



Bend the bar but not the rules

Bending of steel reinforcement must follow New Zealand Standard procedures

Issues of concern

Incorrect bending can severely affect the performance of steel reinforcement in service. Results can be premature fracture, which will affect the capacity of the building elements to carry design loads. Of particular concern is the practice of bending reinforcing steel to too small a diameter. Bending then straightening (rebending) the reinforcing on site is of even greater concern.

To avoid fracture or weakening, NZS 3109 requires that hooks and bends are formed in accordance with the bend requirements of Table 3.1, which is reproduced below with the permission of Standards New Zealand. The minimum diameter of bend is measured on the inside of the bar.

Grade f_y (Mpa)	Bar type	Bar diameter, d_b (mm)	Minimum diameter of bend, d_i (mm)	
			Plain bars	Deformed bars
300 or 500	Stirrups and ties	6–20 24	$2d_b$ $3d_b$	$4d_b$ $6d_b$
	All other bars	6–20 24–40	$5d_b$ $6d_b$	$5d_b$ $6d_b$

Note that the above table only gives part of the requirements for hooks and bends. For full details of standard hooks, bends, stirrups or ties, for mesh bend diameter requirements and for galvanised bar bend requirements, refer to Clause 3.3 of NZS 3109.

Rebending should only be carried out when unavoidable and identified at the design stage. NZS 3109 and NZS 3101 require that rebending is done in the specified manner and to the manufacturer's requirements. For guidance, refer to the Department of Building and Housing wall chart on reinforcing steel requirements.

Don't

- ✗ **Don't** bend steel on site unless absolutely necessary and then only with equipment fit for the purpose.
- ✗ **Don't** rebend steel on site without using a purpose-built tool and proper preparation and preheating.

Do

- ✓ **Do** obtain a copy of the hooks and bends requirements in NZS 3109.
- ✓ **Do** bend any reinforcing steel using a purpose-built tool that will achieve the correct bend diameters.
- ✓ **Do** obtain bend-o-meter discs from the Department to help quickly ensure that reinforcement is bent to the correct diameters.
- ✓ **Do** report any failures of reinforcing steel to the manufacturer and the Department. Keep a sample of the failed bar.

Figure 1 A 12 mm bar bent to correct diameter of 60 mm.
Source: CCANZ IB79



Figure 2 Cracks in Grade 500 reinforcement caused by incorrect bending and rebending



Practice Advisory 1 cont.

Background

There have been formal and informal reports of bars breaking when handled on site. In many cases this was shown to be due to incorrect bending and handling of the bars.

The Department responded by investigating the concerns and issues behind the reports. Many of the reported failures could be linked to incorrect bending and rebending practices on site. These practices are more critical with Grade 500 steel as there is less tolerance for bending this reinforcement to tight diameters.

Further information: AS/NZS 4671, NZS 3101, NZS 3109, Department wallchart, CCANZ Bulletin IB 79

Note that this Practice Advisory is issued as guidance information in accordance with section 175 of the Building Act 2004 and, if used, does not relieve any person of the obligation to consider any matter to which the information relates according to the circumstances of the particular case.