

The Application of Radiometric Method for Quality Assessment of Linear Accelerator Shielding Structures

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ABSTRACT

The development of the modern technical society is linked to the use of ionizing radiation sources. In addition to nuclear power plants, there are the other significant ionizing radiation sources, for example, linear accelerators which are used both in radiography and in oncological therapy. The conditions for ionizing radiation source management become more and more stricter, and hence the higher demands are stipulated for the supervision of shielding structures of linear accelerators during their construction.

The radiometric measuring instruments by which the density of fresh concrete mixtures used for the construction of shielding structures can be continuously measured have been developing for many years at the Faculty of Civil Engineering, Brno University of Technology.

The workers at Brno University of Technology supervise shielding structures in the whole region of the Czech Republic.

At the Brno Hospital, it was found during a current supervision of shielding concrete for the linear accelerator construction that the density of heavy concrete does not coincide with the prescribed calculations. This failure was caused by a reduction of the density of heavy gravel aggregates for the production of heavy concrete and this problem could not be eliminated. A low-density concrete was applied for final concreting, and based upon the results of radiometric density measurements the additional shielding structure made from different thick layers of steel sheets was applied. The final measurements which were carried out by the regulatory body proved that the additional shielding was designed correctly.

Keywords: linear accelerator, shielding structures, radiometric instruments, non-destructive testing of concrete