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## 5.14 COVERMETER TESTING

### 5.14.1 Introduction

Covermeters or pachometers, often referred to as R-Meters, are electromagnetic devices that detect the reinforcing steel in concrete and measure its size and the depth of concrete cover. The device produces a magnetic field and locates the reinforcing steel by measuring the distortion of the magnetic field created by the presence of the steel. The signal received increases with increasing bar size and decreases with increasing cover thickness. Using more than one sensor, the covermeter can be calibrated to convert the signal into a distance, which indicates the depth of cover.

The importance of measuring depth of cover is highlighted by the relationship between cover depth and deterioration mechanisms. Inadequate cover can undermine the protection that the concrete provides to the steel reinforcement from corrosion. Carbonation, the chemical process where carbon dioxide and moisture react with cement products, begins as soon as concrete is exposed to air. The process of carbonation neutralizes the protective alkaline nature of the concrete. If the cover is too shallow, the carbonation will reach the level of the reinforcing steel and the alkaline protection will be lost, potentially leaving the steel susceptible to corrosion. The exposure of the concrete and reinforcing steel to road salts and moisture will further accelerate the corrosion process once the cover has been breached by cracks or spalls. If the cover is too deep, there is the possibility of increased crack widths and decreased effective depth, which both affect design parameters on a concrete member. Refer to Figure 5.14.1-1 for a view of a covermeter.



Figure 5.14.1-1: View of a Basic Covermeter Unit.

### 5.14.2 Applications

Accurately locating the reinforcing steel in concrete allows the inspector to determine if the steel is placed outside of the zone of carbonation. Covermeters, in general, can accurately measure the cover depth to within of an 0.25 inch in the range of 0 to 3 inches in lightly reinforced structural members. Covermeters can also be used to locate reinforcing steel for



the purpose of “tying-in” a new structural member to an existing structure. This process typically occurs during rehabilitation and involves drilling into the existing structure and added reinforcing steel, which spans from the old to the new components.

### 5.14.3 Limitations

The effectiveness of a covermeter as a nondestructive testing method is limited by several factors. A covermeter only locates the reinforcing steel and does not provide any actual information about defects or the material’s state of deterioration. Secondly, it does not distinguish if one or more bars are present at a certain location and therefore, the intensity of the signal may be misinterpreted and the cover depth can be incorrectly noted as shallower than the true depth. This problem is most pronounced in heavily reinforced structures or when large steel objects, such as scaffold, are near the test area. Also, some reports indicate that the epoxy coatings on reinforcing steel can distort the readings of an Covermeter. Likewise, the relative material properties of the concrete often must be assumed to utilize conversion charts for the readings.



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