

# Lead is essential to safe, effective and sustainable medical imaging



Imaging has revolutionised the diagnosis and treatment of numerous medical conditions, from broken bones to cancer. At some stage in our lives, most of us will have an X-ray, for example to check for bone fractures or tooth damage, or will undergo imaging such as mammograms as part of cancer screening programmes.

In fact, 500 million radiological imaging procedures are carried out annually in the EU, and worldwide the number exceeds 3.6 billion - and as access to healthcare improves globally, these numbers are set to increase.

Radiological imaging such as X-rays and CT scans uses ionising radiation to generate images of the body. According to the EU Commission, medical exposure is responsible for up to half of the total radiation exposure of EU citizens. It is therefore important to ensure that exposure is carefully controlled and minimised for patients and staff alike. While large amounts of ionising radiation can increase cancer risk, imaging facilities and the use of radiation in medicine are strictly regulated, meaning that the risk from medically justified scans is low.

Effective radiation shielding is essential to protect staff and patients, ensuring that this critical diagnostic tool can be used safely. Shielding can be in the form of physical infrastructure and barriers such as wall and floor panels and mobile screens, or personal protective equipment such as aprons, collars, and glasses. The imaging equipment itself also uses shielding to minimise patient exposure to stray radiation. The availability and sustainability of effective radiation shielding materials is critical to the continuing expansion of safe medical imaging services globally.

No other material offers the same combination of radiation shielding performance and practical usability in medical equipment and building applications as lead. Due to its high density, as little as a few millimetres of lead can completely block the passage of harmful radiation. Leaded aprons, collars, glass, mobile screens, and curtains are standard protective equipment in hospital radiography departments. Lead is also used to provide shielding in walls, doors, and floors. In fact, its abilities are so unparalleled that the radiation shielding of non-lead materials is reported in 'lead equivalents', i.e. the thickness of that material that is needed to give the same radiation protection as lead under the same conditions.

Lead also offers unique advantages over other metals in terms of availability and sustainability. High-density materials based on tungsten, bismuth and baryte can provide similar radiation shielding properties, but all three are included on the EU [Critical Raw Materials List](#) and have high supply risk, therefore further expansion of their use in radiation shielding is not necessarily sustainable.

Moreover, many potential alternatives have a greater environmental impact, in particular CO<sub>2</sub> emissions, and therefore do not qualify as suitable substitutes. Steel and high-density concretes are widely used for radiation shielding but need to be used at significantly greater thicknesses. This restricts their use in facilities where space is a limiting factor, for example when constructing city-centre hospitals or when refurbishing existing facilities.

Lead is both a safe and sustainable material for use in radiation shielding. It is always fully enclosed in radiation shielding fixtures and fittings – from aprons to lead-lined walls or mobile screens. Easily obtainable, lead is also highly recyclable and an ideal material for circular economies. In practice, almost 100% of lead is recycled after use, and specialist manufacturers of radiation shielding source most of their lead from recycled material.

Lead-based radiation protection is currently the most effective and cost-efficient way to safeguard the use of medical imaging today. As the medical profession continues to work toward cures for global health challenges, lead will remain central to occupational and patient safety for years to come. The availability and sustainability of lead as an effective, safe radiation shielding material will support the expansion of medical imaging services in hospitals and clinics globally.



## Fact file

- Medical imaging has revolutionised diagnostics in the past 60 years. Effective radiation shielding ensures that occupational exposure to ionising radiation is minimised
- Lead is the industry standard for radiation shielding - no other material can compete
- **More than 75%** of lead used in the EU comes from recycled end-of-life products
- Lead is a sustainable resource. It can be infinitely recycled with no loss of performance. Lead's low melting point means it is easy and energy-efficient to refine lead scrap for reuse
- Specialist manufacturers of radiation shielding source at least 95% of their lead from recycled material
- Medical device manufacturers aim to minimise the amount of lead used to reduce weight. Lead use for radiation shielding now represents **much less than 0.1%** of the total annual volume of lead used in the EU.

Developed in collaboration with Calder Group and Curium, this case study highlights just one of the many essential uses of lead that provide societal benefits and boost the EU's economy

For Europe's future, lead matters.

