SRIA STEEL REINFORCEMENT INSTITUTE OF AUSTRALIA

The Safe Use of Class L Reinforcing Mesh in Suspended Floors

The **construction industry** has been successfully using low ductility reinforcing mesh in all types of reinforced-concrete structures in Australia for well over 80 years.

For most of this time it was Grade 450, but approaching the turn of the millennium it moved to Grade 500 in harmony with international best-practice, and was designated Class L for low ductility, as distinct from normal ductility Class N reinforcing bars. Grade 500, Class L mesh is produced to more stringent ductility requirements than ever before. It is also normally made from ribbed wire for improved bond.

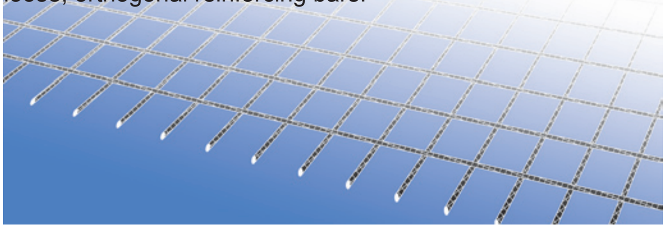
Over this time, with potentially millions of square metres of suspended floors incorporating mesh, to the best of the Steel Reinforcement Institute of Australia's (SRIA) knowledge there have been no structural failures or problems that can be attributed to the mechanical properties of the low ductility steel used in the mesh, when it has been used in suspended slabs and beams, including wide band beams, where the elements and structures were designed and built in accordance with relevant Australian Standards.

The **Concrete Structures Standard** AS 3600:2001 contains comprehensive rules that allow the use of low ductility Class L mesh as the primary reinforcement in all types of suspended reinforced concrete slabs designed for normal static loading conditions. This situation has not changed in the new draft standard currently being reviewed by the responsible Standards Australia committee BD-002.

The 2007 edition of the **Building Code of Australia** (BCA 2007) deems Class L mesh as a "fit for purpose" construction material, when used in accordance with AS 3600:2001, which it calls up (including amendments 1 and 2).

Class L mesh is **efficiently mass-produced** from hot-rolled, coiled reinforcing wire, that is cold worked by drawing and rolling the rib deformations into the wire at high speed, which is then positioned and welded automatically to form a variety of mesh patterns and sizes, using various wire diameters defined in AS/NZS 4671 that can be significantly smaller than the smallest Class N bar diameter.

There are **numerous advantages** of Class L mesh that make it popular in construction. It is particularly efficient for reinforcing typical slabs in two orthogonal directions, providing reliable solutions of low steel intensity. Also, it can be prefabricated into a variety of shapes, possibly forming part of the shear reinforcement of wide beams as well as some of the main reinforcement. Because they are compact and normally light, standard 2.4 x 6.0 metre mesh panels are readily handled on construction sites, either in large packs by crane, or as individual sheets that can be manually lifted and quickly placed in position, reducing construction labour and time when compared to using loose, orthogonal reinforcing bars.



The **design requirements** of AS 3600:2001 are summarised as follows:-

- no moment redistribution should be assumed during the design of members that use Class L mesh as the main tensile reinforcement (which is normally how reinforced-concrete floors are designed anyway, and generally leads to more serviceable structures with less cracking);
- in beams and one-way slabs and supports, the reinforcement is to be designed to carry the elastic distributions of stresses at all locations (the Simplified Method of Clause 7.2 of AS 3600:2001 may be used);
- when designing two-way slab systems, they must be modelled as an elastic system of plates and supports, and the reinforcement must be designed to carry the elastic distributions of stresses (including calculated torsions) at all locations (the Simplified Method of Clause 7.3 of AS 3600:2001 may be used for two-way slabs supported on four sides, or general Linear Elastic Analysis in Clause 7.6); and
- an arbitrary penalty of 20% has to be applied to the design strength in bending, ϕM_{uo}, of under-reinforced or balanced sections in peak moment regions, i.e. $k_u \leq 0.4$, so the strength reduction factor effectively becomes $\phi = 0.8 \times 0.8 = 0.64$.

Despite the fact that Australian **experimental research** into the behaviour of floors incorporating Class L reinforcement consistently shows that the members can reliably exhibit large amounts of moment redistribution at all stages of loading, this new penalty is intended to take into account any unknown foundation movements, variations in loading or accidental loadings, any of which could lead to additional moment redistribution in the actual structure. It is also intended to penalise any potentially brittle failure mode associated with the low ductility of the steel mesh. (The SRIA is undertaking research into the necessity for this penalty.)

The SRIA is developing **Technical Notes** to assist practicing engineers to design slabs incorporating Class L mesh, which will show that it can be beneficial to incorporate short Class N bars tied to the mesh in highly stressed peak moment regions, e.g. over supports, in order to avoid increasing mesh size, leading to more economical solutions.

In conclusion, engineers, builders and developers can design and construct elevated reinforced-concrete slab floor systems in accordance with AS 3600 with confidence using Grade 500, Class L mesh, a superior-quality product backed by the SRIA and its manufacturer and processor member companies, meeting the stringent quality control requirements of AS/NZS 4671 and ACRS, and knowing that its use fully complies with BCA 2007, and that low ductility mesh used in such structures has an unblemished performance history extending back well over 80 years in Australia.

For further information
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