PRESS RELEASE
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Codes and Standards for Agricultural Buildings

Agricultural buildings in the UK are designed to a British Standard and for the structural aspects of the design that standard is BS 5502-22:2013. This standard is only the tip of an iceberg concerning design documents - which a structural engineer has to use to determine the loading on the building, and to design a suitable structure to carry it.

This article aims to untangle the web of codes and standards in use today, explain the relationship between them and inform readers of changes on the horizon.

BS 5502-22:2013

BS 5502-22:2013 is the correct standard for the structural design of agricultural buildings. It provides additional information and design data specific to agricultural buildings, along with reduction factors that may be applied to the wind, snow and imposed loads in certain cases. BS 5502-22 was revised in 2013, bringing it up to date with the structural Eurocodes in use across Europe. This enabled structural engineers to use the same software and design methods that they use for commercial and industrial buildings, while maintaining the reductions in loading enjoyed by agricultural buildings in the UK. The previous version of BS 5502-22 has been withdrawn and is no longer a valid design document so it must not be used.

The Eurocodes

The structural Eurocodes, as they are collectively known, are the principal design documents for all types of structures in the UK, ranging from a 12m span barn to a 1200m span highway bridge. They cover the calculation of wind and snow loading and the structural design of members and frames in a range of materials. As the name suggests, they are applicable for use across Europe (and further afield), although each nation has its own National Annex and is able to set Nationally Determined Parameters (e.g. safety factors). Contrary to popular belief, they are not an alternative to the old British Standards like BS 5950; they are the current and only British Standards still supported by the British Standards Institution (BSI).

At the head of the Eurocodes' family is **EN 1990 or Eurocode 0**. This standard sets out the basis for structural design and presents the basic design principles. Although for most engineers designing simple structures, it is the place where the load combinations and safety factors are obtained. The detailed design equations and methods are contained within all of the other Eurocodes starting with Eurocode 1.

EN 1991, or Eurocode 1 contains everything that the structural engineer needs to know about loading on buildings and structures. It is divided into several parts, covering a diverse range of loading types, including dead and imposed loads (EN 1991-1-1), snow loading (EN 1991-1-3), wind loading (EN 1991-1-4) and accidental actions (EN 1991-1-7). Other parts include rules for traffic loading on bridges, loading from cranes and machinery and special rules for silos and tanks. There is a UK National Annex for each part.

Eurocodes 2 to 6 (EN 1992, EN 1993, EN 1994, EN 1995 and EN 1996), along with Eurocode 9 (EN 1999), give design rules for specific materials, while Eurocode 7 and 8 (EN 1997 and EN 1998) cover geotechnical design (foundations) and earthquake resistance respectively. For most building structures, the structural engineer will need to use several Eurocodes during the design process, e.g. EN 1992 for the concrete slab, EN 1993 for the steel frame, EN 1995 for the timber purlins and EN 1997 for the

foundations. Furthermore, each Eurocode is divided into several parts, giving specific rules and recommendations.

All aspects of steelwork design are covered by EN 1993, including the design of the steel frame and its members (EN 1993-1-1), the connections between members (EN 1993-1-8) and light steel purlins and cladding (EN 1993-1-3). EN 1993 replaced BS 5950 in the UK. Although there appears to be a bewildering number of standards within the Eurocode family, there is a clear hierarchy and each part is written in a way that complements other members of the family. For example, EN 1993-1-3 gives specific rules for cold formed steel members (e.g. light gauge steel purlins), but builds on the general rules given in EN 1993-1-1. This approach avoids unnecessary repetition and prevents contradiction between parts.

EN 1090

Those familiar with the CE marking of steel frames will recognise EN 1090 as the 'CE marking standard for fabricating steelwork'. However, in reality this title should only be applied to EN 1090-1, although to date EN 1090-2 has featured heavily in the CE marking process.

The difference between the two standards is important and is explained below:

EN 1090-1

EN 1090-1 is the Harmonised Standard (hEN) for structural steelwork and includes the list of Essential Characteristics that may be declared by the manufacturer, along with the all-important Annex ZA that gives rules for the CE mark itself. As a harmonised standard, EN 1090-1 has one simple aim: To set out the framework for CE marking by stating which properties may be declared and how they should be measured. It sets out requirements for Initial Type Testing (ITT) and Factory Production Control (FPC), but does not directly set requirements for performance. To ensure that a minimum level of performance (and hence safety) is achieved, EN 1090-1 refers repeatedly to EN 1090-2 on matters such as fabrication tolerances and welding. Simply, a manufacturer CE marking to EN 1090-1 declares that its products comply with EN 1090-2 regarding the Essential Characteristics, and produces a set of FPC procedures ensuring this compliance is achieved in practice.

EN 1090-2

EN 1090-2 is the Execution Standard for structural steelwork and includes details on matters such as tolerances and welding. Although often associated with CE marking due to the many cross references from EN 1090-1, compliance with this standard is independent from the CE marking process. It goes much further than the Essential Characteristics declared on the CE label (seemingly lost on many CE marking auditors). Compliance with EN 1090-2 is essential for safety, since the structural engineer's design calculations are only valid if the steelwork is fabricated to tolerance and welded correctly - clearly stated in EN 1993. Since BS 5502-22 refers to EN 1993 for the steel design and EN 1993 refers to EN 1090-2 for tolerances and welding, it follows that any building that fails to comply with EN 1090-2 automatically fails to comply with BS 5502-22.

Latest code updates

All of the Eurocode documents have been reviewed and are in various stages of being revised, starting with EN 1990. Many of the changes currently being discussed, such as robustness and reliability analysis, will have little impact on agricultural buildings. However there is talk of replacing the equations used to combine snow and wind loading, with possible consequences for design loads. The main parts of EN 1991 and EN 1993 are now at the Working Group stage, where teams of experts from across Europe review the comments received on the existing standards and attempt to address them. Project

Teams have just started the process of undertaking detailed technical work that will eventually feed into the revised Eurocodes.

As a general trend, there is a move to reduce the number of Nationally Determined Parameters (NDPs), i.e. the values and equations that may be specified by individual countries through their National Annexes. No major changes to wind and snow loading are expected, although increases in both cannot be ruled out. Similarly, changes to EN 1993 are unlikely to have a significant impact on the design of steel framed sheds, since the underlying physics has not changed. In both cases however, changes to the design methods or equations would require software updates. The Project Teams and Working Groups have been asked to consider 'ease of use' aiming to make the Eurocodes easier to follow and navigate.

Perhaps more significantly for steel frame manufacturers, EN 1090-1 and EN 1090-2 are also being revised with potential consequences for CE marking. Changes are proposed relating to the bolting and welding of structural steel, including new guidance on the selection of weld inspection classes and the use of preloaded bolts. Guidance on the selection of the execution class has been removed from EN 1090-2 and may now be found in Annex C of EN 1993-1-1. Requirements for cold-formed steel members and sheeting are now in EN 1090-4. The changes proposed to EN 1090-1 are more fundamental in nature and could see the link broken between this standard and EN 1090-2. If this change is implemented, compliance with EN 1090-2 will no longer be mandatory for CE marking, although it will still be essential for building safety and for compliance with BS 5502-22.

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Notes to Editors

1. The Rural and Industrial Design and Building Association (RIDBA) is the recognised trade association for the modern agricultural and industrial buildings industry.
2. RIDBA represents contractors, designers, colleges, surveyors, land agents, planners and manufacturers involved in rural and industrial construction and information about membership can be found on the RIDBA website.