The CARES Guide to Product Certification

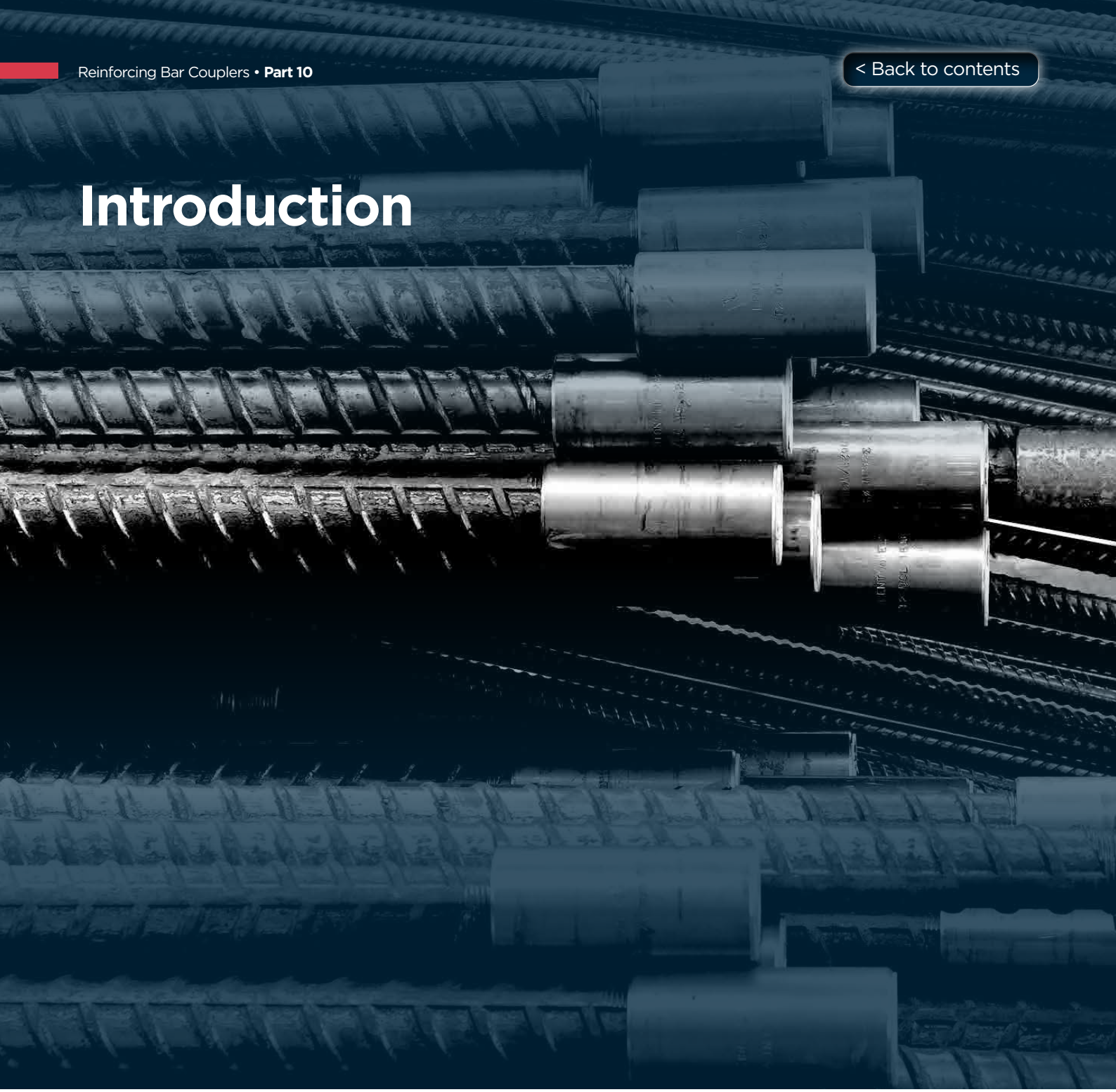
Part 10
2025

Reinforcing Bar **Couplers**

Contents (click to navigate)

Introduction	02
CARES Technical Approval Procedure of Couplers	03
Key differences	03
The procedure in operation for mechanical splices	04
CARES assessment	07
The CARES Scheme	08
The Technical Approval Report	09
References	10

Introduction



Earlier parts of this Guide have described how CARES has undertaken certification for products which have been the subject of product standards and, by specific reference to properties, processes and products, how its certification schemes provide confidence in the compliance of these products.

As the reinforced concrete market develops, certain products and systems have emerged which are designed to provide added value to the contractor and the end product user through improved performance, however that is assessed. Very often, these new products are not covered by a product standard but are proprietary items designed for a specific construction situation, Nevertheless, users require confidence, often by external independent verification and, in order to deal with this, CARES has designed a system of certification to provide this.

Part 10 of this Guide describes the principles and practices of this system, which is called Technical Approval by CARES.

CARES Technical Approval Procedure of Couplers

The procedure begins with a detailed discussion between the applicant firm and CARES, including any technical expert deemed necessary, to establish:

- The extent of the product family to be assessed.
- The scope of use and its intended purpose and any specific installation requirements.
- The general principles of testing and evaluation.

Following a successful review and assessment of other potential applicants, the new Technical Approval Scheme proposal will be discussed at the appropriate CARES Technical Committee, whilst maintaining client confidentiality.

Each CARES Technical Committee comprise of various interested parties and senior structural engineers relevant to each product area. There are currently 5 CARES Technical Committees in the UK (Steel, Coupler, Post Tensioning, Construction Products and Sustainability), with similar Committees set up in other selected countries to ensure true representation in the region.

This procedure ensures CARES impartiality in the process and allows for progression of both new and existing technical approval schemes in line with updated standards, building practises and legislation.
This Technical Approval procedure ensures that a comprehensive series of relevant tests are performed on each product in relation to those characteristics considered important to meet its declared purpose and its intended area of use. The product performance requirements are included in an assessment schedule which is produced by CARES and its agents, approved by the CARES Technical Committee experts and applied by CARES assessment team and nominated test houses.

As part of the certification recommendation procedure there is an evaluation of the technical data of the producer, as applied to the product, which includes those procedures for installation and technical assistance.

Any amendment to the product production or design considered significant to its performance is assessed and further tests are initiated as required. On completion of testing the assessment report and the certificate, which includes the certificate of approval, are approved by a group selected from the CARES Board, before it is signed and issued.

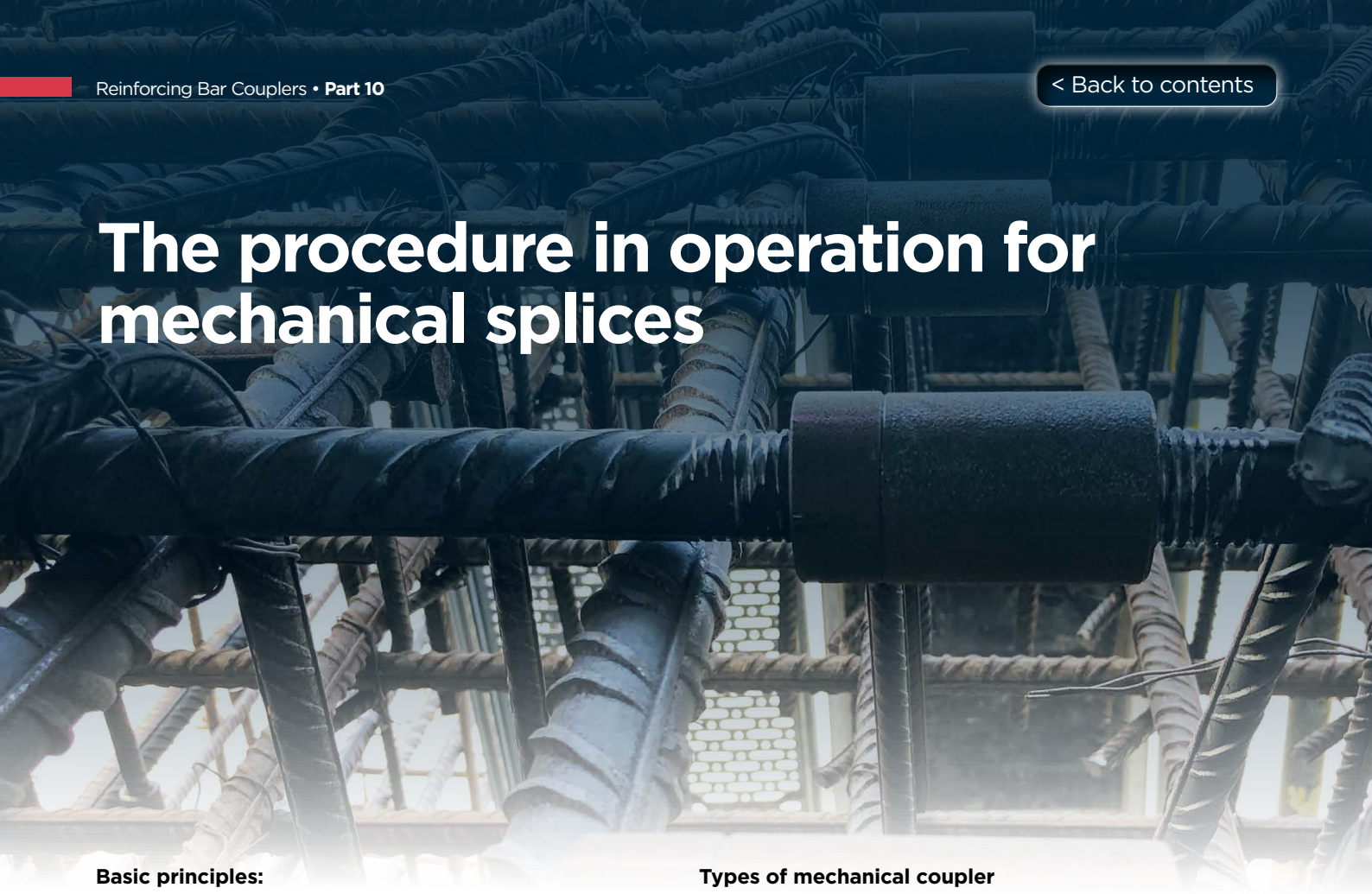
All product assessment schedules include quality management system requirements in accordance with ISO 9001:2015 and these systems are assessed and audited twice-yearly by CARES auditors' expert in the products and processes involved.

Key differences

The key differences between the CARES Coupler Technical Approvals and its Product Certification Schemes are:

- Creation of bespoke tests and testing programme to be included within the assessment schedule. Such testing may be defined in a product standard or alternatively designed by CARES.
- CARES do try to follow the basic ethos of standards writing in this respect, including reference to the balanced membership of the CARES Coupler technical committee in the approval of any Assessment Schedule issued or updated.
- Design considerations.
- Safety considerations.
- Detailed technical reporting as well as certification.
- Correct and up to date installation instructions for the couplers

The procedure in operation for mechanical splices



Basic principles:

The basic principle of lapping, which is common in reinforced concrete construction, is to lay two bars parallel to one another, overlapping for a certain designed length (lap length), and connect them with tying wire. The load in the first bar is transmitted to the concrete by the bond between steel and concrete to the second bar. Since this load transference is indirect, the efficiency of this joint and therefore the lap length depends on many factors, including the properties of the concrete. This complexity requires design regulations for lapping and that design engineers and site engineers must be familiar with these design requirements.

Design codes typically recommend that joints in rebar are to be placed away from points of high stress and that these joints are staggered. Some codes restrict overlapping to areas subject to lower stresses or restrict overlapping to smaller bar diameters, e.g. less that 32mm.

In some circumstances lapping of reinforcement is neither practicable nor cost effective and to solve this problem, the construction industry has developed mechanically coupled splices. This product is known as a coupler and is designed to join two reinforcing bars together and transmit the load in one bar to another. There are many different types of couplers, but the most common are based on either a threaded bar and coupler, a sleeved coupler which is swaged onto the bar, or a combination of both. There is also a sleeved coupler which is bolted onto the bar. By creating an end-to-end bar connection, a continuous load path is created from one bar to another that is independent of the condition and quality of the concrete. Furthermore, the mechanical splice is relatively quick, easy and inexpensive to test.

Types of mechanical coupler

There are numerous proprietary splicing systems that are sold, with various claims of performance and practical benefits. Several examples of the various coupling methods follow:

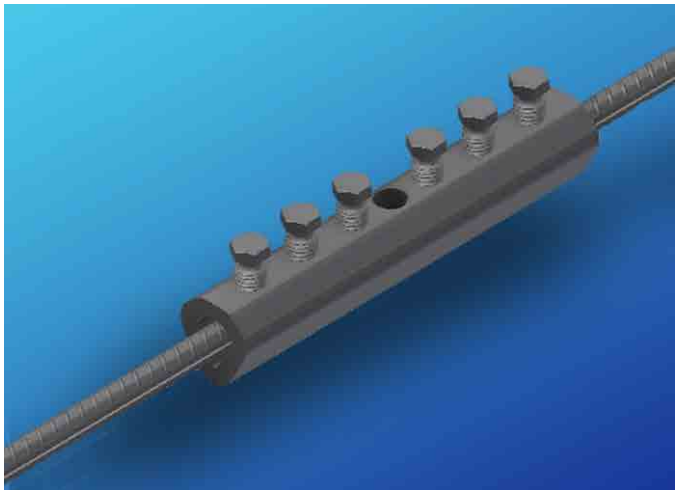
Tapered thread. (Erico Lenton)

The ends of the rebar are sawn square, and a tapered thread is cut onto the bar, using a set of dies and a threading machine, to suite the taper thread of the coupler. The threading machine is usually provided by the coupler manufacturer. The coupler is assembled using a torque wrench, which should be calibrated for the purpose. A benefit of this system is that the bars are easily and correctly centred in the coupler, and the opportunity for cross-threading is reduced. This ensures ease of installation. The coupler is assembled using a torque wrench.

Parallel thread. (Leviat)

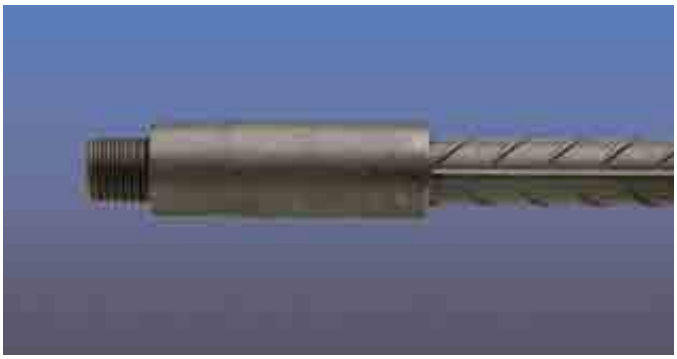
After cutting square, the ends of the bar may be enlarged, or "upset", by cold forging, such that the core diameter of the bar is increased to a predetermined diameter. A parallel thread is then either cut or rolled onto the enlarged end. Using this technique, the effective diameter of the threaded bar is equal to the bar diameter thereby creating the conditions to promote failures within the bar and not the coupled joint. The coupler is usually assembled using a torque wrench.

Bolted coupler. (Terwa)



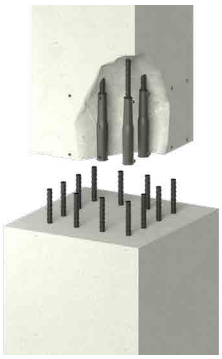
Each end of the bar is inserted into opposite ends of a steel sleeve which is then bolted in a prescribed manner to ensure controlled penetration into the bar surfaces. The couplers are installed with a pneumatic or electric power tool. The bolt heads will shear off when proper installation tightness has been reached.

Swaged or thread/swage combination. (Dextra Griptech)



Swaging of a coupler, in which a steel sleeve is attached to both bar ends by applying radial pressure to the bar/coupler assembly and resulting in a pressure sealed splice, is less common in today's market. This may be due to a very slow installation rate. To overcome this, mechanical splices have been developed which employ a combination of swaging and parallel threading to ensure a full-strength joint with flexibility of assembly. Sleeves, which are swaged onto the bar ends, are connected by means of a high-performance threaded stud, thus ensuring a full-strength joint.

Grouted coupler. (Leviat Sdn BHD)

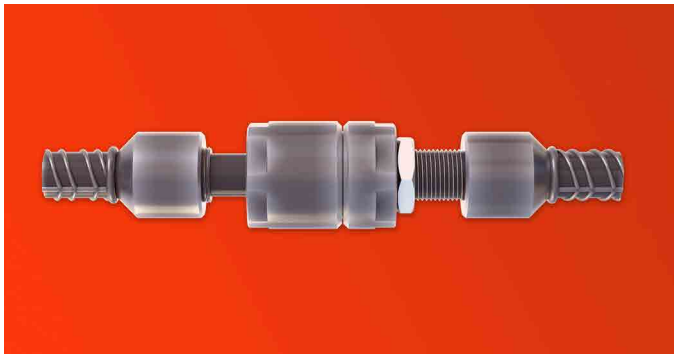


This type of coupler relies on the grout to hold the reinforcing steel within a sealed sleeve. This connection may be enhanced by threading one end of the rebar assembly or using a bolting assembly. The grout must have defined properties as detailed in TA1-B and is subject to strict controls in its production and final properties, as ultimately these affect the properties of the final coupler assembly.

Friction welded coupler. (HyTen)

After cutting square, the ends of the bar may be enlarged, or “upset”, by cold forging, such that the core diameter of the bar is increased to a predetermined diameter. A parallel thread is then either cut or rolled onto the enlarged end. Using this technique, the effective diameter of the threaded bar is equal to the bar diameter thereby creating the conditions to promote failures within the bar and not the coupled joint. The coupler is usually assembled using a torque wrench.

Adjustable coupler. (APTUS)



This particular coupler may be connected to the rebar by conventional means or by friction welding as detailed earlier. The adjustable coupler is typically used for connection of precast elements where each part of the coupler may be cast in-situ in each precast element. Connection in this way allows for the adjustment on site of the eventual connection ensuring tight tolerances are met.

The formation of the joint is achieved by screwing the two sections together at a prescribed distance achieved using the adjusting mechanism.

The above is not an exhaustive list of all the approved CARES coupler manufacturers, for a full list and access to each technical report please visit:

https://www.carescertification.com/certification-schemes/technical-approvals-reports

CARES assessment

Claims of performance between the different types are wide and varied, and each of the above types may have different variations from the standard design, typically positional, transitional, cage or adjustable.

It is essential at the initial assessment stage and subsequent surveillance visits that each coupled sample is witnessed by the CARES assessor during its connection to the rebar, ensuring that the installation methodology in the Technical Assessment report is followed and robust to ensure similar connection on site, where applicable.

Each unique type must undergo the necessary rigorous testing as detailed above, the CARES approach to assessment is driven by design code / client specification requirements.

As a result, CARES has formulated four different assessment schedules for mechanical splices. In addition to a full system of assessment of both management system, including mechanical splice and bar traceability and installer qualification, the following properties are assessed for all sizes under approval.

TA1-A, TA1-B are based on the use with CARES approved reinforcing bars to BS4449 or BS6744.
TA1-C is based on the use with CARES approved reinforcing bars to BS4449.

TA1-F is based on the use with CARES approved reinforcing bars to either of BS4449, BS6744, EN10080, CS2, SS560, ISO6935-2, ASTM A615/A615M and / or ASTM A706/A706M standards

- **TA1-A, for use in Structures and Structural elements designed in accordance with the Fatigue Requirements of Structural Eurocodes (for use with Highway structures)**

The tensile strength requirements are based on the Ratio (tensile strength/yield strength) and yield strength.
The minimum UTS = Re x (Rm/Re) = 540MPa for grade B500B reinforcement and 575MPa for grade B500C.
Permanent set ≤ 0.10mm @ 0.65 fy.
Fatigue = Fatigue testing in air using a range of endurance levels.

There are two fatigue classes, D and R.
Fatigue class D is the most common and specified in the National Highways specification for Bridges.
Fatigue class R is a more onerous test and infrequently requested.

- **TA1-B, Couplers for Reinforcing Steel and Reinforcement Anchors for Static Loading in Tension or Tension and Compression.**

The tensile strength requirements are based on the above and are 540MPa for grade B500B and 575MPa for grade B500C. Permanent set ≤ 0.10mm @ 0.65 fy in tension and compression for EC2 and tension and optional compression.

- **TA1-C, Approval of Tension or Tension-Compression Couplers for Reinforcing Steel and Reinforcement Anchors for Nuclear Applications based on Sellafield Engineering Standard**

Only B500C grade reinforcement is permitted for nuclear applications, and the tensile strength requirement is based on the actual yield strength and is ≥ Re, act x 1.15 and ≤ Re, act x 1.35. UTS ≥ load required to produce 2% strain in reinforcing bar. The effective strain across the splice shall be ≤ strain in the control bar +40%.

Permanent set ≤ 0.10mm @ 0.65fy. As part of the assessment testing, some of the samples are subject to a cold soak (-7◦C) and low cycle fatigue (100 cycles, between 5% and 90% fy). For “Type A” couplers the mode of failure must be by bar break.

- **TA1-F for high cycle fatigue and low cycle loading and static loading applications in tension**

This document acknowledges that the UK Standards Committee rejected ISO15835:2018 during the public comment phase of its introduction. In view of the latter, approvals based on this document will not be applicable in the UK.

The introduction of this appendix is to facilitate a Technical Approval scheme incorporating a testing method for couplers in geographical areas where no national approval schemes currently exist.

Similar to the above the tensile strength requirements are based on the Ratio (tensile strength/yield strength) and yield strength.

The minimum UTS = Re x (Rm/Re) = 540MPa for grade B500B reinforcement and 575MPa for grade B500C.
Permanent set ≤ 0.10mm @ 0.60 fy.
Agt of the coupled joint should be at least 70% of the characteristic value of the reference bar as detailed in the relevant reinforcing bar standard.

Optional testing includes fatigue testing or low cycle reverse loading (Seismic)

Finally, and whilst outside the direct remit of the Technical Approval assessment, CARES also assesses how reinforcement fabricators produce and apply mechanical splices. It covers the use of equipment particular to the type of coupler in question, as well as the approval of individuals who operate this equipment. This certification is defined in Appendix 8 of its Steel for the Reinforcement of Concrete Scheme. (SRC08).

This is essential as the coupler performance is heavily reliant on its connection to the reinforcing steel.

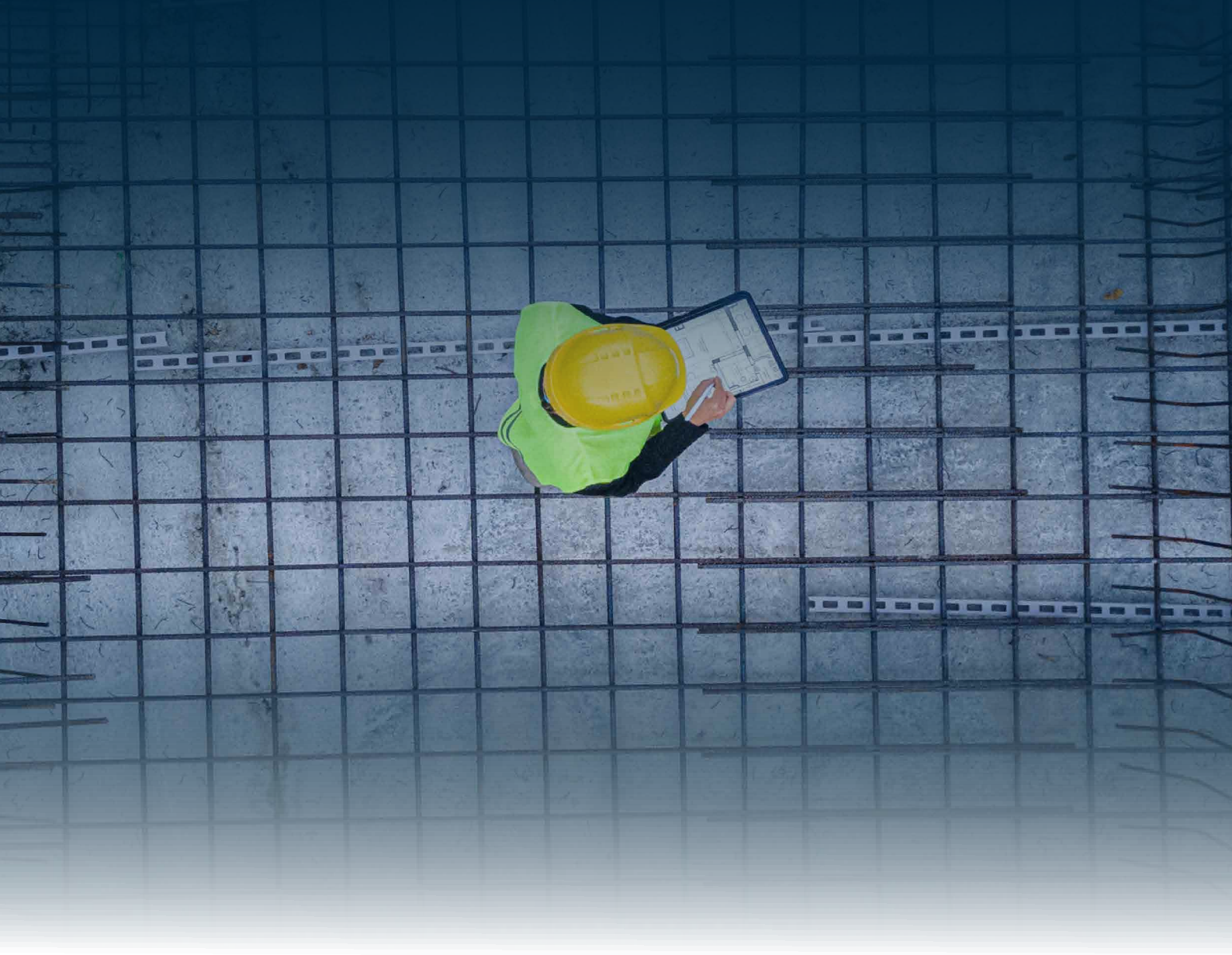
The CARES Scheme

Whilst being different in nature to the CARES Product Certification scheme, in that it does not deal with standardised products, the CARES Technical Approval Scheme uses many of the same principles as they are described in Part 1 of this Guide.

The Technical Approval procedure ensures the following:

- That the product, its specific application and the scope of certification are fully understood. This is subject to the scrutiny of CARES to ensure that it is within its area of defined expertise and that full support for assessment requirements are available
- The formulation of an assessment schedule by CARES and its agents, approved by experts selected from it's Board of Management and applied by its auditors and nominated test houses. All product assessment schedules include quality system requirements and include consideration of the design requirements both for the product itself and for its application.
- The formulation of a comprehensive testing programme giving full consideration to each of those performance characteristics considered important to meet its declared purpose.
- Surveillance sampling and subsequent independent of products, ensuring witnessing of the installation and confirmation that the procedures contained within the Technical Approval report are clear and remain valid (If applicable).
- An assessment of the quality management systems of producers both initially and periodically by CARES auditors' expert in the products and processes involved. This includes any sub-contracting production and testing used by the applicant manufacturer. This assessment is based on the requirements of ISO 9001:2015.
- An evaluation of the technical data of the manufacturer, as applied to the product, including those procedures for installation and technical assistance. Any amendment to the product production or design considered significant to its performance is assessed and further tests are initiated as required if CARES approval is to be maintained.
- On completion of testing an assessment report and Technical Approval report are produced, both of which detail the product scope and scope of use that has been assessed and approved. It is important to note that the technical approval report must be accompanied by a specific CARES Technical Approval certificate as proof that the approval is current and valid.
- The coupler producer is encouraged to assist with the preparation of the Technical Approval report ensuring the accuracy of the final document and clear and up to date information on use and installation of the couplers

Technical Approval Report



The Technical Approval Report is an important document for the end product user in that it defines the conditions of use of the product and therefore, in effect, its limitations. Important conditions in relation to the validity of the approval to be recognised include:

- The product design and specification remain unchanged from that assessed.
- The materials and method on manufacture remain unchanged.
- The product is installed and used as detailed in the report.

The Technical Approval Report must be read in conjunction with the relevant CARES Certificate of Approval.

All CARES Technical Approvals and CARES Certificate of Approvals are published in PDF format on CARES' website: **www.carescertification.com.**

CARES
Pembroke House
21 Pembroke Road
Sevenoaks
Kent TN13 1XR, U.K.

Tel: 00 44 1732 450000
e-mail: general@carescertification.com
website: www.carescertification.com

Your guide to specifying Learn how to procure CARES certified steel products

specification guide

To specify CARES certification that meets government and private sector quality assurance and responsible sourcing requirements use the text from the guide in your project specifications.

References

1. BS 4449: 2005+A3:2016 Steel for the reinforcement of concrete – Weldable reinforcing steel - Bar, coil and decoiled product - Specification.
2. BS 6744:2023 Stainless steel bars. Reinforcement of concrete. Requirements and test methods.
3. BS 8597:2015 Steels for the reinforcement of concrete. Reinforcement couplers. Requirements and test methods
4. ISO 15835-1&2:2018 Steels for the reinforcement of concrete — Reinforcement couplers for mechanical splices of bars (Part 1 – requirements, part 2 – test methods)
5. EN10080, Steel for the reinforcement of concrete - Weldable reinforcing steel – General
6. SS 560: 2016 + A1 2024 Singapore Standard: Specification for steel for the reinforcement of concrete - Weldable reinforcing steel - Bar, coil and decoiled product
7. CS 2: 2012 Hong Kong Standard: Steel for reinforcing Bars for the Reinforcement of Concrete
8. ISO 6935-2:2019 Steel for the reinforcement of concrete Part 2: Ribbed bars
9. ASTM A615 / 615M: Standard specification for Deformed and Plain Carbon Steel-Bars for Concrete Reinforcement
10. ASTM A706 / 706M: Standard specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
11. BS EN 1992-1-1: 2004 Eurocode 2 Design of concrete structures- Part 1-1: General rules for buildings.
12. BS 8110: Part 1:1997 “Structural use of concrete. Code of practice for design and construction”.
13. ISO 9001: 2015 “Quality Management Systems-Requirements”.
14. CARES Guide to Reinforcing Steel Part 1, The Product Certification Scheme for Steel for the Reinforcement of Concrete.
15. CARES Steel for the reinforcement of concrete scheme Appendix 8 Quality and operations assessment schedule for the application of mechanical couplers to reinforcing steel

Assured Steel Certification

Independent | Impartial | Trusted

general@carescertification.com
carescertification.com

Specify **CARES** certified products and download the **CARES Cloud App** to get instant authentication of the **CARES Certificate of Approval.**

CARES Cloud App