higher energy consumption, often causing problems with the ventilation system, as well as causing condensation in the construction which makes the indoor climate poor. 90% of air leaks are caused by the defect in the climate shelf.

To detect air leaks with an infrared camera a temperature difference and a pressure difference over the construction is needed. The air itself is not possible to see. With an infrared camera however, you detect the characteristic patterns that occur when cold air is coming through a leak in the construction - goes along a surface and cools it down. The infrared inspection should always take place on the side of the construction with negative pressure.

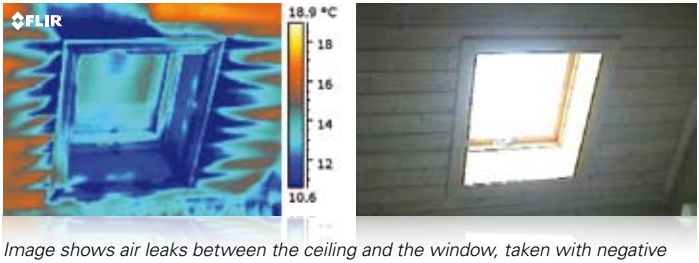
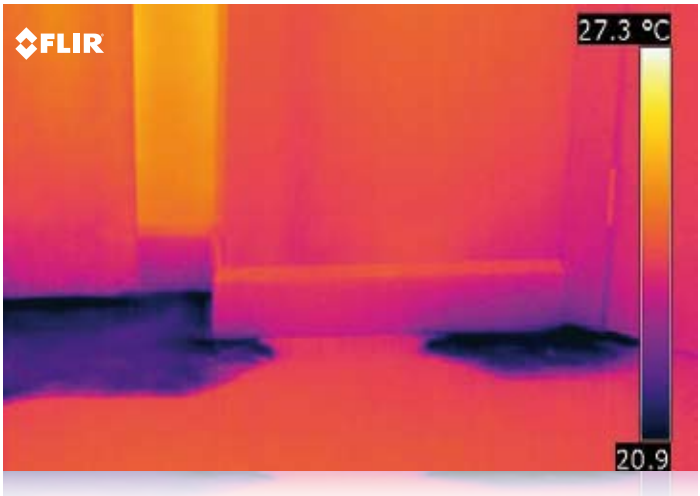


Image shows air leaks between the ceiling and the window, taken with negative pressure inside.

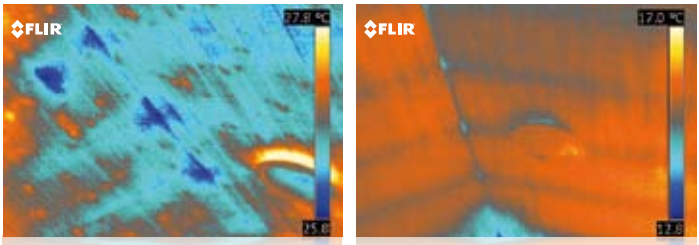
Moisture Detection

Moisture damage is the most common form of deterioration for a house. Air leakage can cause condensation to form within walls, floors, or ceilings and wet insulation takes a long time to dry and becomes a prime location for molds and fungi. Scanning with an infrared camera can locate moisture that creates an environment conducive to molds - locations that may never be seen with the human eye. One might smell its presence, but not know where it is forming. An infrared survey will determine where inherently moist areas are located that promote potentially serious mold and health problems.



Moisture intrusion in floor, impossible to see with the human eye, but clearly visible in infrared.

Moisture can be difficult to spot and the trick is to make the construction change temperature. Materials with moisture will then be clearly visible as they change temperature much slower than dry materials. Where other methods only measure the temperature in one point, infrared covers huge surfaces in an instant.

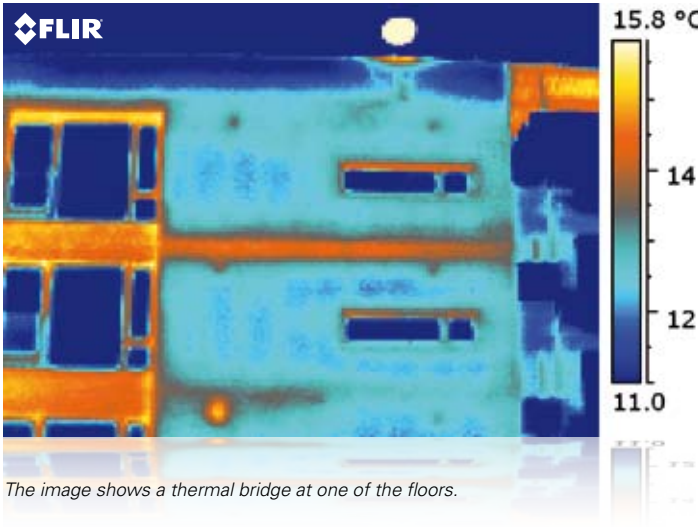


Infrared images taken of the same ceiling. In left image the room temperature has been changed by heating which makes the moisture in the insulation appear clearly.

Thermal Bridges
A thermal bridge is an area with less insulation due to the construction; such as a metal fastener, concrete beam, slab or column. Heat will flow the easiest path from the heated space to the outside - the path with least resistance. Very often heat will "short circuit" through an element which has a much higher conductivity than surrounding material, which can be described as a thermal bridge.

Typical effects of thermal bridges are:

- Decreased interior surface temperatures; in the worst cases this can result condensation problems, particularly at corners.
- Significantly increased heat losses.
- Cold areas in buildings.



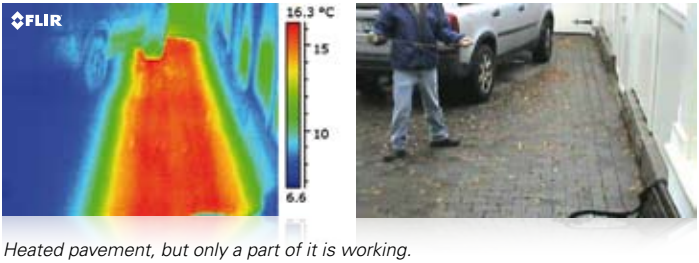
The image shows a thermal bridge at one of the floors.

Here, the bridging is between the roof beams and the adjacent wall.

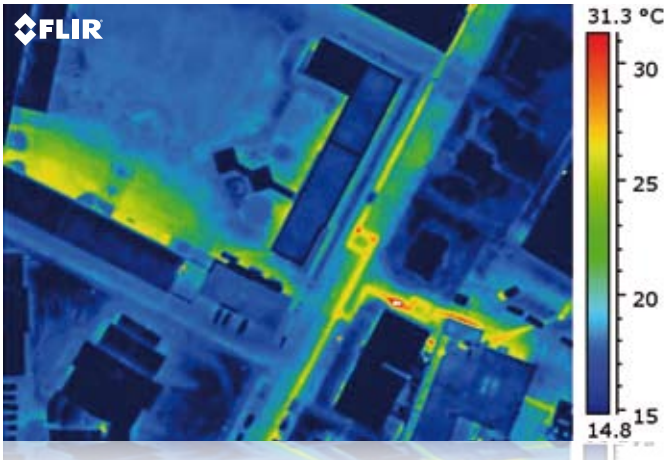
Supply Lines and District Heating

In cold climates heating of pavements and gangways are used. It is also common with district heating, a system for distributing heat generated in a centralized location for residential and commercial heating requirements.

A thermographic survey can easily detect any defects in heating systems under ground. Even if there is snow on the ground, the heating pipe lines are visible with an infrared camera.



Heated pavement, but only a part of it is working.



An aerial IR photo has identified leaks or insulation failure in the district heating system

Finding Leaks in Roofs

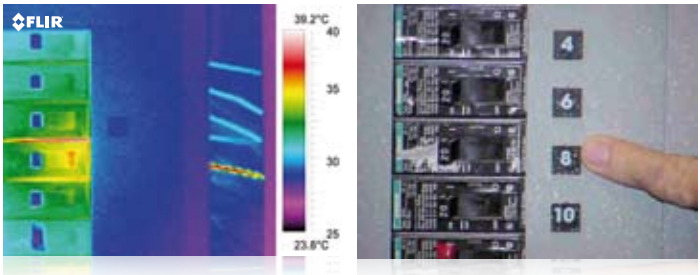
Tremendous savings result when wet areas of a roof can be repaired rather than replacing the whole roof.

By using the sun as a heater it is possible to find wet insulation in a roof with an infrared camera. During the day the sun is heating the roof. At night time the roof cools down again, but much slower where there is wet insulation. This area is clearly visible and indicated as warmer in an infrared image.

The buildings with yellow colored roofs show there is a moisture or insulation problem.

Electrical Faults

One of the most common faults in buildings are electrical faults.

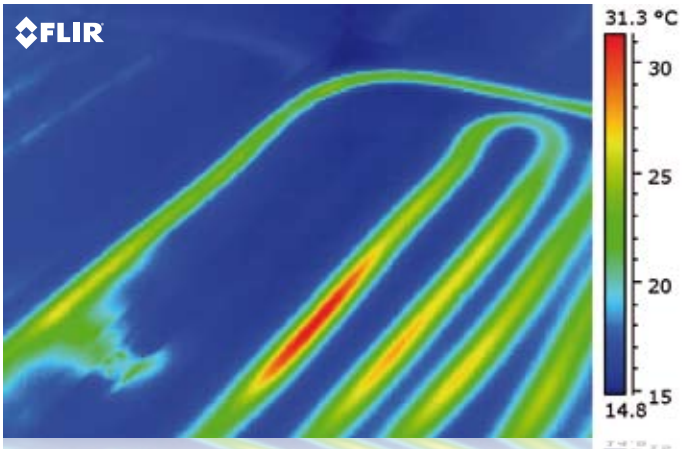


One of the fuses is over-heated, a potential fire risk.

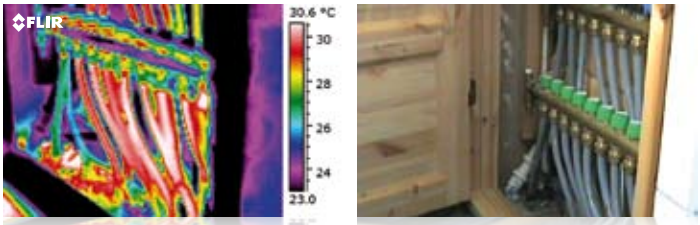
Most of the time these electrical problems are invisible to the naked eye, but an infrared camera instantly makes hot spots visible on a thermal image. You can scan electrical cabinets, components and survey multiple wires, connections and get an instant picture of potential trouble. The problem area can be detected and repaired before real problems occur! Common electrical targets in the building industry are fuses, electrical panels, and lighting.

Locating Leaks in Floor Heating

Infrared is an easy-to-use tool to find and check pipes and tubes for leaks, even when the water pipes are laid in the floor or under plaster. The heat of the pipes radiates through the surface and the pattern can be easily detected with an infrared camera.



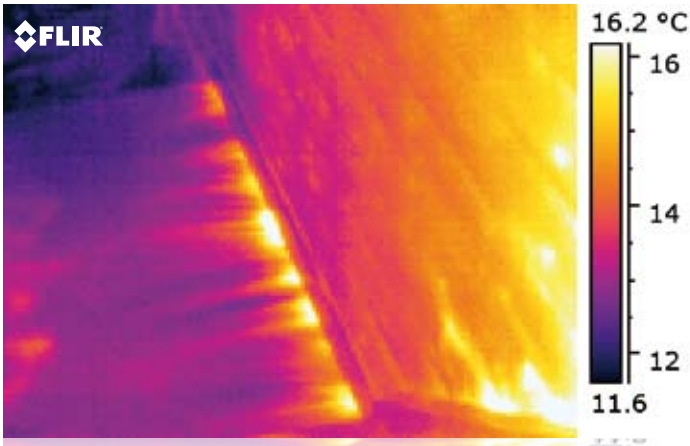
The image above shows a water leak from a hot water pipe in the floor heating.



Distribution of hot water.

Smell

Infrared has proved useful to find leaks between houses. Leaks between houses lead to poorer sound insulation as well as the smell of cigarettes and other unpleasant odors. By using negative pressure together with a temperature difference it's easy to detect the leaks.



Warm air coming in at the base board from the next door neighbor.

Cold Storage Plant

Cold storage plant and cold storage chambers have a great requirement to insulation and tightness. Ordinary indoor temperature at a cold storage plant is -23 °C to -25 °C. Lack of insulation and leakages causes condensation and ice in the construction, which creates the need for more energy - and ice will eventually destroy the construction.

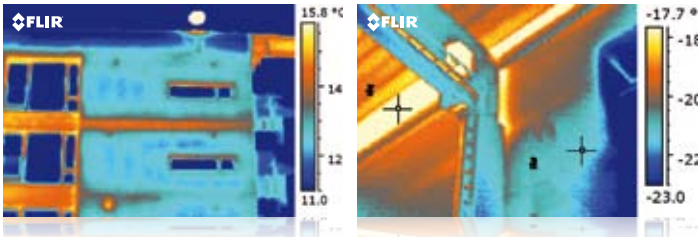


Image to the left shows air leaks in the connection between the wall and roof – leading to a big temperature difference. The image to the right shows a cold bridge between wall and roof.

Redevelopment Planning & Quality Assurance

Infrared technology is used during redevelopment planning, but also in quality assurance and the inspection of new buildings.

During construction-drying, infrared images make it possible to determine the progress of the drying procedures so that necessary measures can be taken to speed up the drying process.

If this process can be accelerated and it can be proven, with the help of an infrared camera, that the construction is totally dry, the building can be surrendered faster to the client.

Building Renovations

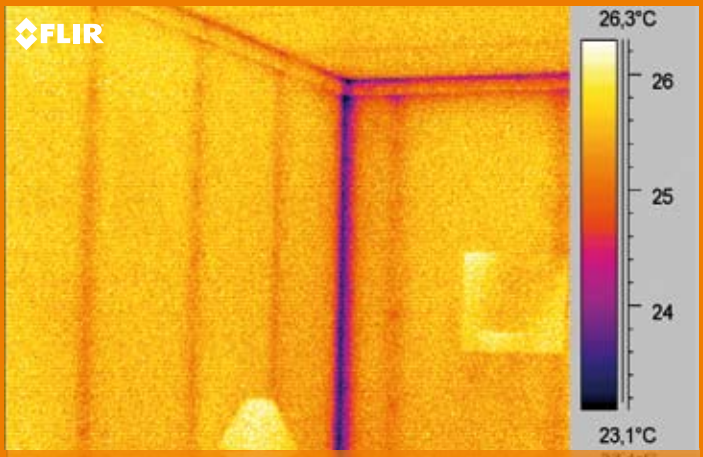
Infrared thermography provides valuable information during the renovation of buildings and monuments. Framework constructions hidden by mineral plaster can become clearly visible in an infrared image. It can then be decided whether exposure of these structures is useful. The detachment of plaster from walls can also be located in a very early stage so that preservation measures can be taken.

3. Building Physics

In order to interpret the infrared images in the correct way you also need to know how different materials and structures influence the temperature readings on the surface. Some of the most important factors influencing the surface temperature and pattern are:

1. Type of materials used in the construction
Some materials, for ex. concrete, are thermally slow which mean they change temperature very slowly. Other materials, like most metals, change temperature quickly. In order to interpret the results correctly, the thermographer has to know if there has been any big temperature change outside or inside close before the inspection takes place – as this can affect the temperature readings.

2. How the construction is built
An outer wall can be built with an air gap between the outer skin and the rest of the construction. Such type of construction is not suitable for control from the outside. Any framework in the wall construction becomes colder seen from the inside (provided it's warmer inside). From the cold side it is the opposite situation. These are expected characteristic patterns and there is nothing wrong.



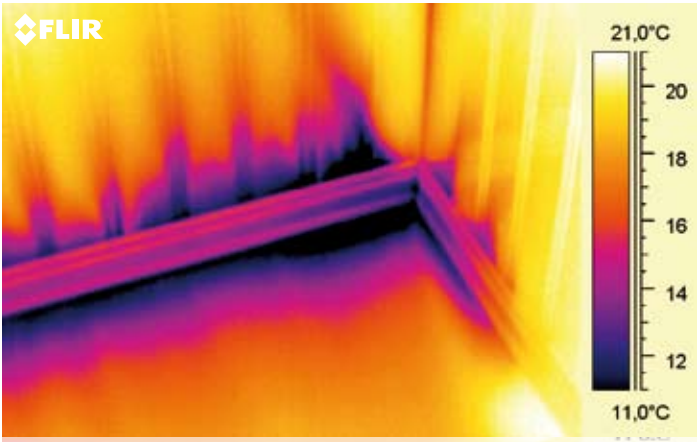
IR-image taken from the inside. The framework is visible, and so are the screws fitting the sheet covering to the framework. The corner is clearly colder, called a corner-effect, but there is nothing wrong here.

3. Indoor- and outdoor temperatures
Missing, damaged or non-performing insulation will stand out clearly in a thermal image when there is at least a 10 °C stable temperature difference between the two sides of the wall. It is often possible to do work with less of a temperature difference depending on the thermal capacitance of the building materials. The inspection is typically done from both the inside and the outside. The best results are often gained from the inside because of fewer influences, but for a better overall understanding of the building a complementary thermal survey from the outside is recommended.

The user should know the indoor- and outdoor temperature and also needs to know if there have been big temperature changes during the last 24 hours.

4. Pressure difference over the construction makes air leaks visible
Difference in pressure over the construction makes air flow from one side to the other if there is a leak in the construction. High pressure difference causes high speed and if there is no pressure difference, no air moves through a leak and the construction looks tight.

The infrared camera does not see the air itself but shows areas that have been cooled down by the airflow. The characteristic pattern (see example below) is shown in the image on which conclusions can be drawn.

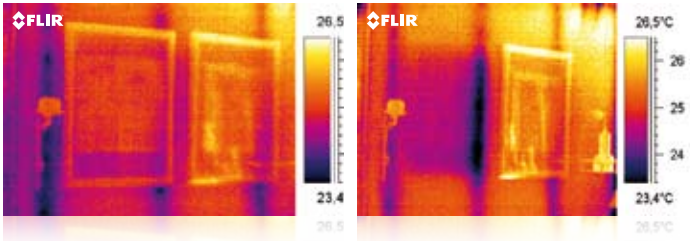


The image shows air-leaks at the base board.

5. Influence on the outside
Sunshine and shadows might give very special patterns on a surface and can be seen many hours after the radiation from the sun has ended. How many hours after depends on the materials in the construction. It should not be mixed up with patterns generated by heat transfer in the inspected construction. As an example, brick changes temperature much slower than wood. Wind has an indistinct effect and leads to less temperature differences on the surface compared to when there is no wind.

Precipitation as rain makes a surface wet and cools down the surface. When drying it leads to evaporation which in turn cools down the surface. Obviously this can produce a misleading pattern and needs to be taken into account.

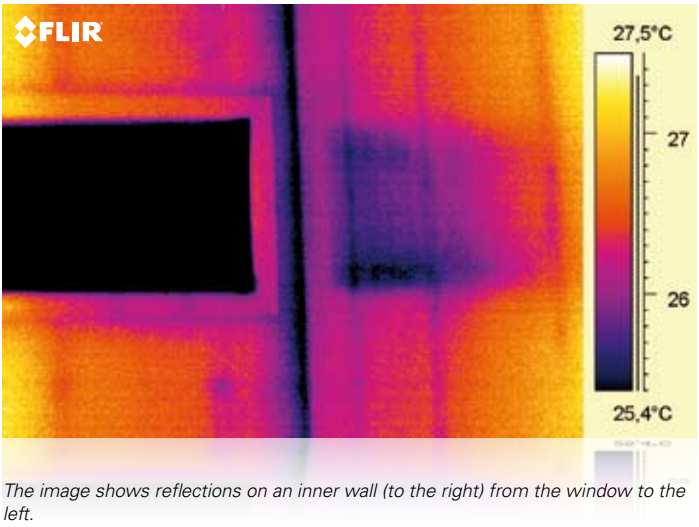
6. Influence on the inside
A heater heats the surrounding surface. Ventilation air might strike a surface and heat – or cool it locally. Bookshelf, cabinet and pictures hanging on the wall have an insulating effect. If these things are taken away from the wall, a colder pattern shows behind.



These two images are taken of the same wall. The temperature outside is colder than inside. The image to the right shows what can happen when you take away a picture from the wall. The temperature is colder behind the pictures and because the picture has a size the same as between two studs in the wall, it looks like some insulation is missing in the wall. The example shows that it is important to move things away from the wall at least 6 hours before an infrared inspection.

7. Reflections from the surroundings

When scanning reflective targets, be sure to change your angle to eliminate the reflections on the image. The reflection could be from your body heat, or some other heat source in the area, a piece of machinery, light bulb or a transformer. Reflections will give you incorrect data in the thermal image, and if not understood, it is a data error.



The image shows reflections on an inner wall (to the right) from the window to the left.

4. Finding the Best Solution for You

Basically five important requirements are important to evaluate when investigating a suitable combination of camera, software and training:

1) Camera resolution
2) Camera sensitivity
3) Added extra functions in the camera
4) Software requirements
5) Training demands

1. Camera Resolution
The more professional cameras will normally offer a resolution ranging from 320 x 240 up to 640 x 480 pixels. 640 x 480 pixels is more and more becoming a standard requirement for professional thermographers. The reasons for this are amongst others:

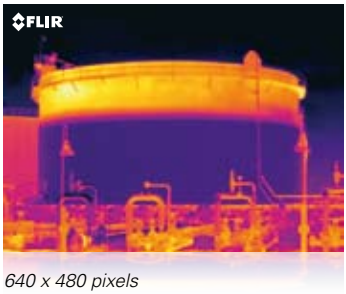
A: Higher resolution provides better temperature accuracy and sees even small details at a distance
A camera with 640 x 480 pixels has 307 200 measurement points in one image which is four times more than a camera with 320 x 240 pixels and 76 800 measurement points. Not only will the measurment accuracy be better for the higher resolution, but also there is a huge difference in the image quality.

The increased number of pixels will result in a much clearer picture where small details are clearly visible but also means the temperature measurements will be much more accurate. This will of course be very important when pinpointing exactly where the hot spots are and how urgent/dangerous the problem is. A nice, sharp and clear image has a higher value increasing the users credability. It is easier to interprete and understand and identify the inspected object.

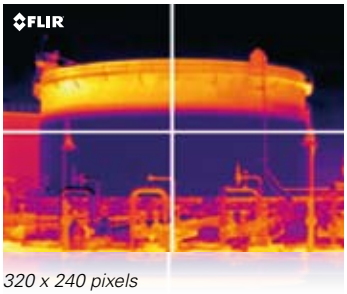
Image by 640 x 480 pixels

Image by 140 x 140 pixels

B: Higher resolution means you need to take fewer images
With a higher resolution camera you can cover a larger object with only one image. With lower resolution more images are needed to cover the same area with the same level of details. With a 640 x 480 pixel camera equipped with at 45 degree lens, a wall area of about 4 m x 3 m can be inspected at 5 meter distance with only one image. To inspect the same wall with a 320 x 240 camera, also with a 45 degree lens, four images on half the distance are required. Using a 640 x 480 camera represents a major increase in efficiency as not only fewer images need to be captured in the field, but also during the documentation phase.



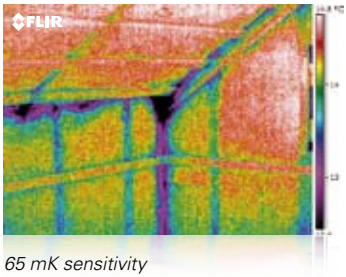
640 x 480 pixels
One IR image needed



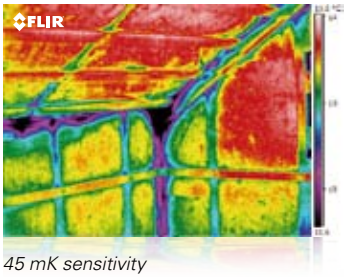
320 x 240 pixels
Four IR images needed at half the distance

2. Thermal Sensitivity
High camera sensitivity is particularly important for building applications where temperature differences are typically lower. Higher sensitivity is needed to capture more detailed images and thus better diagnoses for further actions.

The higher the sensitivity the better the camera is to capture the finest image details even at low temperature differences.



65 mK sensitivity



45 mK sensitivity

Above show the differences in IR images taken from the inside of a house - with different camera sensitivity.

The less advanced cameras have lower resolution and normally range from 80 x 80 up to 320 x 240 pixels. They give good information when you perform less advanced inspections and work as an excellent hand tool. They are compact, easy to use, take images that are good enough, and give the possibility to measure temperature and to save images.

3. Added Extra Camera Functions

As a rule of thumb, the more advanced an infrared camera is the more special functions are included. The less advanced carry a limited number of extra functions thought to be adequate for the user's purpose.

Almost all professional cameras and also some less advanced cameras have a built-in digital camera. Professional cameras also have a Thermal Fusion and Picture-in-Picture functionality which merges visual and infrared images to offer better analysis and reporting.

Picture-in-Picture allows a clear overview of this high voltage installation.

Visual image

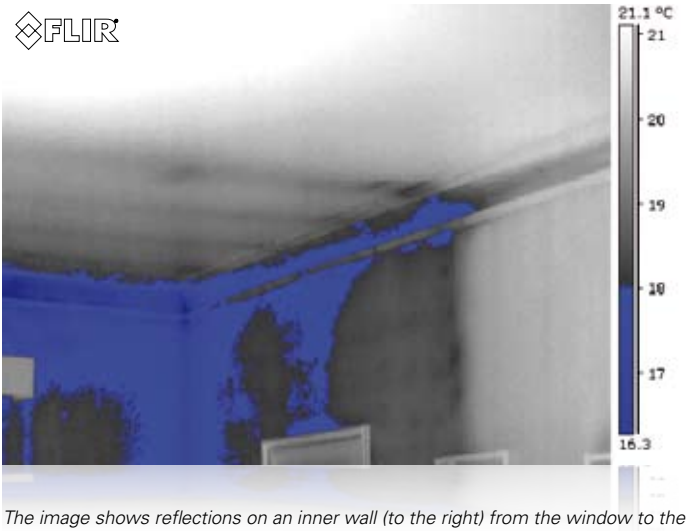
Thermal image

Thermal Fusion Image

Some of the most advanced models have features as GPS for tagging the infrared image to its geographic location, and tiltable viewfinder, a necessary feature for outdoor use as it shows a very sharp image without influence of ambient light and reflections.

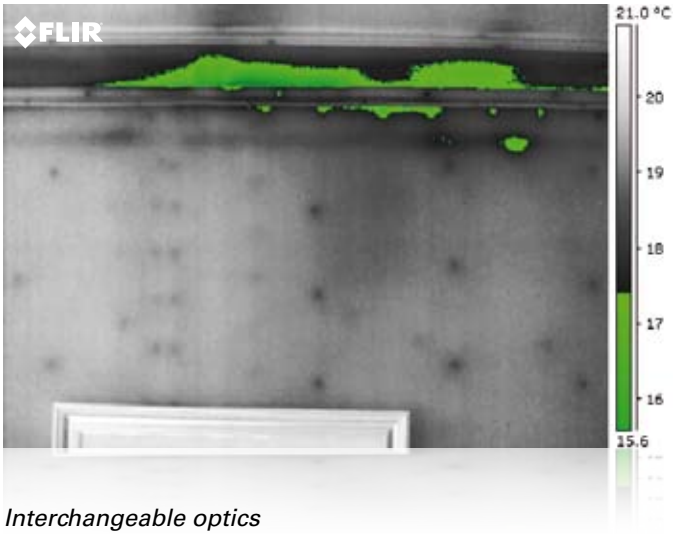
If you work a lot out in the fields, it is handy to have a multi-function camera. It means less equipment to take care of and makes the user more effective.

Relative humidity alarm and insulation alarm
Professional cameras include building specific alarm functions that are particularly useful in building applications; relative humidity alarm and insulation alarm. The relative humidity alarm alerts you to the areas where there is a risk of condensation. In the image below the area at risk is indicated as blue color.



The image shows reflections on an inner wall (to the right) from the window to the left.

The insulation alarm shows where the areas below or above a set temperature are by making them appear in a different color. In the image below the temperature is set to 17.5 °C and all areas below are clearly marked in green.



Interchangeable optics
The more advanced infrared cameras have interchangeable optics for wider field of view.

Reporting
The ability of presenting results from an infrared inspection is an important part of the inspection. All FLIR cameras come with basic reporting software, FLIR QuickReport, which makes it easy to work with the images afterward and put them together in a readymade report template.

The more professional cameras carry more features making reporting even better and more efficient when out in the field. Most of these cameras offer possibilities of inputting both text- and voice comments, either directly or via a PDA as a part of the image. The infrared and digital images are linked together and are automatically presented side by side in a report.

The need of efficient reporting is of great importance and the multi-function cameras with higher camera resolution and detector sensitivity are important to produce the best quality in images and temperature readings.

4. Software Requirements

Analyzing infrared images and reporting the results of infrared inspections are important everyday tasks for any professional thermographer. Depending on your image analysis and reporting requirements, a set of available software will support you:

FLIR BuildIR

The FLIR BuildIR software works together with an infrared camera to visualize and quantify building related problems like air infiltration, insulation defects, thermal bridges and moisture problems in a professional report. With new and unique features it also enables quantifying and estimating the cost of the energy losses.

The software includes an Image Editor for advanced analysis of the infrared image, a Panorama tool and a Sensor tool for making graphs of the conditions during the inspection. The Panorama functionality allows stitching several images together into one big image as well as crop and perspective corrections. Other highlights include a Grid/Area Quantifying function, Energy Cost Estimation Calculator and customizable templates for building related reports.

FLIR Reporter

FLIR Reporter is a software for advanced image analysis and creation of professional reports. The software supports advanced camera functions such as; interval and blending fusion, Picture-in-Picture, Panorama and Trending, the ability to track thermal information of infrared surveys to help with predictive and preventive maintenance plans.

Reporter also supports IR cameras with built-in GPS capability. It allows users to easily add maps, directions, longitude and latitude readings to reports. FLIR Reporter is Microsoft Word based, which makes it intuitive and easy for users to create reports using spell check, formatting, and the templates customized for the FLIR reporting application. Other advanced features include digital zoom, color palette changes, play back of voice comments recorded in the field, and automatic conversion of reports to Adobe .pdf format.

5. Training Demands

FLIR cooperates with Infrared Training Center (ITC), an independent, ISO certified, worldwide training facility. ITC offers everything from short introduction courses to certification courses. For more information, visit www.infraredtraining.com.

5. How to Carry out a Thermographic Inspection

A thermographic inspection is either an interior and/or exterior survey. The energy auditor decides which method would give the best results under certain weather conditions. Interior scans are more common, because warm air escaping from a building does not always move through the walls in a straight line. Heat loss detected in one area of the outside wall might originate at some other location on the inside of the wall. Also, it is harder to detect temperature differences on the outside surface of the building during windy weather. Because of this difficulty, interior surveys are generally more accurate because they benefit from reduced air movement.

The principal when carrying out a thermographic survey is the same whether it's a family house or industrial building.

1. Define the Task
Start the assignment by interviewing the homeowner about the conditions of the building. In this particular case we´ll investigate a townhouse, where energy usage has been reported to be too high. The homeowner tells us that it´s cold inside, especially when it's windy and especially one room is cold, irrespective of wind outside.

2. Start from the Outside
Start the thermographic inspection from the outside. Missing insulation or cold bridges can quickly be located from here. It is important to snap some images also from areas where conditions seem to be ok. It will allow comparing the result with images that show faults, to evaluate the extent of the different problems found.

3. Set up a Blower Door Test
Thermographic scans are commonly used with a blower door test running. The blower door helps exaggerate air leaking through defects in the building shell. Air leaks appear as black streaks in the infrared camera's viewfinder.

A blower door system includes three components: a calibrated fan, a door panel system, and a device to measure fan flow and building pressure. The blower door fan is temporarily sealed into an exterior doorway using the door panel system. The fan is

used to blow air into or out of the building, which creates a small pressure difference between inside and outside. This pressure difference forces air through all holes and penetrations in the building enclosure. The tighter the building (e.g. fewer holes), the less air is needed from the blower door fan to create a change in building pressure.

A thermographic inspection should always be carried out under negative pressure. With the blower door we create a negative pressure inside of 50 Pa. The blower door test clearly shows that the house leaks about 50% more than regulations allow. Next step is to find the leakages and other problem areas.

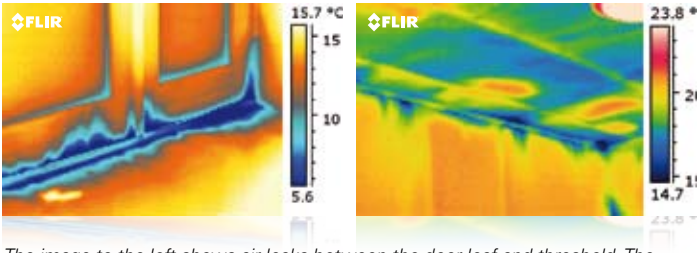
The blower door equipment is normally installed in the entrance door.

4. Thermal Scanning of the Interior
To prepare for the interior thermal scan, the inspector should take steps to ensure an accurate result. This may include moving furniture away from exterior walls and removing drapes. The most accurate thermographic images usually occur when there is a large temperature difference (at least 10°C) between inside and outside air temperatures.

Now we start scanning every room in the house with the infrared camera. When taking images be very accurate about where it was taken. A good idea is to mark with arrows on a floor plan from what angles the thermal images are taken.

5. Analysis and Reporting
When all rooms have been inspected it is time to return to the office to do the analysis of the images and to summarize the findings in a report. Analysis and reporting is carried out using the software FLIR BuildIR.

Below are two examples of faults located in the townhouse and part of the reason why the house is cold and energy inefficient:



The image to the left shows air leaks between the door leaf and threshold. The pattern is characteristic. The image to the right shows air leaks along the cornice and very bad insulation in the ceiling.

6

6. Standards

The current European standard for thermal imaging of building fabric is *13187. Thermal performance of buildings. Qualitative detection of thermal irregularities in building envelopes, infrared method* (ISO 6781: 1983 modified).

There is also a standard for Blower Door testing, commonly used in conjunction with a thermographic survey; *13829. Thermal performance of buildings. Determination of air permeability of buildings. Fan pressurization method* (ISO 9972: 1996, modified).

7. Application Stories

Read how our customers are using FLIR infrared cameras for building diagnostics and energy auditing purposes:

HeatSeeker Vehicles Scan UK Homes for Poor Insulation

Infrared specialist UK-based Thermascan has designed mobile Heat-Seeker vehicles assessed to scan the insulation condition or houses.

Operating at night and during the heating season, the multi-technology imaging system determines the address of each property and produces an energy efficiency verdict which is attached to a thermal image.

This cutting-edge system is equipped with high caliber thermal camera, the FLIR SC620 that is able to record images as the vehicle travels at between 10 – 15 mph. "Vital to this application is the camera's Firewire digital output enabling us to conduct real-time analysis of the property images," explains system designer Dave Blain. "It also has a 640 x 480 detector that provides the high resolution we need to capture as much detail as possible. We can survey up to 5,000 properties in a single evening shift," Dave Blain continues. "And at the end of it the system automatically categorizes the results according to the insulation need."

The image shows reflections on an inner wall (to the right) from the window to the left.

FLIR B-Series IR camera Optimizes Passive Housing Construction

As energy prices soar, the market for low-energy house building is becoming promising all over Europe. AIROPTIMA is using infrared cameras to check the building substance and air circulation during and after the construction phase.

Passive houses have to be planned and constructed with care. "The building process has to be monitored very closely" says Markus Meyer, owner of AIROPTIMA, a building consulting company specialized in HVAC issues for residential buildings and in particular eco houses. "An infrared camera combined with the blower door procedure is a perfect instrument to detect temperature differences in a non-contact and non-destructive way". These temperature differences are prime indicators of building construction faults, warm bridges or air leaks.

Meyer uses a FLIR B360 which has specific measurement features for building applications to inspect the construction after each building stage and after full completion of the house. He often uses the camera's humidity and insulation alarm functions as well as its Picture-in-Picture functionality. His reports for building owners, architects or energy consultants are made with the FLIR Reporter software and contain advice on which appliances to use in order to optimize the house's heating and ventilation.

Infrared image shows insulation quality of a low energy house

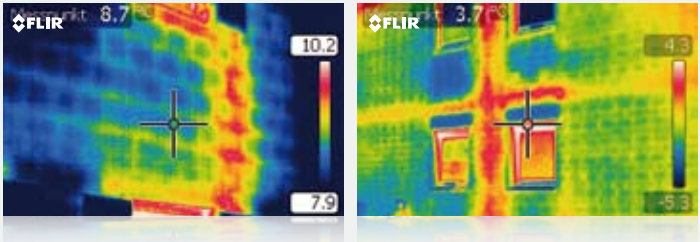
Infrared Camera Tells Truth about Walls and Facades

Building insulation quality becomes a pressing issue as heating costs increases. An infrared camera for building applications and the expert's eye can do a lot to save on energy. Buchstaller in Germany is a company specialized in water damage assessment and thermographic inspection residential buildings.

"Building and floor leak inspections are our main applications", says Günther Buchstaller, a master bricklayer and plasterer. In addition, the camera provides support in showing Buchstaller or his business partner Martin Gastager where not to drill when doing leak surveys or water damage assessments, an asset in a region where floor heating is common.

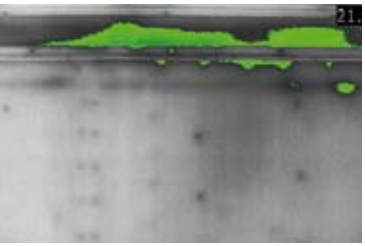
Buchstaller has chosen the FLIR B360 infrared camera: "The camera's screen size is important, not only for our user comfort, but also for the customer who finds the technology quite impressive, the tiltable lens unit is very handy and the camera's weight makes working very easy."

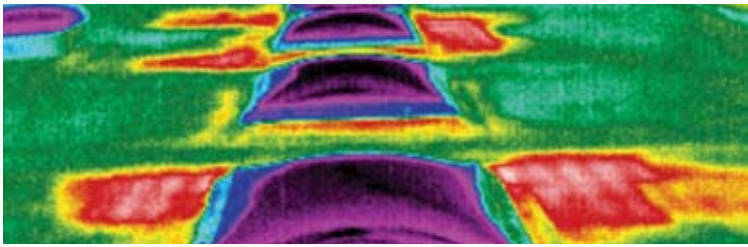
Skyrocketing heating costs and an affordable technology are opening up new market and service perspectives for building professionals. Buchstaller says he expects to amortize his infrared camera within two years.



Examples of inefficient piping insulation between kitchen and bathroom

Bad insulation above balcony window





What's your application?

What kind of infrared camera is best for your needs?

To speak to an infrared camera expert, please contact:

FLIR Systems AB (head office)
Sweden
World Wide Thermography Center
+46 (0)8 753 25 00
sales@flir.se

FLIR Systems Ltd.
United Kingdom
+44 (0)1732 220 011
sales@flir.uk.com

FLIR Systems S.r.l.
Italy
+39 (0)2 99 45 10 01
info@flir.it

FLIR Systems GmbH
Germany
+49 (0)69 95 00 900
info@flir.de

FLIR Systems Sarl
France
+33 (0)1 41 33 97 97
info@flir.fr

FLIR Systems AB
Belgium
+32 (0)3 287 87 10
info@flir.be

You are always welcome to visit us at:

www.flir.com/thg