

INTRODUCTION

OBJECTIVE

The objective of this Handbook is to promote the wider use of prefabricated reinforcement (welded wire fabric and prefabricated cages) by providing useful guidelines to engineers in the design of structural elements using such reinforcement. The wider use of prefabricated reinforcement will raise productivity, reduce site labour and shorten construction time.

SCOPE OF THE HANDBOOK

This Handbook contains tables of welded wire fabric and prefabricated cages. Design of reinforcement is based on BS8110: Structural Use of Concrete: Part 1: 1985, including subsequent revisions up to 1993. Prefabricated reinforcement can be used in slabs, columns, beams, walls, drains and pilecaps. Detailing of reinforcement in two-dimensional and isometric views and guidelines on installation are also provided.

WELDED WIRE FABRIC (WWF)

Welded Wire Fabric is manufactured using automatic welding machines, where parallel series of high strength cold drawn reinforcing wires are welded together in a square or rectangular grid. It uses electrical resistance welding process to fuse the intersecting wires into a homogeneous section and fix all wires in their proper position. Plain wires, deformed wires or a combination of both may be used in welded wire fabric.

In Singapore, WWF are manufactured in accordance to Singapore Standards SS 32 : Welded Steel Fabric for the Reinforcement of Concrete. The characteristic yield strength of WWF is 485 N/mm^2 . Most of the local manufacturers have their WWF certified to the Singapore Quality Mark Scheme ensuring consistent quality of the product. However, engineers may also obtain a copy of test certificates from the supplier to ensure that the strength of the wire meets the requirements.

Currently, the four most commonly used preferred WWF are:

"A" Series: Square fabrics with wires at 200 mm spacing in both directions.

"B" Series: Rectangular fabrics with main wire spacing of 100 mm and cross wire spacing of 200 mm.

"D" Series: Square fabric with wires at 100 mm spacing in both directions.

"E" Series: Square fabric with wires at 150 mm spacing in both directions.

A, D and E fabrics series have equal sizes of wire and spacing in both directions. They are used where the structures they reinforced have to be equally strong in both directions, therefore providing similar areas of steel. B series fabrics are generally used in structures where the principal steel is in one direction, and the steel in the other direction is the minimum required by BS 8110. Standard sheet sizes of 6 m (length) by 2.4 m (width) are usually available ex-stock. Cut-to-size sheets are also readily available from the supplier in flat sheets or bent to required shape.

"Engineered" fabric series and "Designer" fabric series may also be fabricated by varying the diameter, spacing and position of the wire. In this Handbook, a new series of Designer fabric is introduced to increase the choices of WWF available. Engineers may also specify their own Designer Fabric or Engineered fabric in consultation with the suppliers.

PREFABRICATED CAGES

Prefabricated reinforcement improves site productivity and shortens construction time. Off-site fabrication, in the controlled environment of a factory, has the benefit of much higher productivity, better quality control and far less wastage of material. The contractor avoids keeping large quantity of material on site, minimises the tedious tasks of manual cutting, bending, laying and fixing of steel bars in the traditional manner.

WWF as described earlier is the most common prefabricated reinforcement used. WWF can be made from different types of reinforcement steel and is available up to the size of 16 mm diameter, e.g. main wire Tempcore bar T16 and cross wire cold drawn wire H10.

WWF in the form of beam link cages or column link cages is ideal for forming a quick skeleton of reinforcement onto which the main reinforcement can be secured. This form of cages is widely used in HDB projects and is starting to be used in the private sector.

Apart from the flat sheets and bent fabric where the intersections are resistance welded, flat, bent or 3-dimensional prefabricated reinforcement can also be formed using a mig welder to spot weld the reinforcement bars and/or WWF cages together. These assemblies are rigid enough for transport to site without damage and they can be lifted and dropped into the formwork ready to be concreted. With a mig welder it is possible to produce prefabricated reinforcement with diameters larger than 16 mm. This Handbook provides information on the use of prefabricated column cages, beam cages, pile caps and other structural elements. Engineers should check with the manufacturer for more information on design considerations, detailing and supply of the prefabricated reinforcement.

GUIDE TO SECTIONS

The following Sections feature design guidelines and examples using prefabricated reinforcement for slabs, beams, columns, walls, pilecaps and other applications. Design assumptions as well as relevant details are also provided.

New annotations such as S2T10-200 (beam link cage), 3LH10-175 (column close link cage), WA125-A10 (wall type), 1RP150 (single pile type for precast reinforced concrete driven pile) and 5BP600 (5 pilegroup type for bored pile) have been introduced in an attempt to standardise the specifications of these prefabricated reinforcement.