

Technical Note

Viribar®750 Column Fitments

VIRIBAR®
750

Viribar®750, a stronger steel and therefore lighter for the same design capacity compared with 500 MPa fitments, provides a more sustainable option, lower handling costs, and a safer product.

Viribar®750 is InfraBuild Construction Solutions' new range of 750 MPa grade, Class N (750N) bars for fitments in smaller diameters which are equivalent in force capacity to the existing 500 MPa grade Class N (500N) bar. This equivalence means that in the general case no re-design is required to substitute the new Viribar®750 fitments for the existing 500 MPa fitments. The reduction in steel has the potential to significantly improve the sustainability credentials and constructability of a project.

This technical note provides guidance on how the existing 500N fitments can be substituted to utilise the benefits offered by the higher strength Viribar®750 fitments and still meet the requirements of AS 3600 *Concrete structures*. Fitments in columns, sometimes also referred to as ligatures or column ties, are to provide confinement of the concrete and to restrain the longitudinal bars from buckling. The fitments in columns will generally vary in diameter, strength grade, spacing and number (across any one column cross section) to cater for the design actions on the column.

Substitution for the General Case

Table 1 provides the substitution sizes in the general case for columns that are not part of a moment resisting frame subjected to earthquake actions.

Table 1. Substitution Table

Equivalent Diameters (mm)			Minimum Capacity (kN) $A_{b,fit} \times f_{sy,f}$
Standard $f_{sy,f} = 500 \text{ MPa}$	Viribar®750 $f_{sy,f} = 750 \text{ MPa}$	Viribar®750 Designation	
10	8.2	V8.2	39.3
12	9.8	V9.8	56.5
16	13.1	V13	100.5

AS 3600:2018 Clauses 10.7.3 and 10.7.4 indicate that if the confining pressure and the restraint to the longitudinal bars provided by the fitments are not changed, then spacing requirements of the fitments are also not changed. Therefore one diameter fitment can be substituted by another diameter fitment provided they have the same or higher force capacity which is given by the product of the area of the fitment ($A_{b,fit}$) and the grade ($f_{sy,f}$) of the fitment.

For example, in Table 1 above:

For a 500N, 12 mm fitment, the force capacity is: $\frac{\pi \times 12^2}{4} \times 500 \times 10^{-3} = 56.5 \text{ kN}$

For a Viribar®750, 9.8 mm fitment, the force capacity is: $\frac{\pi \times 9.8^2}{4} \times 750 \times 10^{-3} = 56.6 \text{ kN}$

Therefore, the 500 MPa 12 mm diameter fitment can be replaced by a V9.8 i.e. Viribar®750 9.8 mm diameter fitment with the same spacing because it has the same or higher force capacity of 56.6 kN.



Endorsement

The technical aspects of the substitution of Viribar®750 for 500N fitments have been reviewed by Professor Stephen Foster of UNSW Sydney. Professor Foster confirms the Viribar®750 range fitments meet the requirements of AS/NZS 4671:2019 for substitution for 500N fitments as per the details of this publication for the special confinement regions of high-strength concrete columns.

Columns resisting earthquake actions

Where columns have been designed to carry earthquake actions as part of a moment resisting frame, an additional check for the maximum fitment spacing requirement at each end of the column for a distance, x is required. Where x is the greater of:

- i. The maximum dimension (D) of the column cross section
- ii. $1/6$ th the clear length of the column ($L/6$)

Table 2. Spacing check of fitments at each end of column resisting earthquake actions

Viribar®750 Fitment	Max. Spacing (mm)
V8.2	195
V9.8	235
V13	310

Conformance with AS/NZS 4671:2019

The Viribar®750 fitments meet the requirements of AS/NZS 4671:2019 *Steel for the reinforcement of concrete*. Samples of this product have been independently tested by the University of New South Wales and MTS Laboratories to confirm the conformance of Viribar®750 material to AS/NZS 4671. Typical stress/strain curves for Viribar®750 and 500N material are shown in Figure 2.

Recognition by the GBCA

Viribar®750 fitments are recognised by the Green Building Council of



Australia (GBCA) as a more sustainable option compared with standard fitments. Using Viribar®750 fitments can, subject to certain criteria, provide an automatic credit point via the Innovation Challenge category for a project's Green Star rating. For more information visit www.gbca.org.au/faqs.asp?action=details&faqId=112 or email sustainability@infrabuild.com

Bar Markings

The Viribar®750 fitments are produced from bars that can be identified by their rolled-in bar markings. The bar markings are designated in the following format – Grade (MPa) / Ductility Class (N) / Diameter (mm). For example, 750N 9.8 designates the product is a 750 MPa grade fitment, with normal ductility, with a nominal diameter of 9.8 mm. The letters – LSA (Liberty Steel Australia) is the mill identifier.

Disclaimer:

This information is provided as a service to those interested in steel reinforcement. Since the information is general guidance only, and in no way replaces the services of professional consultants, no legal liability can be accepted by InfraBuild Construction Solutions for its use.

InfraBuild Construction Solutions reserve the right to change specifications and availability without notice.

Copyright © 2020, All rights reserved. InfraBuild Construction Solutions Pty Limited ABN 22 004 148 289.

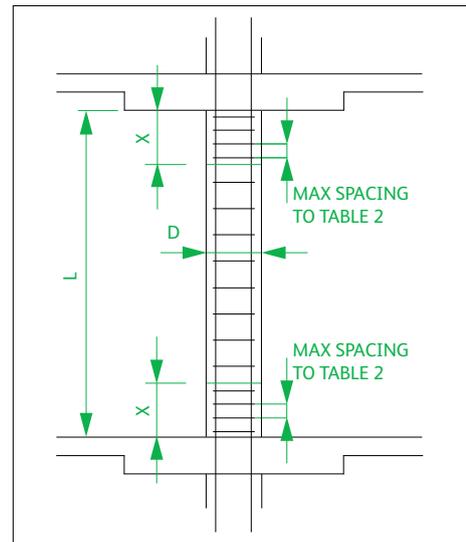


Figure 1. Additional fitment spacing check for columns resisting earthquake actions

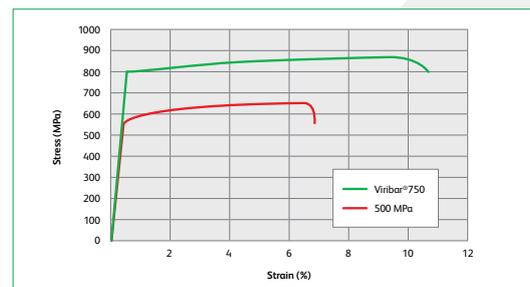


Figure 2. Stress/strain properties of Viribar®750 compared with conventional 500 MPa reinforcing steels

Figure 3. Typical rolled-in bar markings



Read more about the Green Building Council of Australia's (GBCA) Green Star program by scanning this code.