RF Attenuation in Steel Fiber Reinforced Concrete

Shielding at cheaper methods of building

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Abstract— Construction industry, like any other industry, wants to reduce cost and improve productivity. When building in concrete, iron binding is a considerable part of building cost and time. For this reason it would be desirable to replace some of the normal rebars in concrete with steel fiber reinforcement. Introducing steel fibers will make the concrete more conductive, and thus contribute to increase electromagnetic shielding. Different compounds can be added in concrete in order to increase electromagnetic shielding, but the main purpose of adding 35 or 50 mm steel fibers is to strengthen the concrete.

Keywords-concrete; electromagnetic shielding;

I. INTRODUCTION

Traditional ways of protecting buildings or rooms against IEMI can be expensive. Some studies have been carried out in order to investigate RF attenuation in normal buildings[1] and samples of building material.[2] In these studies most materials like plywood, bricks and gypsum has shown low attenuation, while concrete has provided higher, but still modest attenuation, although increasing at frequencies over 1GHz. There have been variations in the measured attenuation in the different studies. Other studies have inserted carbon or metal fibers for the purpose of providing electromagnetic shielding. Attenuation of up to 70 dB have been reported.[3]

II. MOTIVATION

In this work the aim was to find the shielding effect from adding steel fibers for reinforcement. Steel fibers can replace normal rebars especially in concrete floors. In walls, normal rebars will be required, but the quantity could possibly be reduced. As a result, buildings could be built faster and cheaper.

The standard commercially available fibers for reinforcement are 35 mm and 50 mm. Most concrete companies can deliver concrete with up to 40 kg/m^3 steel fibers as a standard product. The concrete will however be less liquid, and in thin walls with rebars, we could face problems if the concrete does not flow properly into the formwork.

III. EXPERIMENTS

Concrete plates, 2x2 m, 20 cm thick, were mounted in an opening in a steel container. The plates were with 50 mm steel fibers, 35 mm steel fibers and without steel fibers. When produced, aluminum foil was put at the edge in the framework, in order to provide contact with the flange of the container. Attenuation measurements were then done in the container.

We see from the measurements, Fig 1 that steel fibers in the concrete provide a distinct contribution to shielding, which in some cases could be sufficient, or allow simpler methods of protection to handle residual threats.

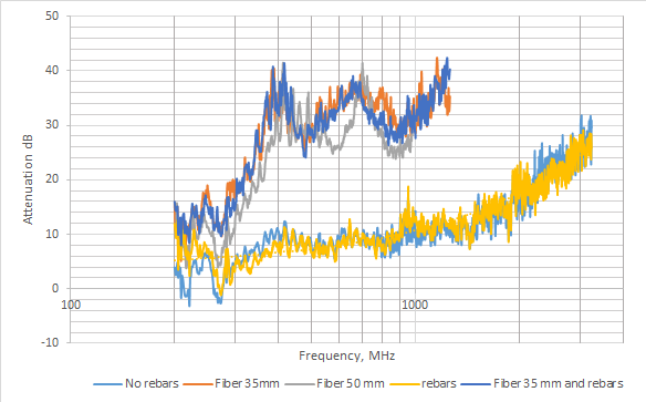

Figure 1 Attenuation measurements on concrete plates with and without steel fiber reinforcement

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