

Digital Radiography for Concrete Inspection

In the construction industry (buildings, bridges) there is a need for fast non-destructive means, most commonly to locate targets (Pipes, Re-bars, Conduit, Fittings etc.) within concrete structures prior to drilling, cutting or coring. Measuring reinforcements is also performed for static calculations and to detect corrosion problems and damages. Cracks and voids can also be visualized. The examinations are not only restricted to concrete constructions; they can also be applied to reinforced masonry made of natural stones or bricks.

Many consider Radiography to be the best method for inspecting concrete. Most other inspection techniques display hard-to-interpret signals whereas Radiography displays easy-to-understand images which can be understood even by people without background in Radiography.

The old film based radiographic inspection technology enabled viewing the insides of the material without damaging or changing its qualities. However, this technology is cumbersome, requires powerful sources of radiation (Ir-192 or Co-60), film developing (use of chemicals) as well as long exposure times. This means the time since the equipment is deployed until the Image is acquired, is very long.

With Digital Radiography the operation is improved in many aspects

- *Wide dynamic range, High Image quality*
- *Immediate results on site – Digital Image displayed within seconds on a high resolution Screen, no time wasted on Film developing and no need to return for Reshoots!*
- *Increased Safety and work efficiency - by using weaker sources and shorter exposures*
- *Long term cost savings – No consumables (Film, Chemicals), more images per day!*
- *Images are enhanced, saved and a report can be created with ease and on-site*
- *Efficient operation - Sharing images is effortlessly done via email, Instant*

Massaging etc. for any need, such as consulting with a professional who is away from the work site

- *Environmentally friendly*

With Digital Radiography it is possible to:

Detect Rebar Pattern and location - Concrete and construction professionals can benefit from Digital Radiography to locate structures within concrete prior to drilling, cutting or coring.

Locating and identifying wire Mesh, Conduit direction, Post-tensioned cables, Voids, Embedded electrical ceiling boxes, Pipes, drains, Data cables, Cooling & heating lines are also within the scope of Digital Radiography.

A digital system contains 3 main parts:

- X-ray source or an Industrial Isotope
- X-ray Detector
- Tablet with Controlling Software



Digital System setup:

The Detector and Source are placed on both sides of the concrete. Using a magnet or gauss locator the x-y location is verified so that the Radiation and the Detector will be aligned. The Radiation passes through the Concrete and reaches the detector in a non-uniform way since Concrete contains construction

aggregates (sand, gravel, crushed stone and other recycled materials). The thicker or the denser the material, the fewer x-rays or gamma rays pass through (the beam is attenuated). The Detector Records Radiation according to the thickness and density of the materials which it had passed through in its path and therefore we receive an Image with different shades of grey. Where there is a flaw, the material is thinner and more Radiation passes through that area. On the other hand, the presence of Re-bars or cables attenuates the Radiation relative to the surrounding and therefore less Radiation reaches the Detector.

