



## BRIDGE TECHNICAL DIRECTION BTD2009/01

### ***DESIGN OF SIGN STRUCTURES***

#### **Background**

Recently several large sign structures have failed in NSW and Victoria.

Investigations have revealed that these failures resulted from a combination of factors.

The design provisions of AS 5100 for sign structures are not sufficiently comprehensive and do not provide adequate guidance for the consideration of fatigue in the design of these structures.

#### **Information**

Similar failures have occurred overseas. Considerable research has been carried out in the USA and UK to develop fatigue design rules for sign structures. Interim design provisions and construction details have been developed based on this research.

#### **Bridge Technical Direction**

The following interim provisions and construction details shall apply for the design of sign structures for RTA and those that will become the property of RTA:

1. Sign structures shall be designed for ultimate wind forces calculated in accordance with AS/NZS 1170.2, including wind striking the sign at 45°. The values for drag coefficient  $C_d$  specified in AS 5100.2 shall not be used.
2. Sign structures shall be designed for fatigue in accordance with Section 11 of AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 4th Edition 2001, with Interims to 2006, or later Editions.

These fatigue provisions shall apply to the design of all types of signs (including Variable Message Signs), traffic signals and lighting structures. Structures that cantilever over, or could fall onto marked traffic lanes, shall be taken as Fatigue Category I to determine the appropriate Fatigue Importance Factor in Table 11-1 of the AASHTO specification. All other structures shall be taken as Fatigue Category III.

The natural wind gust fatigue loading shall be taken to act normal to the sign.

3. Anchors shall be Grade 4.6 or less, and be fabricated in a rag bolt assembly so that they can be accurately positioned, to eliminate the need for recesses in the footing.
4. The base plate shall be at least as thick as the nominal anchor diameter.

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- 5 The base plate shall be held with a double nut moment joint, consisting of a standard height levelling nut and washer below the base plate, and washer and top nut above the base plate, on each anchor. All nuts shall comply with AS 1112.2 or be property class 5 to AS 1112.3.
6. The maximum unsupported length of the anchor from the top of the footing to the bottom of the levelling nut shall be one anchor diameter.
7. All levelling nuts shall be accurately installed to the same level and top nuts tightened to just past snug tight.
8. Base plates shall be grouted with a non-shrink grout in accordance with the manufacturer's instructions, with satisfactory performance at each project proven prior to use by carrying out a trial base plate installation.

However, the bearing of the base plate on the concrete or grout shall be neglected in determining the load effects on the anchor bolts.

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