

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 Reinforcings' 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 500 MPa column fitments

Table 1 provides the substitution sizes for 500 MPa column fitments.

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 this publication have been reviewed by Professor Stephen Foster of UNSW Sydney. Professor Foster confirms the Viribar®750 range fitments meet the requirements of Clauses 10.7.2 to 10.7.4 and Clause 15.5.4 of AS3600–2018 for substitution for 500N fitments in high-strength concrete columns as per the details of this publication.

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 1.

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

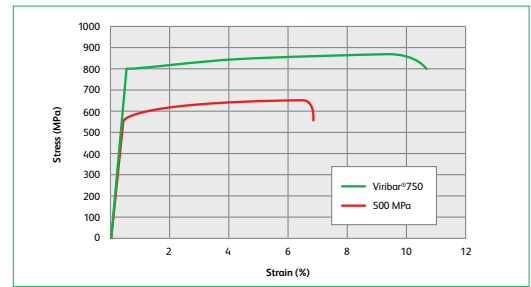


Figure 1. Stress/strain properties of Viribar®750 compared with conventional 500 MPa reinforcing steels

Figure 2. Typical rolled-in bar markings



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.



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

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 Reinforcing for its use.

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

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Frequently Asked Questions

- **How do I specify Viribar®750?**

Specifying Viribar®750 requires two simple steps:

1. Add the following note to the General Notes Drawing:

Reinforcement:

Material is indicated by the following symbols:

- N Deformed Bar Grade 500 MPa (Normal Ductility)
- R Plain Round Bar 250 MPa
- V **Viribar®750 Plain Round Bar Grade 750 MPa Normal Ductility**
- W Plain Wire Grade 450 MPa
- SL Square Fabric Grade 500 MPa
- RL Rectangular Fabric Grade 500 MPa

2. Add the following table below the Column Schedule on the column drawing:

Diameter of 500 MPa Fitment	Alternative Viribar®750 MPa Fitment
N10	V8.2
N12	V9.8
N16	V13
Viribar®750 plain round fitments may be used as an alternative to 500 MPa fitments in accordance with the table above.	

- **Does Viribar®750 conform to an Australian Standard?**

Yes, Viribar®750 has material properties that meet all the requirements of Australian Standard AS/NZS 4671:2019 *Steel for the reinforcement of concrete*, Strength grade 750 MPa and Ductility Class N. As Viribar®750 has a chemical composition which also meets the Standard, it is weldable to AS 1554.3. InfraBuild provide Certificates of Conformance to confirm that the Viribar®750 supplied meet the requirements of AS 4671:2019.

The Australian concrete design Standard AS 3600 *Concrete structures* allows the use of reinforcing steel up to 800 MPa for column fitments and up to 600 MPa for all other reinforcing elements. The specific reference in AS 3600 that allows the use of Viribar®750 is Clause 10.7.3.3 equation 10.7.3.3(2) where it states that the yield stress of the reinforcement used as a fitment can be up to 800 MPa.

- **Does Viribar®750 comply to the BCA?**

Yes, Viribar®750 conforms with the requirements of Australian Standard AS/NZS 4671:2019 *Steel for the reinforcement of concrete*, which is referenced by AS 3600 *Concrete structures*. Designs which are produced to AS 3600 are deemed-to-comply with the 2019 BCA.

- **Does Viribar®750 comply with the 2015 BCA?**

Yes, it does, and this includes earlier editions of the BCA. However, designers will have to demonstrate compliance using the simple framework below because these editions of the Code were written prior to Viribar®750 being developed. The following framework can be used to justify compliance to the 2015 BCA (and to prior versions):

The BCA 2015 Clause 2.2 – Evidence of suitability states that evidence of material suitability may be in the form of a certificate from a professional engineer or other appropriately qualified person which:

- (A) certifies that a material complies with the requirements of the BCA; and
- (B) sets out the basis on which it is given and the extent to which relevant specifications, rules, codes of practice or other publications have been relied upon.

To satisfy requirement (A) a professional engineer will need to provide a certificate that the 750 MPa Ductility Class N material meets the performance criteria of the BCA on the basis of (B) set out below.

To satisfy requirement (B) the professional engineer would use the following:

- AS 3600:2009 (the primary reference in BCA 2015) CI 10.7.3.3 and AS 3600:2018 CI 10.7.3.3 both permit the use of 750 MPa fitments which conform to the requirements of AS/NZS 4671
- InfraBuild Reinforcing issues a Certificate of Conformity which confirms the Viribar®750 supplied meets all the requirements of AS/NZS 4671:2019, Grade 750 MPa, Ductility Class N
- AS 3600:2018 is a primary reference document in BCA 2019 which provides additional confidence in the suitability of the 750 MPa product for compliance with the performance criteria of the BCA 2015.

- **Does Viribar®750 conform with the requirements of AS 5100.5 Bridge design – Concrete?**

No, the latest edition of AS5100.5 *Bridge Design – Concrete* limits the design of fitments to 500 MPa.

- **How do you check/ensure that Viribar®750 has been supplied to a project?**

A rolled-in mark which is clearly visible and at regular intervals will identify both the size and the grade of the Viribar®750 fitment. Test Certificates which conform with the requirements of AS/NZS 4671:2019 that relate to the Viribar®750 supplied are available to confirm the properties meet the requirements of the Standard.

- **Can Viribar®750 be used as beam fitments?**

AS 3600 design models for beam fitments currently limits the design strength to 600 MPa. Given that Viribar® is currently only available in Grade 750 MPa its full capacity cannot be fully utilised when designed as a beam fitment.

- **Why does Viribar®750 not have ribs?**

Viribar®750 was specifically produced for fitments and fitments do not require ribs to develop anchorage as this is provided by the hooks which wrap around the main bars.

- **Does Viribar®750 offer any environmental sustainability benefits?**

Viribar®750 is 33 % lighter than its equivalent strength 500N reinforcing bar. This means that in comparison to the standard 500N bars, Viribar®750 is produced using up to 33 % less energy and raw materials. The lighter product also means that it uses comparatively less energy to transport and lift onto the building site.

The Green Building Council of Australia recognises the improved environmental credentials of Viribar®750 over standard reinforcing steel. On Green Star rated projects it rewards its use in buildings by offering an automatic point in the Innovation Challenge Credit if all the fitments in the columns of a concrete building utilise Viribar®750.

The Infrastructure Sustainability Council of Australia's (ISCA) IS rating tool also recognises the reduction of raw materials consumed by using Viribar®750 in its materials calculator.

[Click here for more information on the sustainability benefits offered by Viribar®750.](#)

- **How does AS 4671:2019 require Viribar®750 to be designated?**

Using V9.8 as an example, the full designation for V9.8 (Viribar®750, 9.8mm diameter bars) in accordance with AS 4671:2019 Clause 5.3 is – R750N9.8, where:

R for a Round profile

750 is the Grade expressed in MPa

N is the Ductility Class

9.8 is the Diameter in mm

However, AS 3600, Clause 5.3 allows the project plans and specification to refer to them in an abbreviated form provided there is a general note on the documents to indicate how to interpret the abbreviation and there is no possibility of confusion on a project.

The example given in the Standard is D500N12 can be abbreviated to N12 if all normal ductility, 12 mm diameter bars on a project are deformed, 500 MPa bars. So R750N9.8 can be abbreviated to V9.8 because all V9.8 that InfraBuild will supply on a project will be round, 750 MPa, normal ductility bars.

- **What is the meaning behind the name 'Viribar®'?**

The name Viribar® is derived from the Latin word Viridi (shorten term Viri) meaning blooming and youthful and also fresh and green.

These all convey the properties that are inherent to Viribar® – a steel bar that is new and strong (youthful) and also green (in terms of its sustainability credentials). It is a fresh approach to a reinforcing product, we haven't simply made it stronger, we have made it in diameters that do not require engineers to redesign for it to be used.