CARES Technical Approval Report TA1-A&B 5016

Issue 3

Boo Won BMS
Parallel Threaded Coupler

Assessment of the Boo Won BMS Parallel Threaded Coupler Product and Quality System for Production

TECHNICAL APPROVAL 5016

UKAS PRODUCT CERTIFICATION 0002

Product

Boo Won BMS
Type A, B & C
parallel threaded
mechanical couplers
for reinforcing steel

Product approval held by:

BOO WON B.M.S. Co., Ltd.
165, Chungjusandan 2-ro,
Chungju-City,
Chungbuk,
Korea

Tel: +82 43 856 6640
Fax: +82 43 856 6643

1 Product Summary

Boo Won BMS type A, B & C parallel threaded mechanical couplers in the size range 16mm - 40mm are for the mechanical connection of deformed high yield carbon steel bars for the reinforcement of concrete complying with the requirements of BS4449 Grade 460B and B500B as shown in tables 1 - 3.

1.1 Scope of Application

Boo Won BMS type A, B & C parallel threaded mechanical couplers in the size range 16mm - 40mm, have been evaluated for use as follows:

a) 16mm to 40mm BMS type A, B & C parallel threaded mechanical couplers for static EC2 and BS8110 applications in tension only in accordance with CARES Appendix TA1-B.

b) 16mm to 40mm BMS type B parallel threaded mechanical couplers in tension only in accordance with CARES Appendix TA1-A, Class D fatigue requirements using Grade B500B reinforcement.

1.2 Design Considerations

BS 8110 Clause *3.12.8.9 Laps and Joints* states "Connections transferring stress may be lapped, welded or joined with mechanical devices. They should be placed, if possible, away from points of high stress and should preferably be staggered". However, BS 8110 Clause 3.12.8.16.2 Bars in tension states "The only acceptable form of full-strength butt joint for a bar in tension comprises a mechanical coupler" satisfying specified slip and tensile strength criteria.

Eurocode 2, Clause 8.7 Laps and mechanical couplers 8.7.1 General (1)P "Forces are transmitted from one bar to another by:

- lapping of bars, with or without bends or hooks;
- welding;
- mechanical devices assuring load transfer in tension-compression or in compression only."

Clause 8.8 Additional rules for large diameter bars goes on to state that "Splitting forces are higher and dowel action is greater with the use of large diameter bars. Such bars should be anchored with mechanical devices."

The specified cover for fire resistance and durability should be provided to the coupler sleeve. All couplers have been designed with controlled mechanical properties to be compatible with reinforcing bars complying with reinforcement of the relevant Grade in accordance with BS4449.

1.3 Conclusion

It is the opinion of CARES that Boo Won BMS type A, B & C parallel threaded mechanical couplers are satisfactory for use within the limits stated in paragraph 1 when applied and used in accordance with the manufacturer's instructions and the requirements of this certificate.

Lee Brankley

L. Brankley
Chief Executive Officer
January 2020

CARES TECHNICAL APPROVAL 5016 UKAS PRODUCT CERTIFICATION 0002

2 Technical Specification

2.1 General

Boo Won BMS type A, B & C parallel threaded mechanical couplers are for joining deformed grade 460B and B500B reinforcing bars.

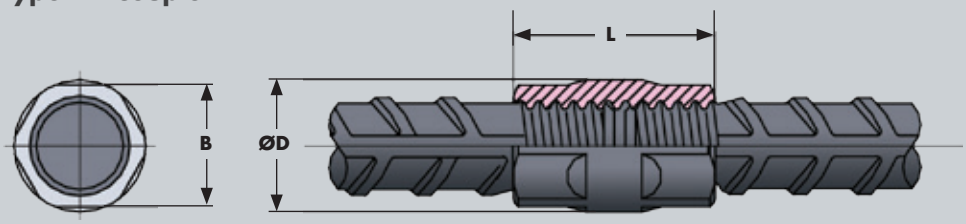
The Boo Won BMS parallel thread coupler comprises a steel sleeve that is internally threaded. The deformed high-yield carbon steel bars are cold formed into a round shape before roll threading to a pre determined size to suit the couplers.

Parallel thread couplers are available in three types:

2.2 BMS Type A

The standard coupler Type 'A' is designed for use where one of the bars to be joined can be rotated. It comprises a steel sleeve with an internal parallel thread. The deformed high-yield carbon steel bars are processed and matching external parallel threads half the length of the coupler is applied to both bar ends to facilitate the joining of the two bars. The coupler dimensions are given in Table 1.

Type 'A' Coupler



Size (mm)	Part No.	D (mm)	B (mm)	L (mm)	Weight (Kg)	TA1-B tension only
16	BMSFC16-10001	23	21	38	0.069	✓
20	BMSFC20-10001	31	29	46	0.169	✓
25	BMSFC25-10001	38	35	58	0.296	✓
32	BMSFC32-10001	48	45	70	0.572	✓
40	BMSFC40-10001	60	56	86	1.120	✓

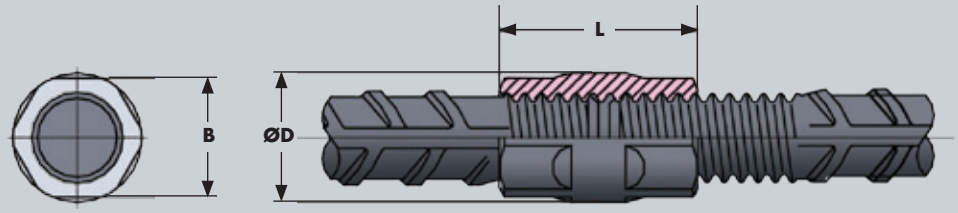
Table 1

2.3 BMS Type B

The 'Easy Fixing' Type 'B' coupler is designed for use where one of the bars to be joined can be rotated. It comprises a steel sleeve with an internal parallel thread. The deformed high-yield carbon steel bars are processed and matching external parallel thread is applied to facilitate the joining of the two bars. One side is threaded with a standard length thread (half the length of the coupler) and the other bar is threaded with an extended thread (the full length of the coupler). The coupler is screwed fully on to the extended thread allowing assembly by simply butting up the two bar ends and rotating the coupler from the extended thread onto the standard length thread.

This coupler type is typically used in applications of large size long bars it may be difficult to rotate them due to their large size, weight or length. Final tightening is by wrench, spanner, etc. The coupler dimensions are given in Table 2.

Type 'B' Coupler



Size (mm)	Part No.	D (mm)	B (mm)	L (mm)	Weight (Kg)	TA1-B tension only	TA1-A grade B500B only class D fatigue
16	BMSFC16-10001	23	21	38	0.069	✓	✓
20	BMSFC20-10001	31	29	46	0.169	✓	✓
25	BMSFC25-10001	38	35	58	0.296	✓	✓
32	BMSFC32-10001	48	45	70	0.572	✓	✓
40	BMSFC40-10001	60	56	86	1.120	✓	✓

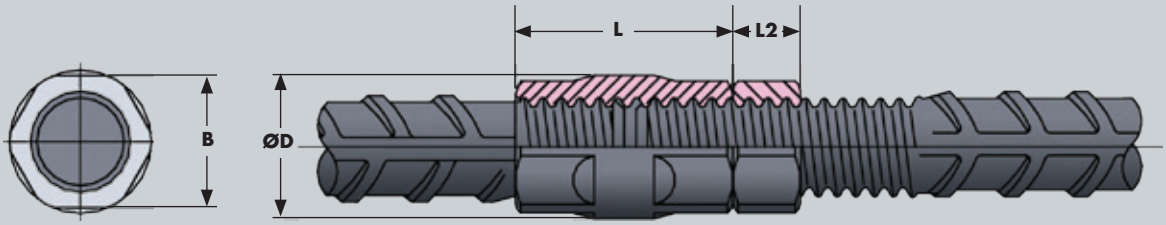
Table 2

2.4 BMS Type C

The coupler is designed for use where neither bar is free to turn i.e. with bent or cranked bars or in prefabricated cages. It comprises a steel sleeve with an internal parallel thread. The deformed high-yield carbon steel bars are processed and matching external parallel thread is applied to facilitate the joining of the two bars. One side is threaded with a standard length thread (half the length of the coupler) and the other bar is threaded with an extended thread (the full length of the coupler + additional lock nut). The lock nut and coupler are screwed fully on to the extended thread. Assembly is completed by butting up the two bar ends and rotating the coupler from the extended thread onto the standard length thread and final locking up of the assembly with the lock nut.

Used for construction of prefabricated cages or fixing hooked/cranked bars. The coupler dimensions are given in Table 3.

Type 'C' Coupler



Size (mm)	Part No.	D (mm)	B (mm)	L (mm)	L2 (mm)	Weight (Kg)	TA1-B tension only
16	BMSFC16-10001	23	21	38	10	0.069	✓
20	BMSFC20-10001	31	29	46	12	0.169	✓
25	BMSFC25-10001	38	35	58	18	0.296	✓
32	BMSFC32-10001	48	45	70	18	0.572	✓
40	BMSFC40-10001	60	56	86	25	1.120	✓

Table 3

3 Product Performance and Characteristics

Full destructive tests have been carried out to demonstrate compliance with the performance requirements defined in CARES Appendix TA1-A and TA1-B when used with reinforcing bars to BS4449 Grade 460B and B500B as show in tables 1 - 3:

CARES APPENDIX TA1-A requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension with BS4449 grade B500B reinforcement (as defined in tables 1, 2 and 3).
- 99% characteristic tensile strength is greater than 540MPa with Grade B500B reinforcement.
- D Class Fatigue requirements (BMS Type B only).

CARES APPENDIX TA1-B requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension.
- 99% characteristic tensile strength is greater than 540MPa

4 Installation

The bar to be spliced does not need to be specially saw cut and can be normally sheared to length. No additional length allowance is necessary for the bar end preparation. The bar is inserted into the swaging machine and rotated whilst the swaging dies come together and cold form a controlled round shape. It is then faced and thread rolled to suit the appropriate coupler. Bar end preparation is carried out by suitably trained and qualified personnel. The qualification and certification of operatives is issued respectively following detailed training and assessment by Boo Won BMS Engineers.

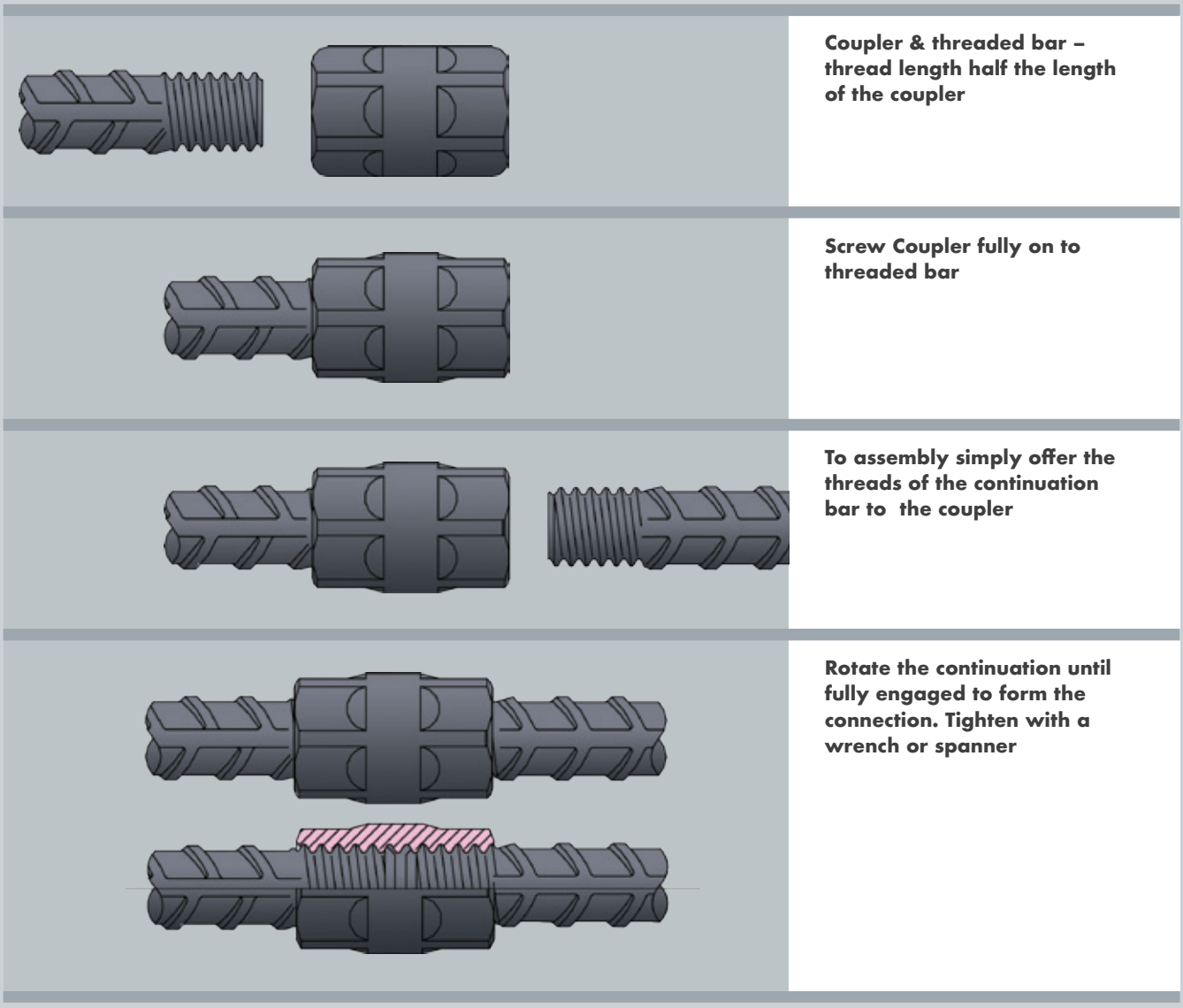
4.1 Standard Ranges

Couplers are normally supplied fitted to a reinforcing bar which has been threaded to suit the coupler.

After removal of plastic protective caps in the coupler and on bar end; offer the continuation bar to the coupler and rotate until the bar threads engage and continue to screw the bar into the coupler until fully engaged. To ensure correct installation, tighten and lock with a pipe wrench, spanner or chain wrench to complete the assembly. The joint is now complete. The installation procedures can be found in the Operating and Maintenance Manuals. Appendices Types A & B and apply to the Standard Coupler.

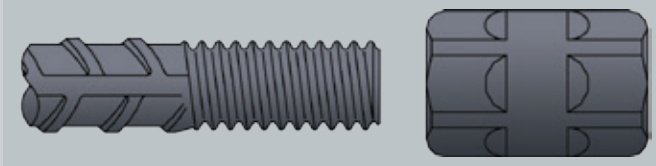
A Type Coupler

Installation instructions

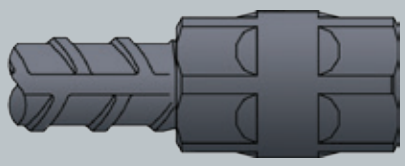


B Type Coupler

Installation instructions

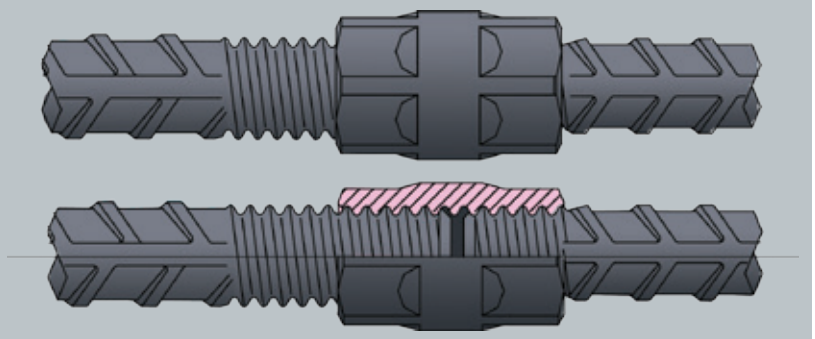


Coupler & bar end having extended thread the full length of the coupler



The coupler is fully screwed on until bar end and coupler are flush

To assemble the bar ends are placed against each other and the coupler rotated from the extended thread onto the short thread to form the connection



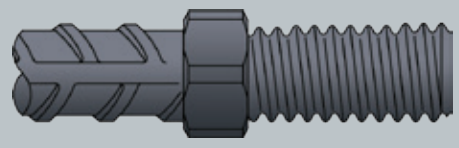
Rotate either bar usually no more than half a turn to complete the assembly. Tighten with a wrench or spanner

4.2 Positional Ranges

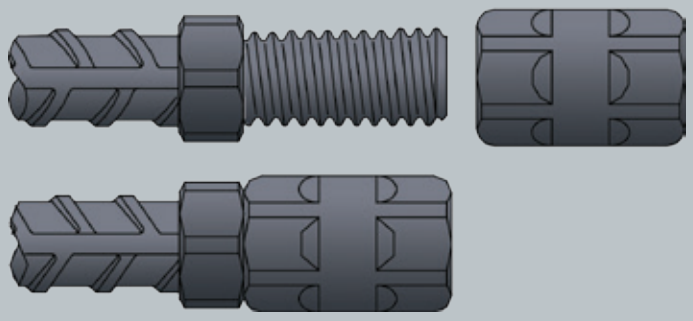
Positional couplers are generally supplied fitted to reinforcing bar. The female section and bar are normally cast proud of the concrete or the bar end can be cast in the concrete with an additional pocket former attached to allow space for the coupler to locate on the bar threads. The installation procedures can be found in the Operating and Maintenance Manuals, Appendices C Type apply to the Positional Coupler.

C Type Coupler

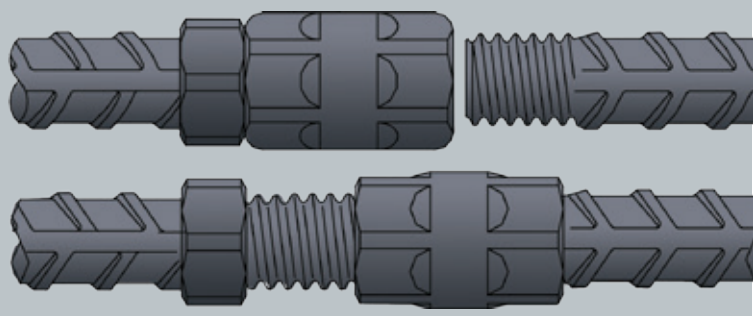
Installation instructions



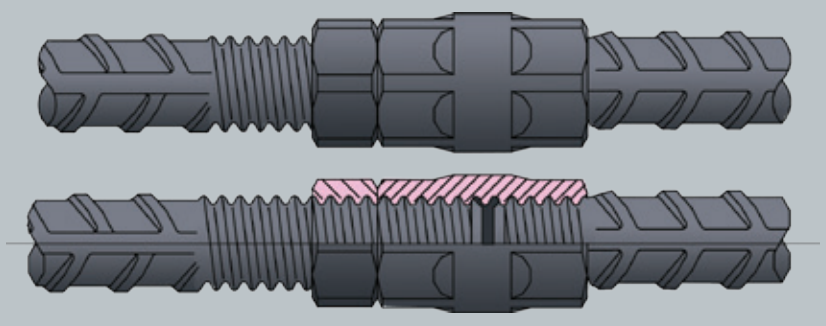
Bar end with extended thread & Lock-nut shown screwed on



The coupler is fully screwed on until bar end and coupler are flush



To assemble; first the bar ends are placed against each other and the coupler rotated from the extended thread onto the short thread



Wrench tighten the coupler onto the short bar and rotate the lock nut against the coupler and tighten with wrench

5 Safety Considerations

Boo Won BMS parallel thread couplers are generally supplied in robust cardboard cartons. Containers weighing up to 25kg may be handled manually with care. Heavier cases require the use of mechanical handling equipment. Protective gloves should be worn when installing the couplers.

6 Product Testing and Evaluation

Boo Won BMS type A, B & C parallel threaded mechanical couplers have been tested to satisfy the requirements of CARES Appendix TA1-A and TA1-B for Couplers with reinforcing bars to BS4449 Grade 460B and B500B. The testing comprised the following elements:

- Tensile Strength
- Permanent Deformation
- Resistance to fatigue

The products are subject to a programme of periodic testing to ensure that they remain within the performance limits of this technical approval.

7 Quality Assurance

Boo Won BMS type A, B & C parallel threaded mechanical couplers are produced under an ISO9001 quality management system certified by CARES. The quality management system scheme monitors the production of the couplers and ensures that materials and geometry remain within the limits of this technical approval.

8 Building Regulations

8.1 The Building Regulations (England and Wales)

Structure, Approved Document A

Boo Won BMS type A, B & C parallel threaded mechanical couplers, when used in EC2 based designs using the data contained within this technical approval, satisfy the relevant requirements of The Building Regulations (England and Wales), Approved Document A.

Materials and Workmanship, Approved Document

This technical approval gives assurance that the Boo Won BMS type A, B & C parallel threaded mechanical couplers comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that Boo Won BMS type A, B & C parallel threaded mechanical couplers comply with the material requirements of EC2 by virtue of regulation *23, Deemed to satisfy provisions regarding the fitness of materials and workmanship.*

8.3 The Building Standards (Scotland)

Fitness of Materials

This technical approval gives assurance that Boo Won BMS type A, B & C parallel threaded mechanical couplers comply with the material requirements of EC2 by virtue of *Clause 0.8.*

Structure

Boo Won BMS type A, B & C parallel threaded mechanical couplers, when used in EC2 based designs using the data contained within this technical approval, satisfy the requirements of *The Building Standards (Scotland) Clause 1.*

9 References

- BS 4449: 2005: Steel for the reinforcement of concrete - Weldable reinforcing steel - Bar, coil and decoiled product - Specification.
- BS8110: Part 1: 1997: Structural Use of Concrete, Code of Practice for Design and Construction.
- BS EN 1992-1-1: 2004 Eurocode 2 Design of concrete structures - General rules for buildings.
- BS EN ISO 9001: Quality management systems - Requirements.
- CARES Appendix TA1-B; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel and Reinforcement Anchors For BS8110 and EN1992-1-1 Applications for Static Loading in Tension or Tension and Compression.
- CARES Appendix TA1-A; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel for use in Structures and Structural elements Designed in accordance with the Fatigue Requirements of Structural Eurocodes.

10 Conditions

1. The quality of the materials and method of manufacture have been examined by CARES and found to be satisfactory. This Technical Approval will remain valid provided that:

   a. The product design and specification are unchanged.
   b. The materials, method of manufacture and location are unchanged.
   c. The manufacturer complies with CARES regulations for Technical Approvals.
   d. The manufacturer holds a valid CARES Certificate of Product Assessment.
   e. The product is installed and used as described in this report.

2. CARES make no representation as to the presence or absence of patent rights subsisting in the product and/or the legal right of Boo Won to market the product.

3. Any references to standards, codes or legislation are those which are in force at the date of this certificate.

4. Any recommendations relating to the safe use of this product are the minimum standards required when the product is used. These requirements do not purport to satisfy the requirements of the Health and Safety at Work etc Act 1974 or any other relevant safety legislation.

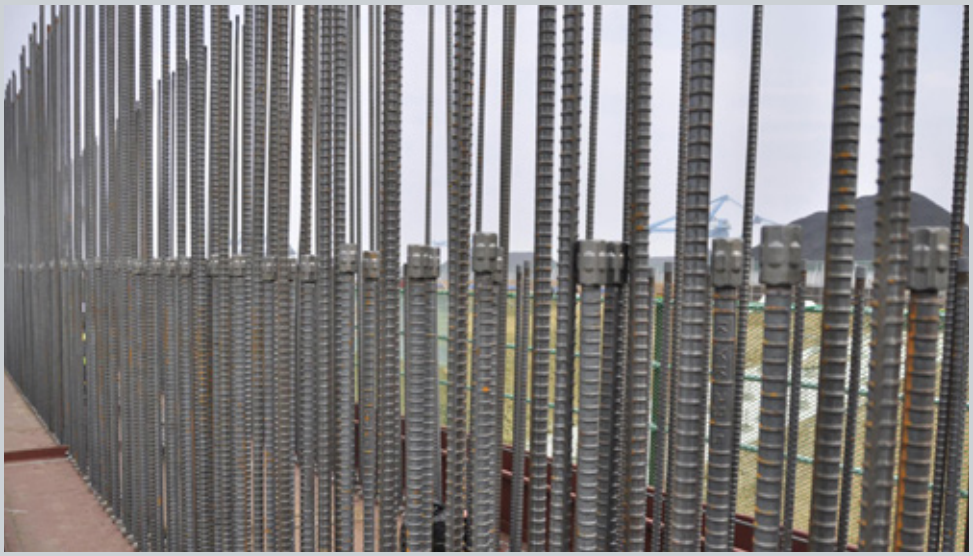
5. CARES does not accept any responsibility for any loss or injury arising as a direct or indirect result of the use of this product.

6. This Technical Approval Report should be read in conjunction with CARES Certificate of Product Assessment No 5016. Confirmation that this technical approval is current can be obtained from UK CARES.

Boo Won Typical Coupler Applications

Construction of prefabricated rebar cage

LNG Tank



Core Wall

TECHNICAL APPROVAL 5016

UKAS PRODUCT CERTIFICATION 0002

UK CARES
Pembroke House
21 Pembroke Road
Sevenoaks
Kent TN13 1XR

Phone: +44(0)1732 450000
E-mail: general@ukcares.com
URL: www.ukcares.com

Independent Product Assessments for the Construction Industry

7.1.22