



INTRODUCTION TO INFRARED THERMOGRAPHY

- 
- **What is Non-Destructive Testing?**
 - **What is infrared thermography?**
 - **Why are we using infrared thermography?**
 - **Where can we use IR Thermography?**

WHAT IS NON-DESTRUCTIVE TESTING (NDT)?

- Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system.
- In other words, when the inspection or test is completed the part can still be used.

Source: <https://www.asnt.org/MinorSiteSections/AboutASNT/Intro-to-NDT>

TYPES OF NON-DESTRUCTIVE TESTING (NDT)

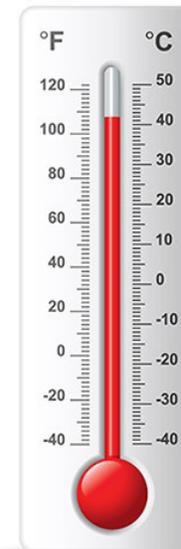
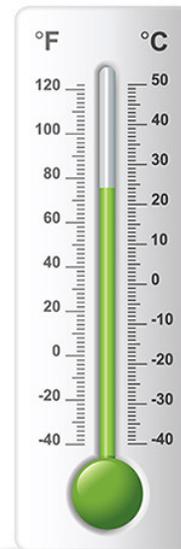
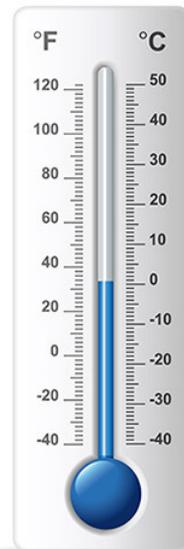
- Acoustic Emission Testing (AE)
- Electromagnetic Testing (ET)
- Guided Wave Testing (GW)
- Ground Penetrating Radar (GPR)
- Laser Testing Methods (LM)
- Leak Testing (LT)
- Magnetic Flux Leakage (MFL)
- Thermal/Infrared Testing (IR)
- Ultrasonic Testing (UT)
- Vibration Analysis (VA)
- Visual Testing (VT)
- Microwave Testing, Liquid Penetrant Testing (PT)
- Magnetic Particle Testing (MT)
- Neutron Radiographic Testing (NR)
- Radiographic Testing (RT)

Source: <https://www.asnt.org/MinorSiteSections/AboutASNT/Intro-to-NDT>

QUESTION?

What is the most commonly use of measurement in the world?

ANS: TEMPERATURE!



WHAT IS INFRARED THERMOGRAPHY?

Thermal/Infrared Testing, or infrared thermography, is used to measure or map **surface temperatures** based on the infrared radiation given off by an object as heat flows through, to or from that object.

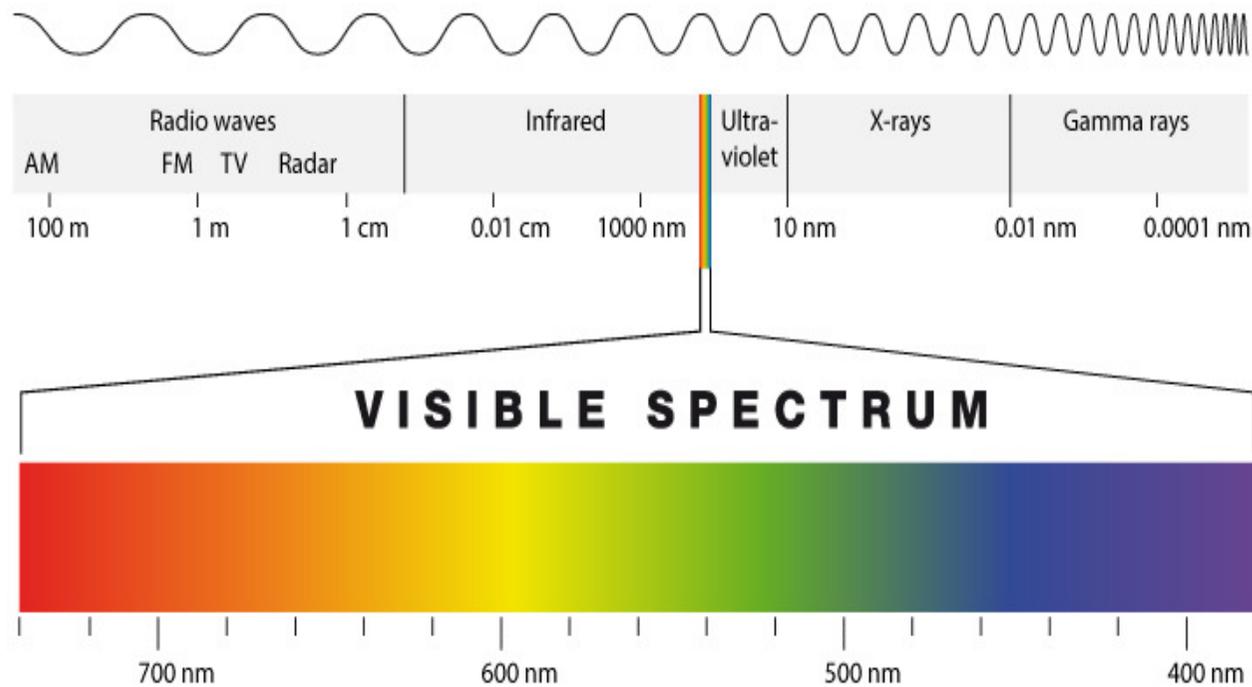
We can use the **temperature to predict or diagnose** a potential failure. This temperature is directly related to the materials, the thermal energy level and heat transfer rate.

Thermal imaging can be used to detect corrosion damage, delamination, disbonds, voids, inclusions.

Source: <https://www.asnt.org/MinorSiteSections/AboutASNT/Intro-to-NDT>

WHY INFRARED?

All matters with a temperature greater than absolute zero emits thermal radiation. When the temperature of a body is greater than absolute zero/



SO CAN WE SEE TEMPERATURE DIFFERENCE?



ANS: YES & NO



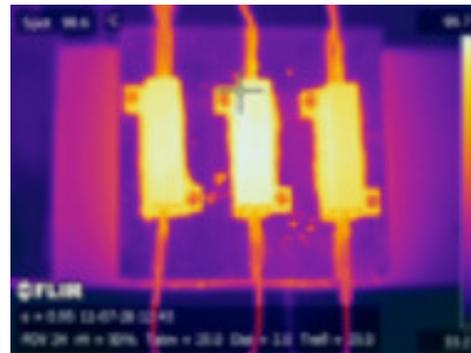
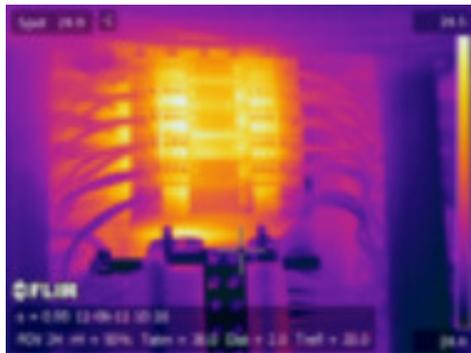
SO WHAT TOOL CAN WE USE TO SEE TEMPERATURE?

THERMAL IMAGER CAMERAS (TIC)



INFRARED INSPECTION APPLICATIONS

- **Electrical** Systems - such as transmission lines, distribution lines, switchboards, transformers, circuit breakers, electrical panels and cables. Loose/corroded connections, overloaded circuits, faulty equipment
- **Mechanical** Systems - such as turbines, paper machines, motors, pumps, fans, heat exchangers, cement kilns, conveyor belts, and bearings.
- **Machine Structural Integrity** - such as boilers, chimneys, refractories, furnaces, flares, storage tanks, and pipes.
- Inspection of **sediment and liquid level** in vessels and storage tanks.



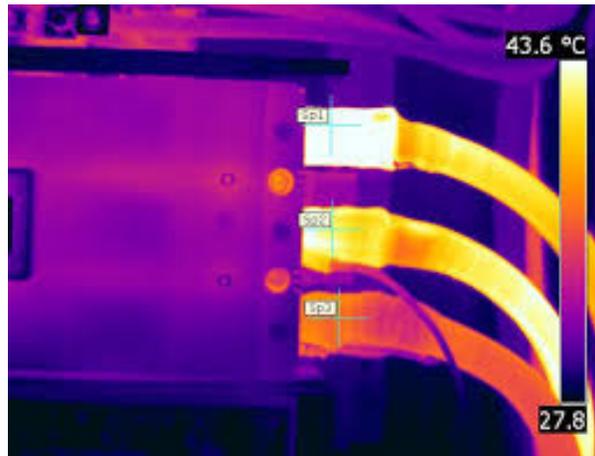
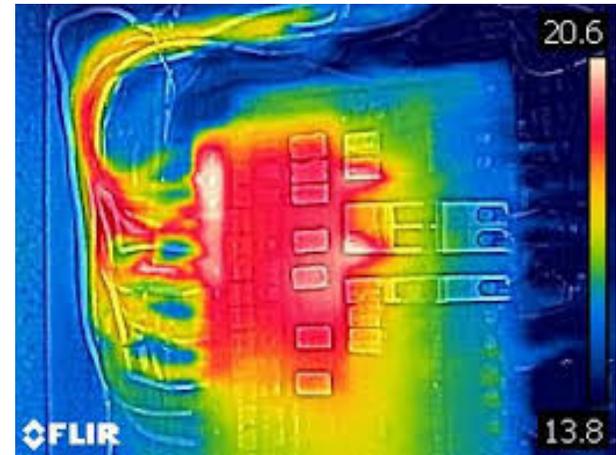
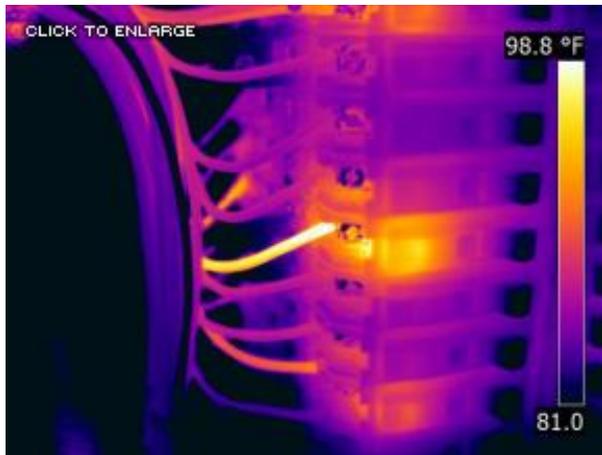


INFRARED INSPECTION APPLICATIONS

- **Process Equipment** – Pipe blockages, coolant leaks, steam traps, tank levels
- **Building Systems** – HVAC systems, building envelopes, flat roofs
- **Data Centers** – Airflow analysis, Electrical power distribution systems, UPS systems and emergency generators. Thermal Mapping

WHERE CAN WE USE IR THERMOGRAPHY?

ELECTRICAL INSPECTIONS



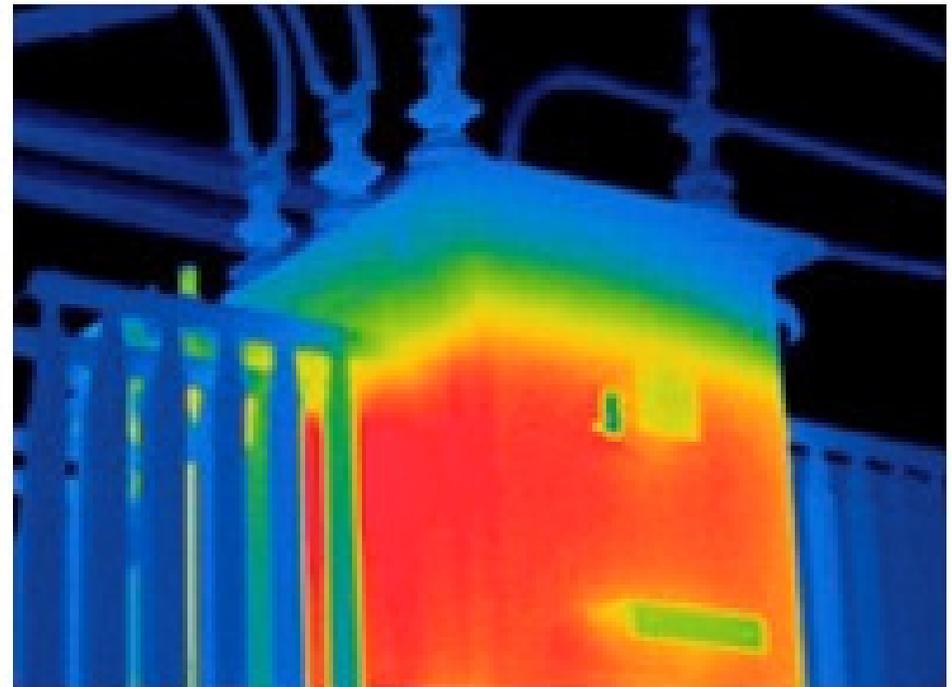
WHERE CAN WE USE IR THERMOGRAPHY?

ELECTRICAL INSPECTIONS (OIL FILLED TRANSFORMERS)



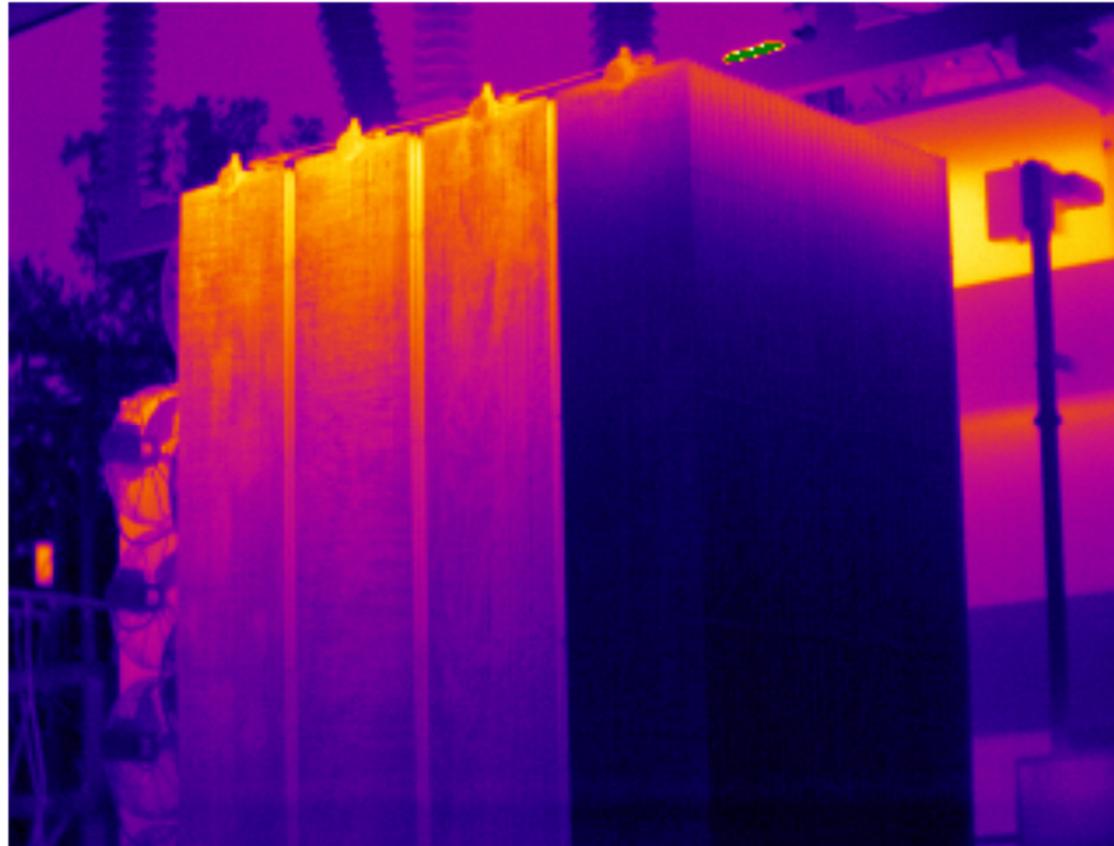
WHERE CAN WE USE IR THERMOGRAPHY?

ELECTRICAL INSPECTIONS (OIL FILLED TRANSFORMERS)



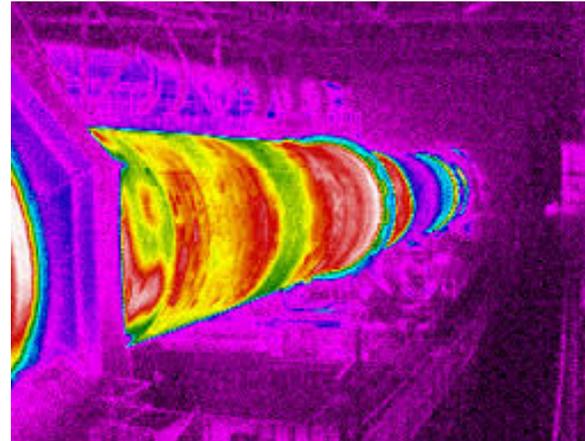
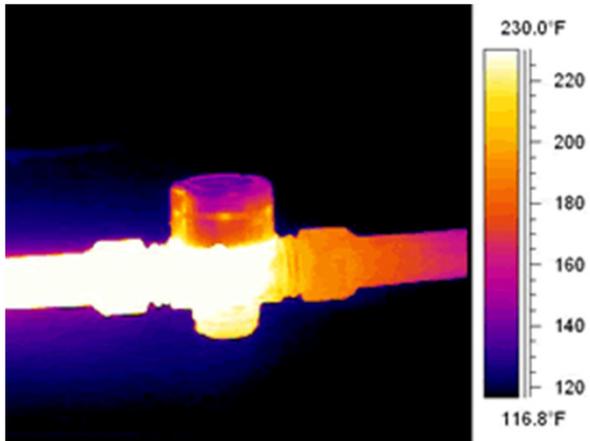
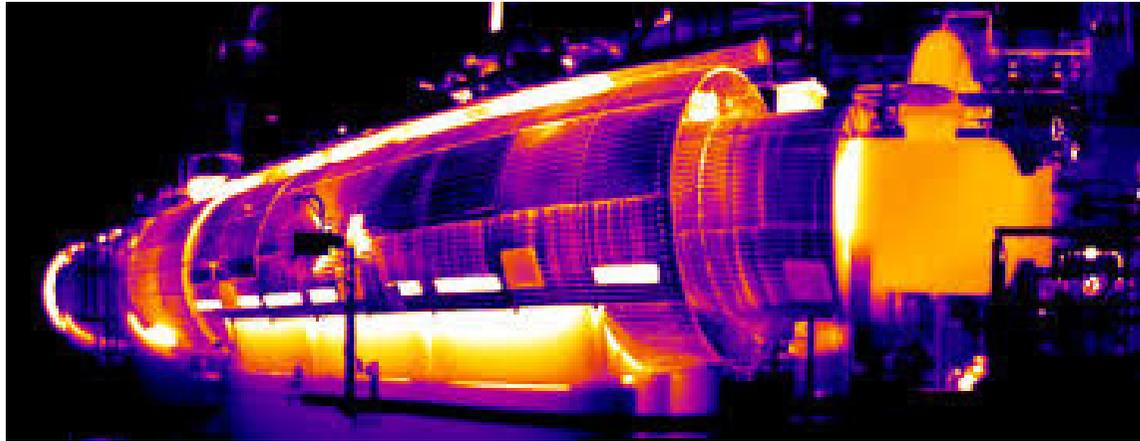
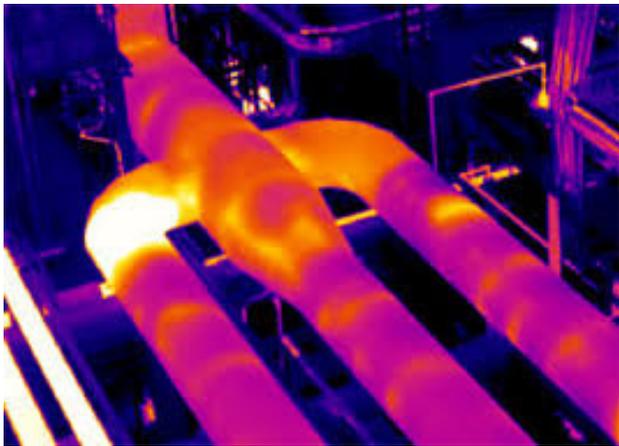
WHERE CAN WE USE IR THERMOGRAPHY?

ELECTRICAL INSPECTIONS (OIL FILLED TRANSFORMERS)



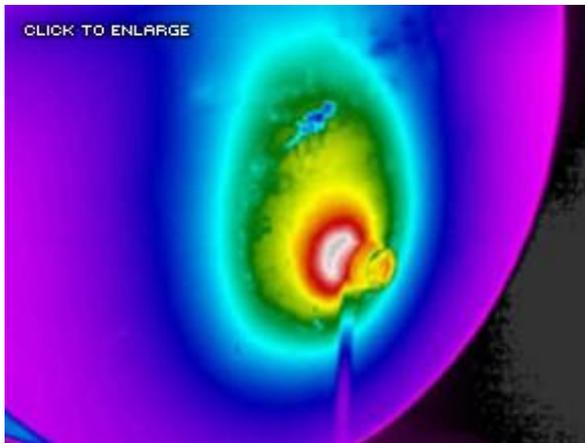
WHERE CAN WE USE IR THERMOGRAPHY?

PROCESS INSPECTIONS (MECHANICAL)



WHERE CAN WE USE IR THERMOGRAPHY?

PROCESS INSPECTIONS (MECHANICAL)



For this high temperature steam boiler, thermal imaging shows that the insulation on the inside of this vessel has deteriorated.

Only infrared imaging provides a fast, safe, non-contact method of inspection!

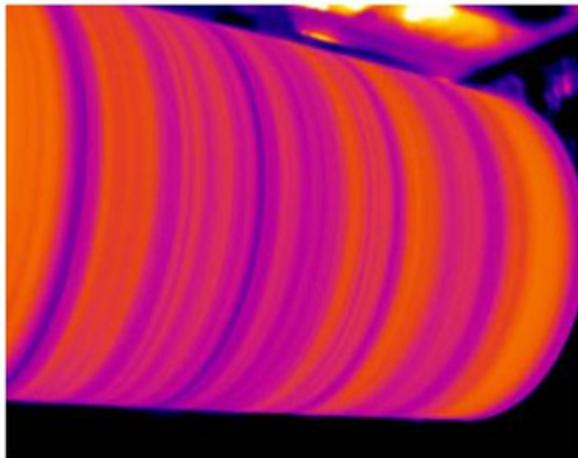


This thermogram shows the hot water radiant coils under a tile floor. Thermal imaging accurately located the exact position of each radiant coil, confirmed there were no leaks and identified safe locations to drill fixture mounting holes.

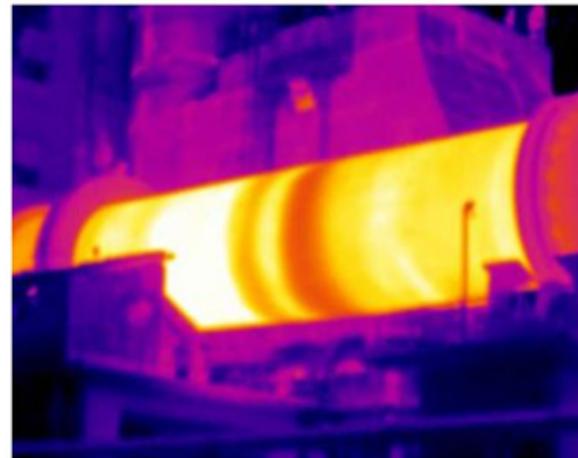
WHERE CAN WE USE IR THERMOGRAPHY?

PROCESS INSPECTIONS

IR Thermographs of paper roll and some processes in a pulp and paper mill



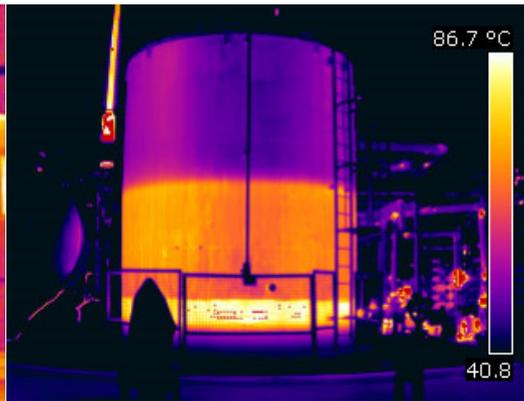
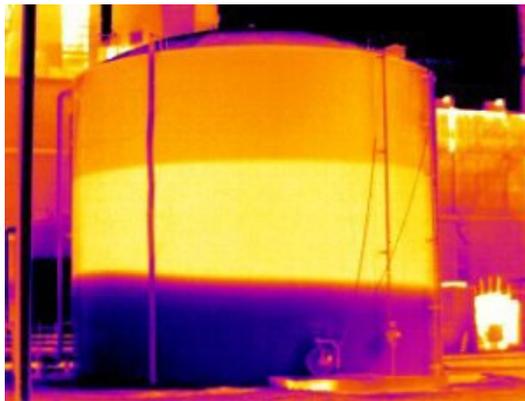
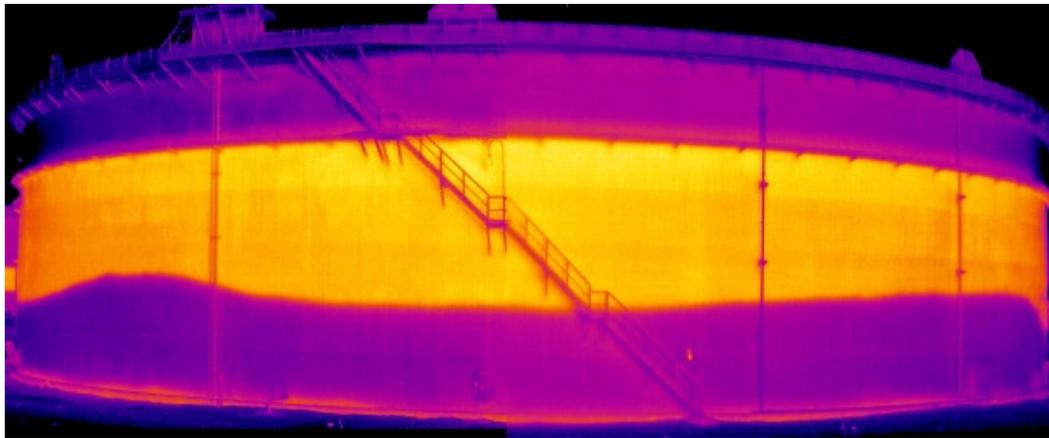
A. Temperature profile of paper roll on pope reel



B. Temperature profile of lime kiln

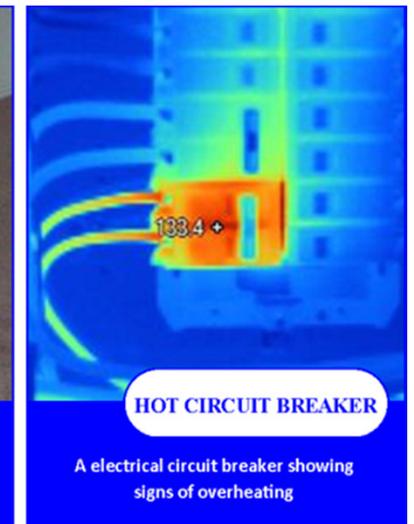
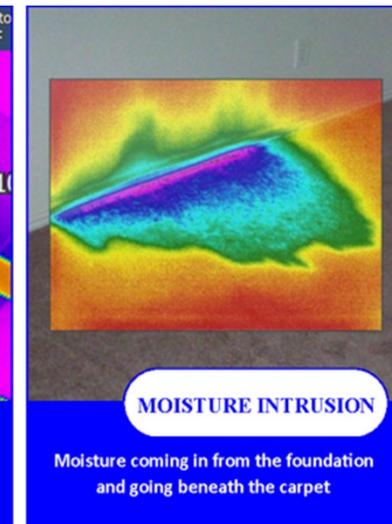
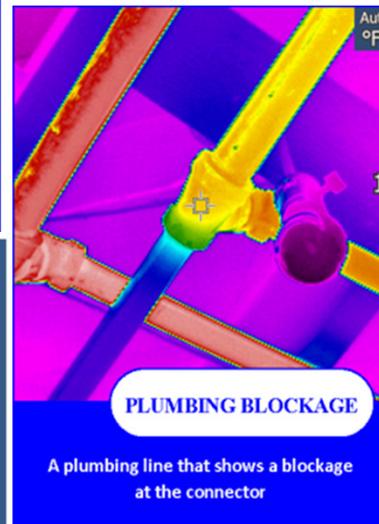
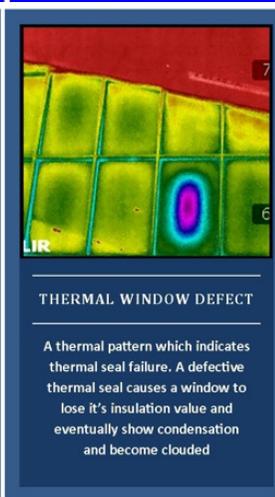
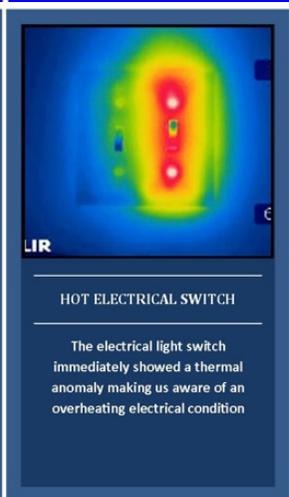
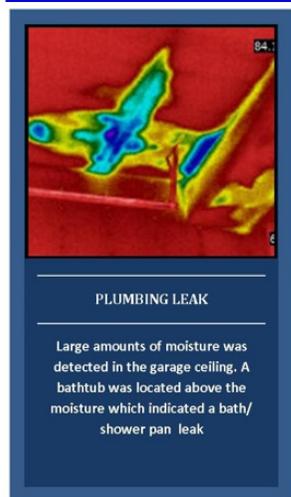
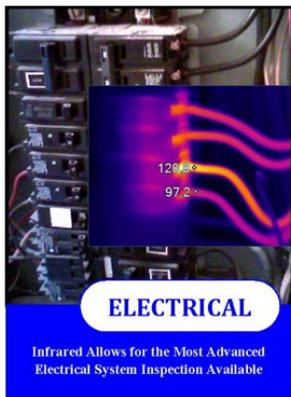
WHERE CAN WE USE IR THERMOGRAPHY?

PROCESS INSPECTIONS – OIL TANK



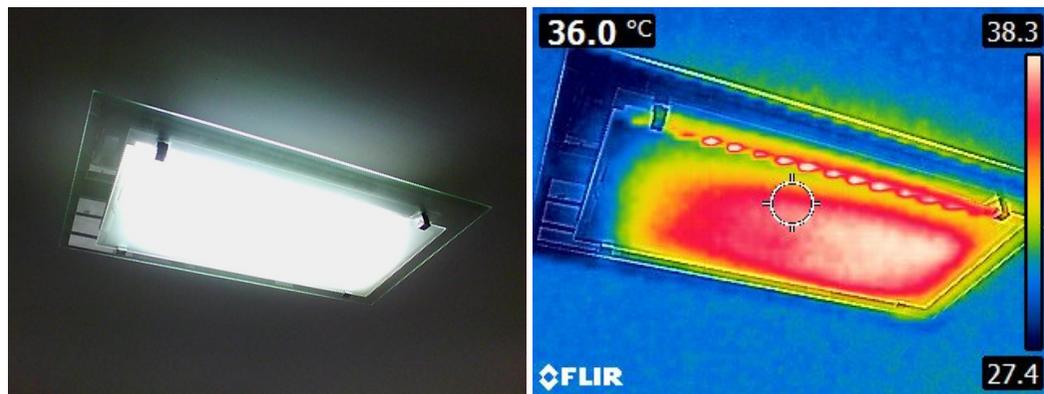
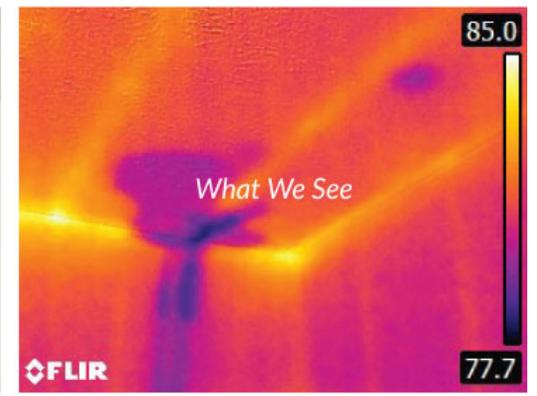
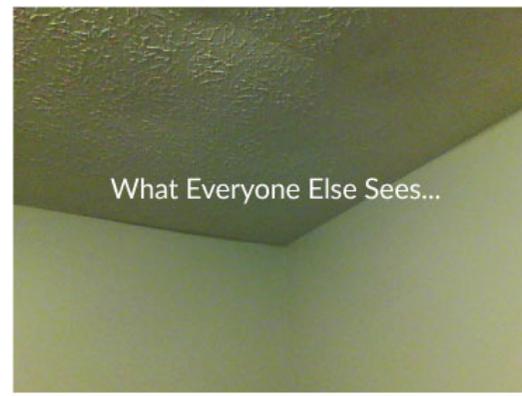
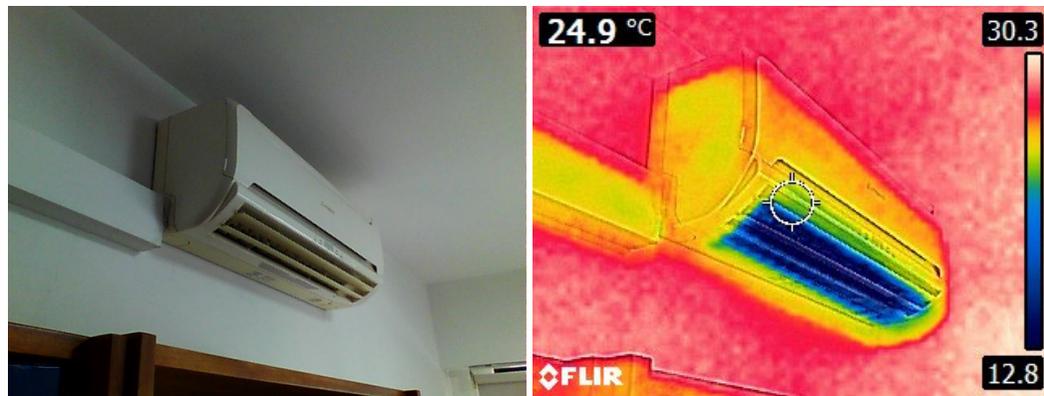
WHERE CAN WE USE IR THERMOGRAPHY?

BUILDING INSPECTIONS (MOISTURE, INSULATION)



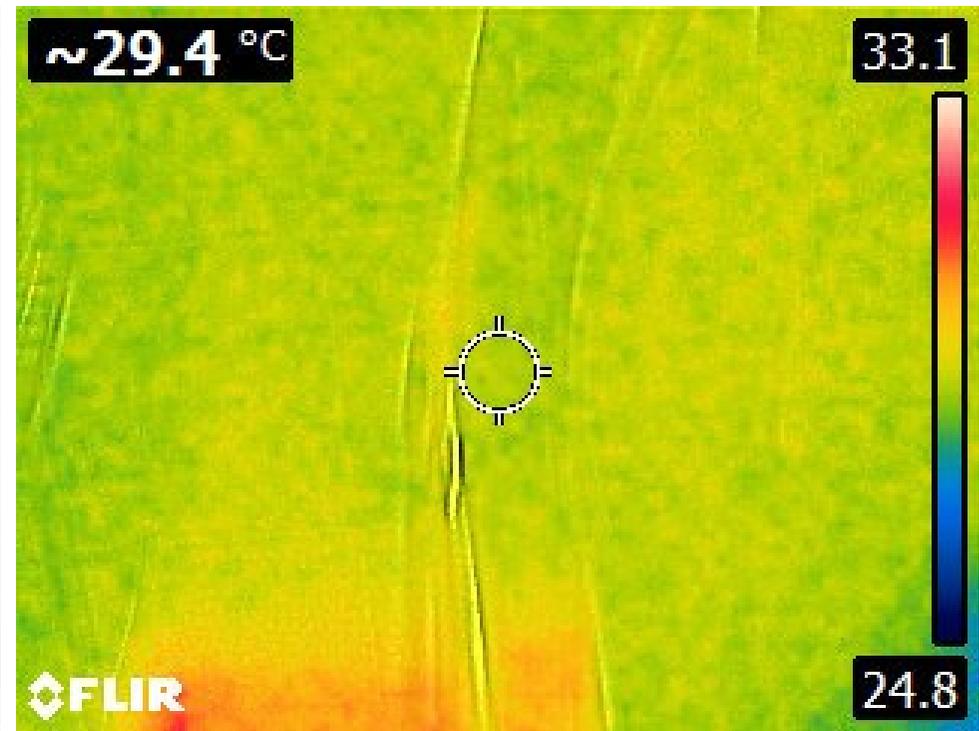
WHERE CAN WE USE IR THERMOGRAPHY?

BUILDING INSPECTIONS



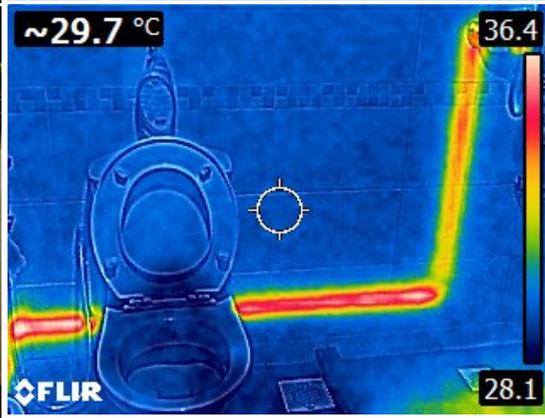
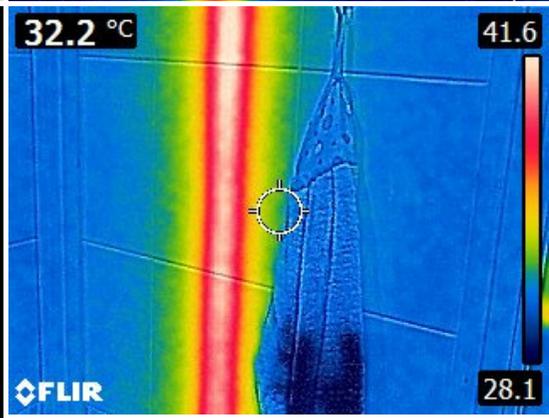
WHERE CAN WE USE IR THERMOGRAPHY?

BUILDING FITTINGS INSPECTIONS (TRACING OF EMBEDDED PIPES)



WHERE CAN WE USE IR THERMOGRAPHY?

BUILDING INSPECTIONS (TRACING OF EMBEDDED PIPES)





THANK YOU!

The word "THANK YOU!" is rendered in large, colorful, and highly decorative letters. Each letter is a different color and features various patterns, textures, and small illustrations. For example, the 'T' is red with colorful dots and a green feather on top. The 'H' is yellow with a red and blue pattern. The 'A' is blue with a white outline. The 'N' is green with a blue feather. The 'K' is blue with a red and yellow pattern. The 'Y' is yellow with a red and blue pattern. The 'O' is a colorful face with a rainbow. The 'U' is red with a white outline. The exclamation point is black with a white outline and a smiley face at the bottom.

