



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE DEVELOPMENT DEPARTMENT



**THE NATIONAL ASSEMBLY FOR WALES
CYNULLIAD CENEDLAETHOL CYMRU**



**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

Weathering Steel for Highway Structures

Summary: This Standard replaces BD 7/81. The requirements specified here cover design, construction and in-service maintenance aspects. It shall be used in conjunction with relevant parts of BS 5400 as implemented by overseeing organizations, except where otherwise indicated.

APPENDIX B - RESIDUAL STEEL THICKNESS MEASUREMENT USING ULTRASONIC GAUGES

Traditional ultrasonic thickness gauges measure the transit time of an ultrasonic signal originating at a probe head placed on one surface of the steel, then reflected from the steel air interface on the other side of the section back to the probe head. Surface coatings or layers of rust on the steel will increase the transit time and give an increased apparent steel thickness. As the signal speed through the coating or rust is not the same as through the steel, it is not straightforward to allow for this. To obtain the steel thickness alone, the surface coating or corrosion must be removed prior to measurement. The use of such gauges on weathering steel structures to monitor residual thickness has the following disadvantages:

- (a) The rust layer must be removed without removing any of the underlying steel.
- (b) The rust layer has now been removed at that point so will subsequently corrode in a different manner from the remainder of the steel. To estimate ongoing corrosion, further measurements need to be made at a different position.
- (c) The procedure leads to unsightly blemishes on the steel surface.

These problems can be overcome by utilising a special type of thickness gauge which provides an accurate measurement of the residual steel thickness without the need to remove the rust coating. Instead of measuring the probe back to probe transit time, the instrument measures the time between echoes within the steel section. Typical instruments are small, light in weight, battery operated and have a digital display. A couplant material is needed to transmit the signal from the probe head through the rust into the steel. Water or a light easily removable material such as glycerol are effective in doing this.

Such instruments are accurate to +/- 0.1 mm. This is adequate for absolute residual steel thickness measurements for structural calculations. However this limited accuracy combined with the low corrosion rates of weathering steels - typically 5 to 15 μm per year - means that estimating corrosion rates from the difference in thickness readings at different times can only be done over long time periods.

Because the rust coating does not need to be removed, steel thickness can be measured at exactly the same position at different times.