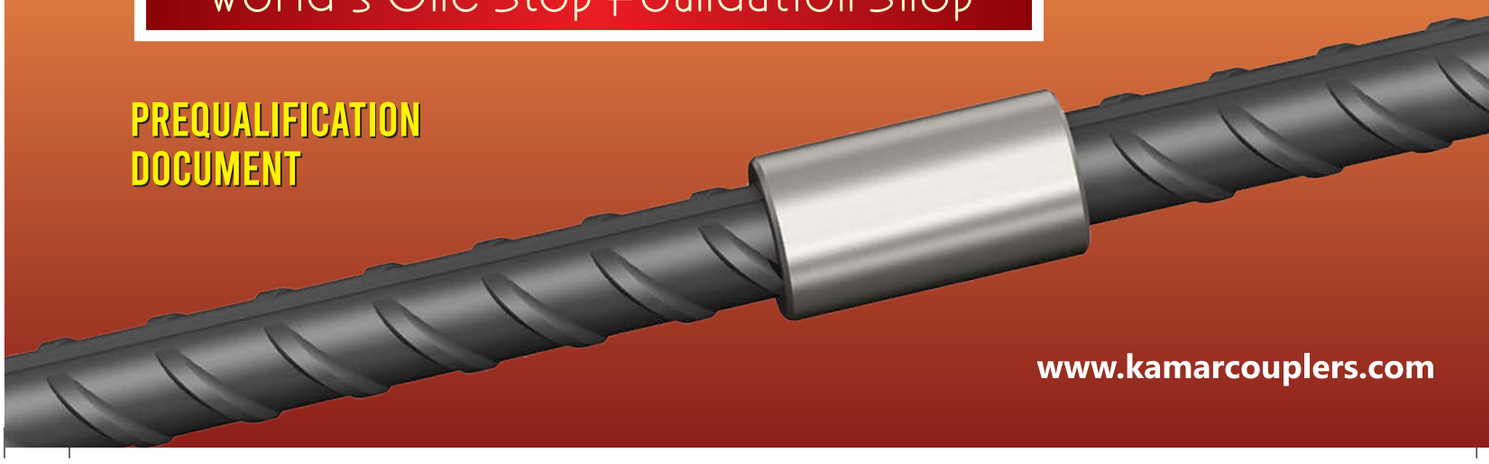
KAMAR

REINFORCING BAR COUPLER

FOR THE CONSTRUCTION INDUSTRY

KAMAR
INFRASTRUCTURE PVT. LTD.
World's One Stop Foundation Shop

PREQUALIFICATION DOCUMENT



www.kamarcouplers.com

Introduction

Established in 2005, as a sole proprietorship firm in Taloja, Mumbai, Kamar Infrastructure Pvt. Ltd. has created a niche of its own in the market. Owing to the vast industrial expertise, we have become highly proficient in our domain. We have come up as the most trusted manufacturer, exporter and supplier of dimensionally precise and functionally efficient range of drilling tools and other accessory equipment. With customization facility available, we have been able to satisfy our clients. Complying with international quality standards, we make use of high quality raw material and advanced technology in fabrication of our range.

KAMAR highly focuses on international co-operation and communication. Till present, our products have been exported to many different countries and regions such as Dubai, Singapore, Malaysia, Bangladesh, Iraq, Saudi Arabia, South Africa, Sri lanka, USA, Australia, etc.

Meanwhile, the brand name recognition is enhancing. In order to offer better local service, KAMAR established a branch in MALAYSIA, Sri lanka, USA. We have experienced technical team and sales team there. Furthermore, KAMAR founded Dealers in Bangladesh, South Africa , Australia, UAE & Saudi Arabia, Turkey, etc.

With the enlargement of company scale and the increasing of international business, KAMAR pays more and more attention to the international cooperation and communication. Experience quality with understanding of our client`s needs without forgetting to be competitive has determined our success.

Index

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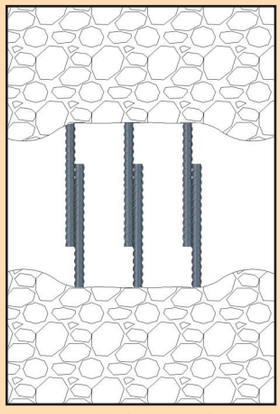
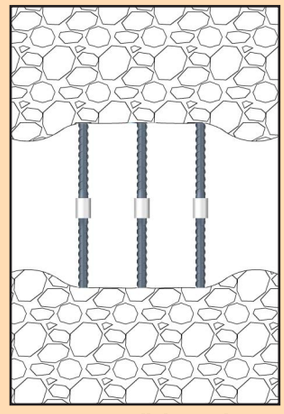
Kamar Infrastructure Pvt. Ltd. caters to the need of mechanical splicing system technology for the construction industry. Our solutions offer connection of rebars with mechanical couplers over tradition lap splicing methods for bars ranging from 16mm to 40mm.

KAMAR Couplers over traditional methods

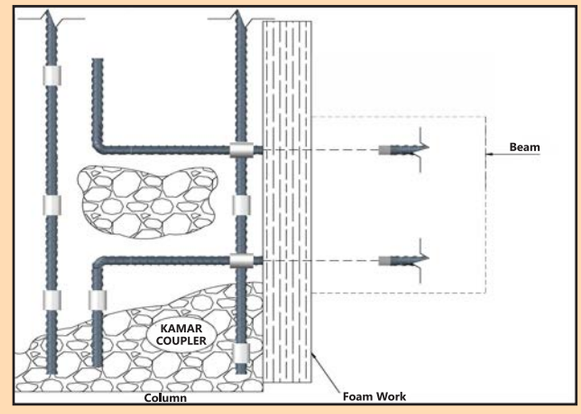
- Reducing rebar congestion in reinforced columns an improving flow of concrete.
- Eliminating cavities of honeycomb in concrete element.
- Insufficient spacing for lap splicing of rebars.
- Speed in construction of projects and reducing size of concrete section and pillars.
- High tensile and compression capacity of reinforced structure maintaining greater structural integrity where design structure demand high tensile load capabilities.
- Connecting precast members with full tension splice.
- Avoid use of expensive starter rebar box and protecting expensive formwork from being damaged by starter bars.
- Reduce steel consumption, labor cost and accelerating job schedule with easier coupling.
- More reliable than lap splicing as mechanical splices doesn't depend on concrete for load transfer.



Traditional Lap Spilcing



Kamar Parallel Couplers



Quality Assurance

The quality assurance system of KAMAR COUPLER ensure solutions are delivered through processes which are assessed, approved & certified to ISO 9001:2015. Our products are designed manufactured, inspected and tested to ensure that specification and industry standard are met and no compromise are made. Products manufactured comply to cost of the codes of practice IS 16172- 2014, Bureau of Indian Standards Act, 2014.

Dedicated work force and internal audit, guaranteed quality systems are implemented across all stages, from incoming raw materials to final test and delivery. Full traceability of raw material is ensured as our products are stamped with lot no. tracing it back to the original lot of steel. Documentation of the lot are recorded and maintained with us which can be produced when requested.

Benefits :

- Construction cycle time reduced.
- Rebar wastage is reduced.
- Easy installation and requires no skilled labor.
- Threading cycle time is fast.
- Eliminating tedious lap calculation.
- One coupler for standard and positional splicing requirement.

Features:

- 100% preservation of rebar cross section area.
- Standard Metric thread.
- Ultimate tensile strength complying to IS 1786 standards.
- Superior to parent rebar tensile strength.
- Fast production cycle.

I) BASIC USE :

The rebar end preparation for Standard coupler is suitable to make Mechanical Splices with reinforcing bars in diameters 16 to 40.

Mechanical connections are a quicker, safer and more convenient alternative to lap splicing and field butt welding.

Typical applications include monolithic structures, splicing of reinforcement bars in columns and beams, diaphragm wall cages ,core walls, top-down construction temporary openings and obstructions,etc.

Typical applications include development of reinforcement, column-beam knee joints, column heads, pile-feet,cantilevered members, corbels,etc.

Kamar Couplers are manufactured from **EN8D OR C45** steel grade or equivalent.

II) APPLICABLE STANDARDS GUIDES & CODES :

KAMAR couplers comply with all major Building codes and standards.Splicing of reinforcing bars is governed by:

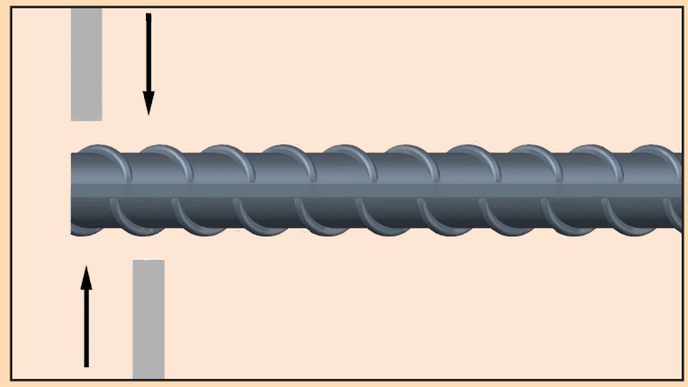
The Bureau of Indian Standards Act, in its standard IS16172:2014.

III) SAFTEY FACTORS :

On a design point of view, Kamar mechanical connections have been computed to far surpass all the requirements of the standards & codes cited above. The Kamar splicing system achieves full strength of reinforcement bars grade 500 & 550D in the most demanding definition of "full strength" which is to prove an ultimate tensile strength higher than the actual ultimate tensile strength of the bar **(as per IS1786).**

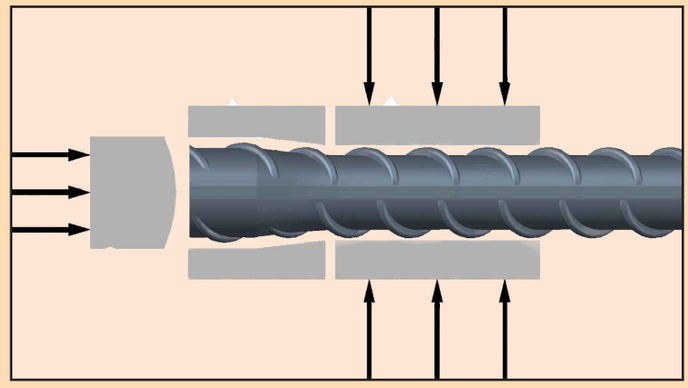
1. Cutting / Shearing of Rebars :

The Bars with improper ends like bent, too much heated, improper manufactured ends etc., are cut with Band saw machine. This is done in order to achieve a approximate Flat face for further forging of the Rebar.



2. Forging of Rebars :

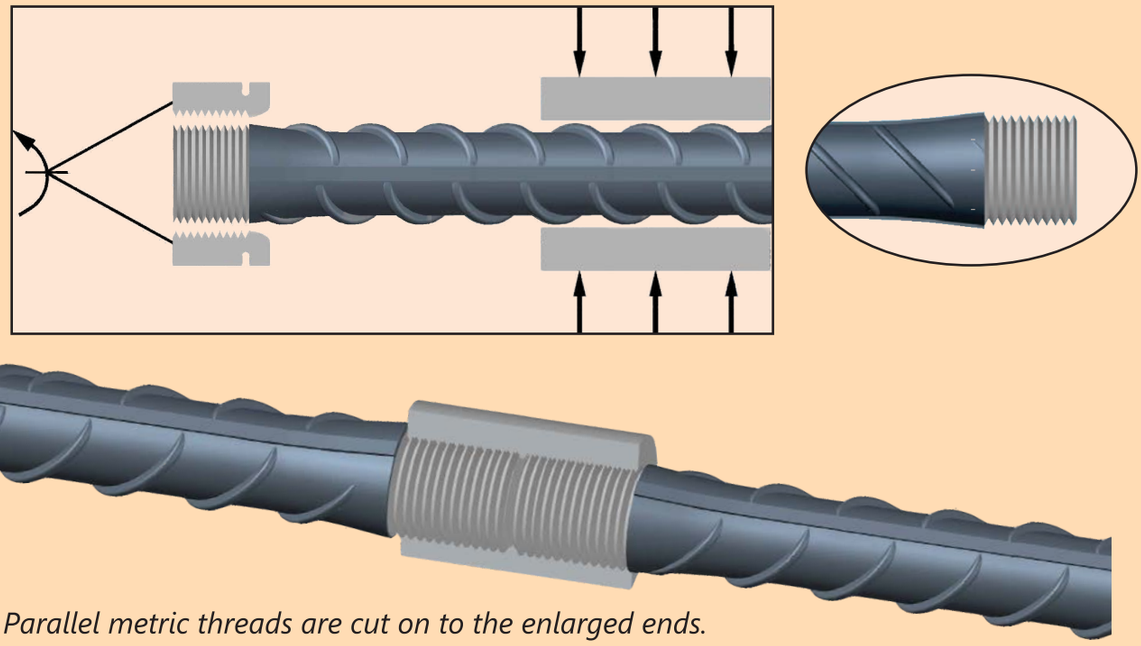
The Cut bars then cold forged at the ends to increase their diameter. The process is described as Upsetting of the bar end. The Diameter of the bar is increased to a defined value by applying pressure with the help of a Hydraulic Ram and a Gripping Mod. The percentage increase in the diameter, the new diameter & the pressure applied is as given in the table below.



Sr. No.	Rebar Dia	Forged Dia	Approx. Percentage Increase	Approx. Pressure Applied in BAR
1	12 mm	14 mm	17%	60 - 70
2	16 mm	20 mm	25%	80 - 90
3	20 mm	24 mm	20%	100 - 120
4	25 mm	29 mm	16%	150 - 170
5	28 mm	33 mm	18%	220 - 230
6	32 mm	36 mm	13%	250 - 270
7	36 mm	40 mm	11%	280 - 300
8	40 mm	45 mm	12%	300 - 320

3. Threading of Rebars :

The Forged end of the bar are then threaded with a threading machine, the machine consists of 4 chasers, which generate the needed thread profile on the bar end. The threads are then checked with a GO Gauge & NO-GO Gauge. Depending on site conditions, the threaded ends are stored for furthersite installation.



Parallel metric threads are cut on to the enlarged ends.

KA SERIES THREAD (Class H)									
SIZE		12	16	20	25	28	32	36	40
THREAD PITCH		2.0	2.5	3	3.5	3.5	4	4	4.5
HALF THREAD	NO. OF THREADS	7	8	8	9	9	9	10	10
	LENGTH OF THREADS (mm)	14	20	24	30	33	36	40	45
FULL THREAD	NO. OF THREADS	12	15	15	16	18	17	19	19
	LENGTH OF THREADS (mm)	24	37	45	56	63	68	76	85

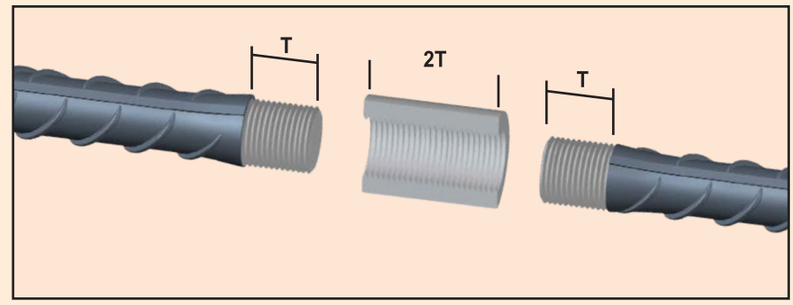
SS SERIES THREAD (Class L)									
SIZE		12	16	20	25	28	32	36	40
THREAD PITCH		2.0	2.0	2.5	3	3	3	3.5	3.5
HALF THREAD	NO. OF THREADS	6	6	8	8	9	11	10	12
	LENGTH OF THREADS (mm)	14	16	20	25	28	32	36	40
FULL THREAD	NO. OF THREADS	11	13	15	16	18	20	20	22
	LENGTH OF THREADS (mm)	22	30	37	48	54	60	70	77

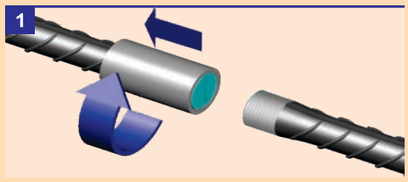
Note : ±1 nos. OR ±2mm of tolerance.

4. Installation :

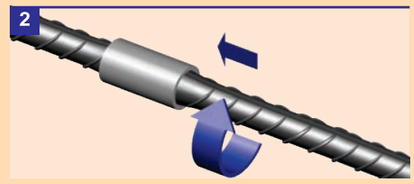
Type A

The Coupler Type A system utilizes internally threaded couplers with a single right hand thread and is suitable for applications where the continuation bar can be rotated. The ends of the bars are upset and threaded for half the length of the coupler.

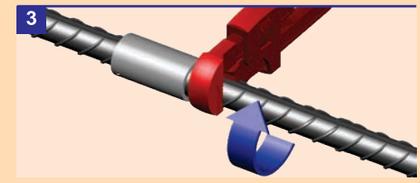




Screw the coupler to the rear of the thread on the fixed bar and lock tight. The bar end should be central within the coupler.



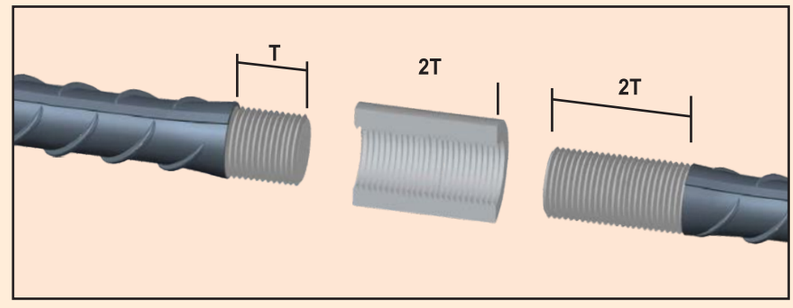
Remove the plastic cap from the coupler. Position and rotate the continuation bar in the coupler.

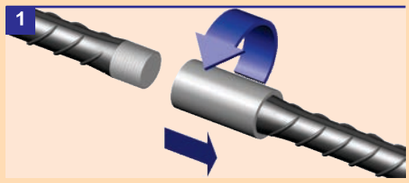


Tighten the joint using a wrench on the continuation bar. After tightening there should be no more than 2-4mm of thread exposed, depending on the diameter of the rebar.

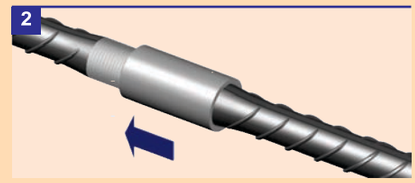
Type B

The Coupler Type B uses the same coupler as the Type A system, but one bar is threaded for a full coupler length. It is used for applications where it is difficult but not impossible to rotate the continuation bar.

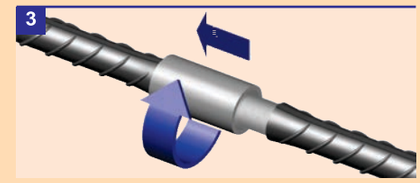




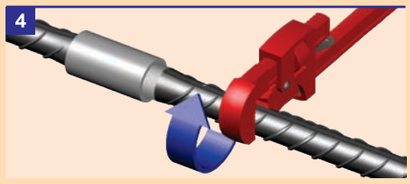
Screw the coupler to the rear of the thread onthe continuation bar.



Position the continuation bar with the coupler against the end of the first bar.

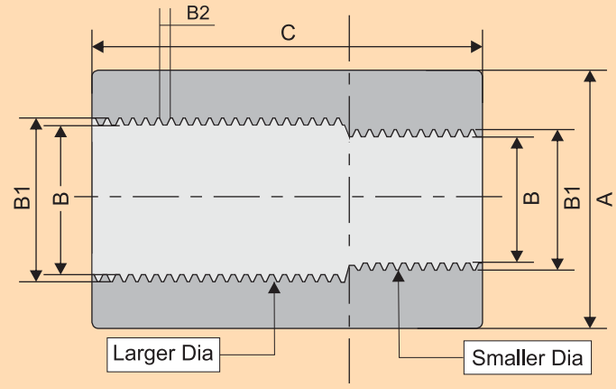


Rotate the coupler from the continuation bar to engage against the rear of the thread on the opposing bar and lock tight.

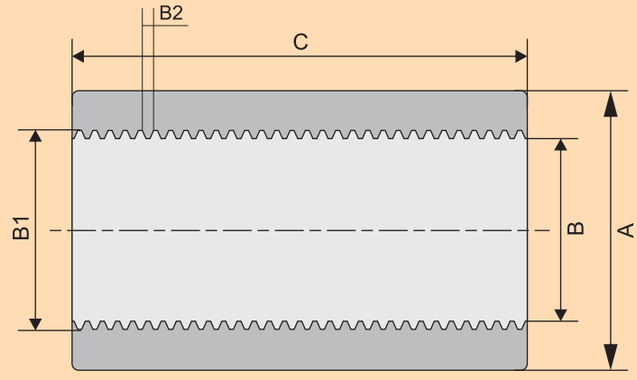


Using a wrench, rotate the continuation bar to lock the two bar ends against each other within the coupler. After tightening, the length of exposed thread should be no more than half of the coupler length plus 2-4mm depending on the diameter of the rebar.

Parallel Threaded Reducing Couplers



In situations where 2 different sized bars are being connected, the Reducer will enable the connection to be done in a timely manner. The Reducer Coupler range uses the same threading principles as the Standard, but in this case, extended threads are only possible on the smaller diameter bar.



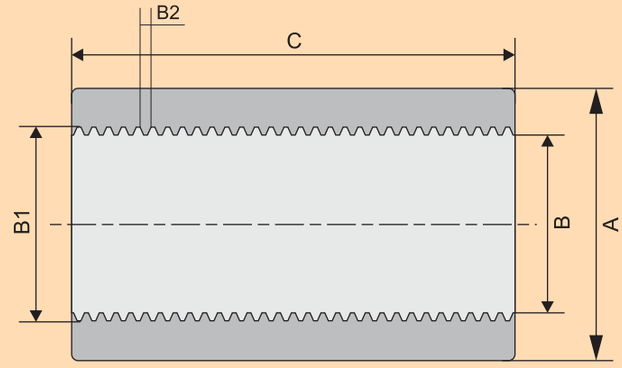
KA SERIES (Class H Couplers)										
REBAR DIA			**12**	**16**	**20**	**25**	**28**	**32**	**36**	**40**
MATERIAL DIA	**A**	OD	25	32	36	45	50	53	60	65
DRILL DIA	**B**	ID	12	17.5	21	26.5	29.5	32	38	40.5
LENGTH	**C**	LENGTH	27	36	45	56	63	72	81	90
THREAD SIZE	**B1**		M14	M20	M24	M30	M33	M36	M42	M45
THREAD PITCH	**B2**		2.0	2.5	3	3	3.5	4	4	4.5
WEIGHT		Kgs.	0.092	0.131	0.237	0.455	0.555	0.792	1.077	1.430

SS SERIES (Class L Couplers)										
REBAR DIA			**12**	**16**	**20**	**25**	**28**	**32**	**36**	**40**
MATERIAL DIA	**A**	OD	22	28	32	40	45	50	58	63
DRILL DIA	**B**	ID	12	15.5	21.5	26	30	33	35.5	41.5
LENGTH	**C**	LENGTH	24	32	40	50	56	64	72	80
THREAD SIZE	**B1**		M14	M18	M24	M29	M33	M36	M40	M45
THREAD PITCH	**B2**		2.0	2.0	2.5	3	3	3	3.5	3.5
WEIGHT		Kgs.	0.066	0.083	0.137	0.285	0.388	0.557	0.931	1.104

RL Series Coupler

The RL Series is an alternative threading technology where the thread is rolled as opposed to being cut. It can provide exceptional performance in high cycle elastic fatigue applications, whilst maintaining values in excess of the design strengths of the bar. Characteristic strength of the rebar.

The RL system, uses a rolled parallel thread. It is a full strength system, capable of exceeding the nominal ultimate



The RL System, uses the RL coupler and a radially pressed & rolled parallel thread. It is a bar break system, capable of exceeding the actual ultimate characteristic strength of the bar. The bar is radially pressed prior to skimming and rolling to provide a bar break system with excellent fatigue properties that is capable of resisting an equivalent bar stress of more than 700MPa and the coupler material provides excellent impact toughness.

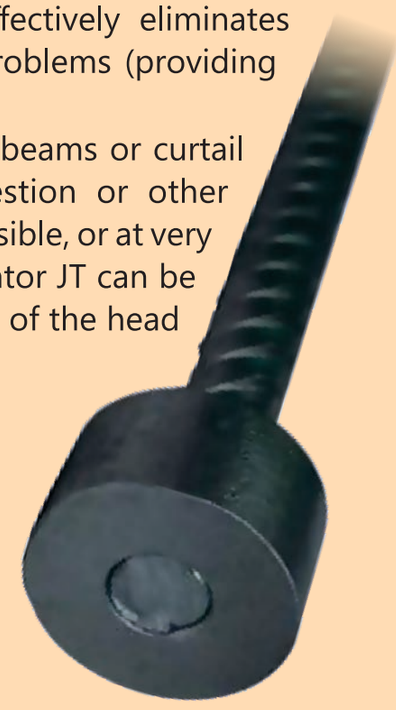
The process to create the bar end for RL is as follows:

- Saw cut the end of the bar if the bar is uneven
- Skim the ribs to cut away the excess material and leave a smooth surface
- Roll a metric thread on the end of the reinforcing bar

RL SERIES									
REBAR DIA			**16**	**20**	**25**	**28**	**32**	**36**	**40**
MATERIAL DIA	**A**	OD	28	32	40	45	50	58	63
DRILL DIA	**B**	ID	14.5	18.5	23	26	30	33.5	37.5
LENGTH	**C**	LENGTH	40	50	62	70	80	90	100
THREAD SIZE	**B1**		M17	M21	M26	M29	M33	M37	M41
THREAD PITCH	**B2**		2.5	2.5	3	3	3	3.5	3.5
WEIGHT		Kgs.	0.141	0.209	0.409	0.574	0.789	1.228	1.348

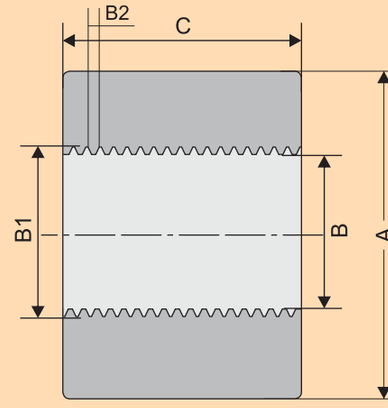
The KT Series provides anchorage solution which effectively eliminates hooked bar preparation, placement, and congestion problems (providing concrete cone capacity is not critical).

Whether you are trying to tie pile cages In to capping beams or curtail reinforcing bars at the end of beams, heavy congestion or other constraints can often mean that bending of bars Is Impossible, or at very least, incredibly time consuming. Therefore, the Terminator JT can be used to fully develop the bar immediately at the surface of the head (providing concrete cone Capacity Is not critical).

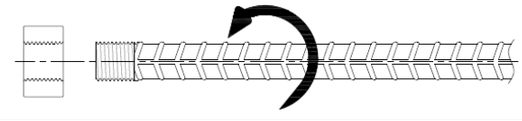
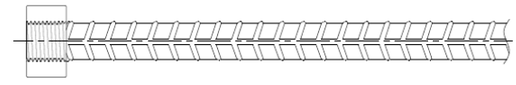


Dimensions

KT SERIES									
REBAR DIA			**16**	**20**	**25**	**28**	**32**	**36**	**40**
MATERIAL DIA	**A**	OD	36	40	50	60	65	75	80
DRILL DIA	**B**	ID	17.5	21	26.5	29.5	32	38	40.5
LENGTH	**C**	LENGTH	20	24	30	33	35	42	45
THREAD SIZE	**B1**		M20	M24	M30	M33	M36	M42	M45
THREAD PITCH	**B2**		2.5	3	3.5	3.5	4	4	4.5
WEIGHT		Kgs.	0.122	0.171	0.332	0.554	0.682	1.09	1.318



Installation Guidelines

Steps	Instruction	Pictures
1	The couplers are to be hand tighten & **IN CASE OF SLIGHT RUST, A PIPE WRENCH COULD BE USED TO TIGHTEN.**	
2	Engaged onto extended thread end and forwarded until the end of the thread.	
3	Make sure the thread is engaged firmly to the coupler terminator and it is ready for use.	

Splice Bars In Situ - Crimp Coupler

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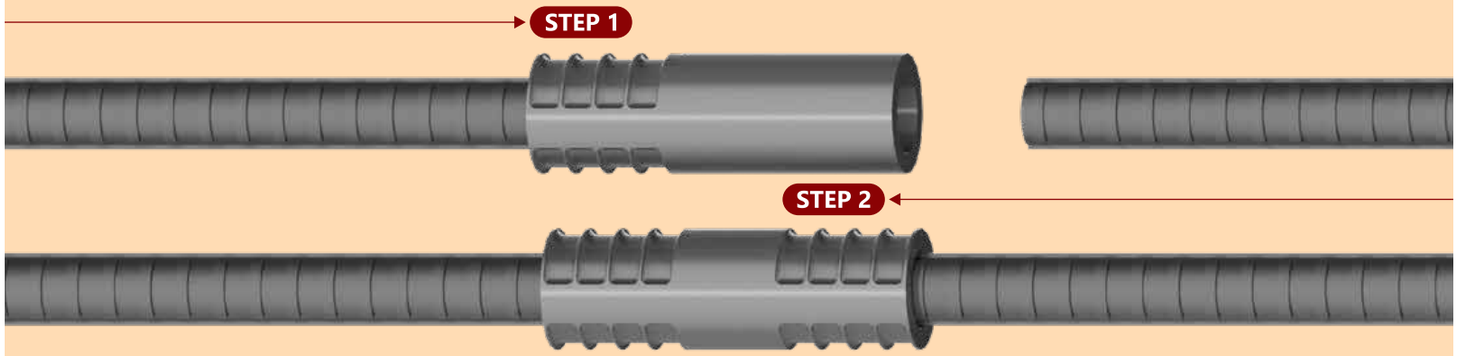

Product Features

The KHC is a portable system designed to splice bars in situ. It is a simple and proven method to splice bars that did not have their end shop-prepared.

The KHC sleeve is swaged onto the bar ends by an hydraulic tool powered by a separate power unit. The resulting connection guarantees at least 100% of nominal tensile strength on reinforcing bars grade 500 Mpa.

KHC splices are butt-to-butt splices that are suitable to both tension and compression applications.

Benefits

For repair or retrofit works.

- Fits any cold shear cut bar end.
- No reduction of the cross-section area of the bar.
- All sleeves are individually marked allowing full traceability of material origin and manufacturing batch.
- Manufactured under quality assurance ISO 9001.

Dimensions

Approximate dimensions in millimeters

HC SERIES									
REBAR DIA			**16**	**20**	**25**	**28**	**32**	**36**	**40**
MATERIAL DIA	**A**	OD	32	38	45	53	57	63	70
DRILL DIA	**B**	ID	20	24	30	34	38	43	48
LENGTH	**C**	LENGTH	100	100	160	170	180	180	250
WEIGHT		Kgs.	0.385	0.535	1.11	1.733	2.003	2.353	4.001

Note: The information in this catalogue is considered up to date at the time of publication. We reserve the right to make technical and design changes at any time.

Kamar Infrastructure shall not accept liability for the accuracy of the information in this publication or for any printing errors.

Splice Bars In Situ - Crimp Coupler

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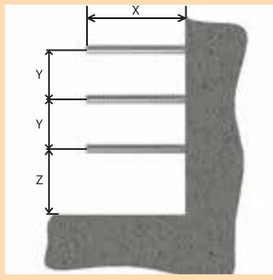
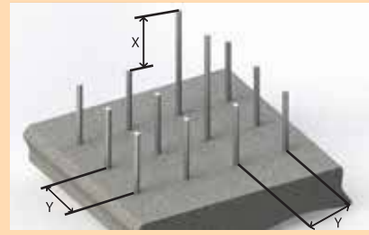
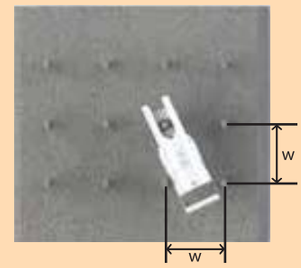


Start by swaging the bar that is closer to the floor or adjacent wall.



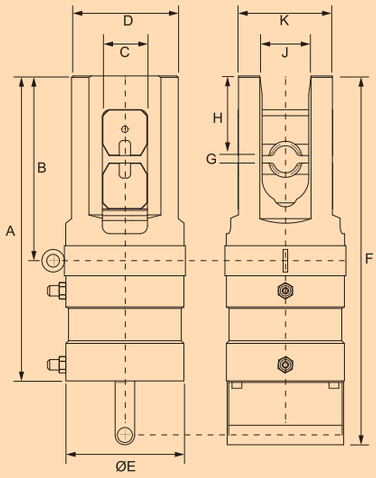
Clustered bars can be spliced if they are staggered and if the central ones are the longest.



If clustered bars are not staggered, the required spacing is wider so that the swaging tool can reach the central bars.

Bar Diameter (mm)	12	16	20	22	25	28	32	36	40
Hydraulic Tool Model	KCM-32							KCM-40	
X	150	150	150	170	170	160	160	190	220
Y	95	95	95	100	100	110	110	120	120
Z	90	90	90	90	90	90	90	100	100
W	230	230	230	230	230	230	230	250	250

Hydraulic Tool Dimensions



Model	A	B	C	D	E	F	G	H	J	K
KCM-32	405	250	60	142	157	490	32	106	65	125
KCM-40	440	282	60	148	182	526	37	102	72	145

Diameter (mm)

Operating Data

Bar Diameter (mm)	Hydraulic Pressure (Mpa)	(bar)	(psi)	Number of grips per bar end	Engagement Length (mm)	Hydraulic Tool Model	Weight of Hydraulic Jack (kg)
12	30	300	4,350	3	45	KCM-32	42
16	40	400	5,800	3	45	KCM-32	42
20	45	450	6,530	3	45	KCM-32	42
22	50	500	7,250	4	60	KCM-32	42
25	60	600	8,700	4	60	KCM-32	42
28	65	650	9,430	4	60	KCM-32	42
32	65	650	9,430	5	75	KCM-32	42
36	63.5	635	9,210	6	75	KCM-40	50
40	63.5	635	9,210	8	88	KCM-40	50

Applications


Change Of Contract Package


Repair & Retroitting Package


Short Bent Bars

Installation Instructions

STEP 01

Site preparation: straighten and clean each rebar before proceeding.

STEP 02

Mark each bar at a distance equal to half a KHC sleeve from the bar end.

STEP 03

Put sleeves into the gauge supplied with the equipment and mark the gripping limit on each as shown above.

STEP 04

The central area of the sleeve should not be gripped. Gripping should be made from the limit towards the end of the sleeve.

STEP 05

Prepare the hydraulic tool and set the adequate grip dies. Connect power. In the case of using 380/440V motor, motor rotation can be corrected with the selector switch.

STEP 06

Insert the sleeve half way onto the continuation bar, using the mark on the bar as the engagement limit.

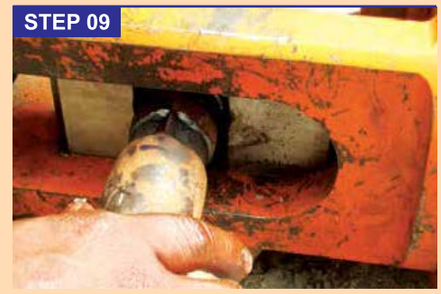
STEP 07

Start applying the required pressure on the KHC sleeve.

STEP 08

Stop swaging when the pressure reaches the value specified in the Operating Data table page 14.

STEP 09



Repeat the operation for each continuation bar that must be prepared.

STEP 10

At this stage, the second gripping limit should still be visible on sleeves. Caution, central area must not be swaged!

STEP 11

Pre-position connecting bars

STEP 12

Repeat swaging operation beyond the mark and at the required pressure to complete splicing operation.

Kamar uses the modern machining technology to machine parts with highest precisions various CNC turning centers. Including fully automated dual turret lathes machine parts from stock up to four inch in diameter, larger diameter parts can easily be accommodated in our CNC & VMC Lathe. We also utilize several six and eight spindle screw machine with capacities up to 23.1/4 inches in diameter. Our vertical and horizontal CNC machine center is equipped with multiple pallets large enough to machine parts in excess of 300 Lbs. We also have various secondary lathe, Mills and drill presses.

Area Required for installations of machines - 15m x 6m

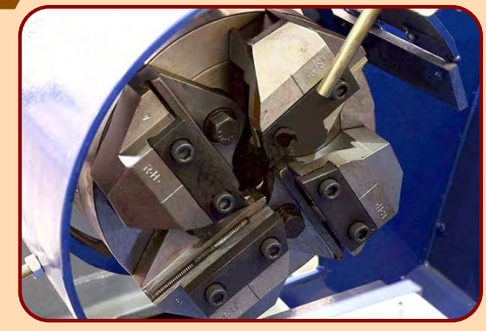
The threaded ends of the bars are protected by an external plastic cap (TPC). Couplers, which are usually supplied attached to the bar, have their internal threads protected by an internal plastic end cap (CPC). For certain applications, especially where the couplers system is being used in deep pours, the coupler end caps may not prevent the ingress of concrete fines.

REBAR THREADING MACHINE

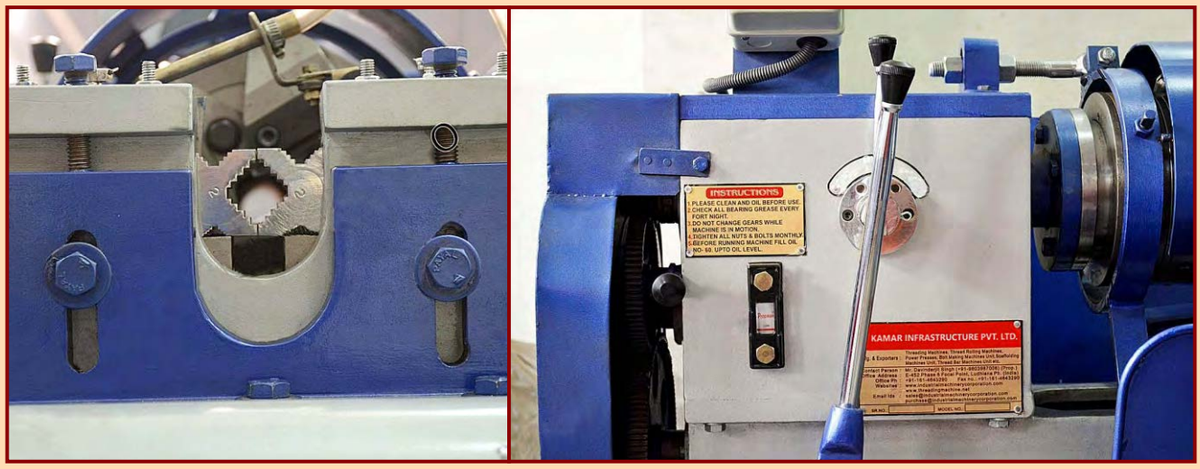
The Bar Threading Machine is use to cut the external threads on the bar with the help of Tangential chaser. Bar Thread cutting Chaser is use as a cutter in machine. Bar remain still, Die-head rotates. Different types of threads can be cut on the bar such as BSW, NPT, UNF, METRIC, UNC, ACME, BSFThreads etc.
The SPINDLE BORE 400mm fitted with taper bearing 32211, 32210, 30206, 30205. The CHINE has two speeds 75 & 140 RPM. All gears are tempered. Oil Seal (43-68-12) motor pulley 12" diameter. V-Belt Drive. Vice Fitted with Jaw. Electrical 3 HP - 1440 RPM. Motor Belts, Coolant Nozzle, Coolant Pipe and Starter (SIEMENS / CROMPTON make) are provided with machines.

The machine mainly consists the following:

- BASE
- HEAD STOCK
- SADDLE
- BED TYPE CLAMPING VICE
- DIE HEAD O SADDLE
- ELECTRICAL PARTS



The machine mainly consists the following:
Base, Head Stock, Saddle, Bed Type Clamping Vice, Die Head, Electrical Parts.



MODEL	3/8" TO 1.1/2" (BED TYPE)
SADDLE MOVEMENT	13"
SPINDLE SPEED RANGE	75-140
NUMBER OF SPINDLE SPEED	2
THREADING CAPACITY	3/8" to 1.1/2"
PRODUCTION PER HOUR	60-80
H.P. REQUIRED	3 H.P.
LEAD SCREW	OPTIONAL
WEIGHT (KG) APPROX.	550

Accessories Included

- Electrical Main Motor 3 HP
- Coolant Pump
- Motor Belt
- Coolant Nozzle
- Coolant Pipe
- Starter

Tool Kit with Machine

- 1 Screwdriver
- 12 pcs. Socket Set.
- 180 Degree Protractor Ruler
- Spancer
- 3LKeys
- 2 Wrench
- 1 Hammer
- 1 Chaser Setting Gauge
- 1 Scale

REBAR COLD FORGING MACHINE

Rebar Cold Forging Machine KF-40

KF-40	
REBAR DIAMETER (MM)	16-40mm
RATED WORKING PRESSURE	40Mpa
MAX. RETURN OIL PRESSURE	35Mpa
MAX. UPSETTING PRESSURE	1800KN
DIMENSION (MM)	940*490*570mm
N.W./G.W. (KGS)	660kgs/710kgs

KF-40 Rebar Cold Forging Machine is the key equipment in rebar upsetting connection technology, used for Φ12 - 40mm rebars.

19


MH01D
R4068


BOLERO

We follow the IS code of practice for testing of coupled joints as per IS 16172-2014, Bureau of Indian Standards. The code abstracted is as below.

Splicing by Mechanical Devices.

- Bars may be spliced with mechanical devices, e.g.by special grade steel sleeves swaged on to the bars in end to end contact or by threaded couplers. A mechanical splice including its connecting elements shall develop in tension or compression at least 125 percentage of the characteristic strength fy.
- The coupled joints should develp with FE500 TMT bar at least 125% i.e.625N/mm2 of stress value.
- The test reports are attached in the section of test reports.

Marking and traceability :

Each coupler shall be legibly and durably marked (e.g. hard stamped) with the identification of the manufacturer, the nominal bar size for which it is intended, and for traceability purposes.

Installation Instructions :

The supplier shall provide a clear written installation instruction. The described installation process of the couplers shall be achievable in our conditions.

Specification Instructions :

As couplers are specified by reference to IS 16172-2014,some features or technical conditions should be decided case by case by the specified because they are subject to agreement between purchaser and supplier.

This information is meant to serve as a checklist for the manufacturer/supplier of couplers as well as information to the purchaser on subjects for which a specification might be relevant and included in a data sheet for the product/delivery.

TCR ENGINEERING

ISO/IEC 17025 : 2017 Accredited Testing Laboratory by NABL Vide Certificate No. TC - 6905

TCR Engineering Services Pvt. Ltd.
VKB House, EL-182 MIDC-TTC
Electronic Zone, Mahape
Navi Mumbai - 400 710, India
T: +91-9022137295 I W: www.tcreng.com

TEST REPORT

ULR - TC690521000023047F

Date: 14-10-2021

T.C. No. : CE3830

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208

Party Ref.	:	Email	Condition of Sample	:	Test Piece
Ref. Date	:	08-10-2021			
Description of Sample	:	Coupler			
Specification	:	BS 970 part 3:1991 Grade 080A42 (EN 8D)	Sample Received on	:	13-10-2021
Sample Drawn By		Party	Date of Completion	:	14-10-2021
			Enclosure	:	NIL

Test : SPECTRO CHEMICAL ANALYSIS

ID No	20KI3014
Heat No	21D01677
Size	20mm

I. Chemical Testing

1. Metals and Alloys

SPECTRO CHEMICAL ANALYSIS

	Result	Test Method	Requirement
% Carbon	0.41	ASTM E415:2017	0.40-0.45
% Sulphur	0.002	ASTM E415:2017	0.05 max.
% Phosphorus	0.014	ASTM E415:2017	0.05 max.
% Manganese	0.73	ASTM E415:2017	0.70-0.90
% Silicon	0.21	ASTM E415:2017	0.10-0.40
Result	Satisfactory		

Remark: The above result(s) meets the specified requirements of BS 970 part 3:1991 Grade 080A42 (EN 8D) with respect to elements analysed.

Test Witnessed By: 1)Mr.Nabajyoti Dutta of L&T 2)Mr.Anikit Thakur of PEPL 3)Mr. Ashfaque Ahmad of Kamar Infrastructure on 13-OCT-21

******END OF REPORT******

vk/-

CHECKED BY TCR

Checked By

Reviewed & Authorised By

D.N. GAICHOR
(HOD Chemical)

TCR/QF/5101

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VKB House, EL-182 MIDC-TTC
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TEST REPORT

ULR - TC690522000008837F

T.C. No. : CG2381

Date: 09-04-2022

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208
Contact No.:9137157166,Email Id:info@kamargroup.com

Party Ref.	:	Ltr/01608	Condition of Sample	:	Test Piece
Ref. Date	:	09-03-2022	Sample Received on	:	23-03-2022
Description of Sample	:	Rebar Coupler			
Specification	:	BS 970 part 3:1991 Grade 080A42 (EN 8D)	Testing Started on	:	23-03-2022
Sample Drawn By	:	Party	Date of Completion	:	07-04-2022
Test Location	:	TCR Navi Mumbai	Enclosure	:	NIL
Test	:	SPECTRO CHEMICAL ANALYSIS			

Batch No 25KI2031
Size 25mm Dia

I. Chemical Testing

1. Metals and Alloys

SPECTRO CHEMICAL ANALYSIS

Test performed on : 07-04-2022

	Result	Test Method	Requirement
% Carbon	0.44	ASTM E415:2017	0.40-0.45
% Sulphur	0.025	ASTM E415:2017	0.05 max.
% Phosphorus	0.029	ASTM E415:2017	0.05 max.
% Manganese	0.81	ASTM E415:2017	0.70-0.90
% Silicon	0.25	ASTM E415:2017	0.10-0.40
Result	Satisfactory		

Remark: The above result(s) meets the specified requirements of BS 970 part 3:1991 Grade 080A42 (EN 8D) with respect to elements analysed.

CHECKED BY TCR Srs/-

Checked By

******END OF REPORT******

Reviewed & Authorised By

D.N. GAICHOR
(HOD-Chemical)

TCR/QF/5101

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TEST REPORT

ULR - TC690522000008833F
Date: 09-04-2022

T.C. No.	:	CG2377			
Issued To.	:	**M/s KAMAR INFRASTRUCTURE PVT. LTD.** Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208 Contact No.:9137157166,Email Id:info@kamargroup.com			
Party Ref.	:	Ltr/01608	**Condition of Sample**	:	Test Piece
Ref. Date	:	09-03-2022	**Sample Received on**	:	23-03-2022
Description of Sample	:	Rebar Coupler			
Specification	:	BS 970 part 3:1991 Grade 080A42 (EN 8D)	**Testing Started on**	:	23-03-2022
Sample Drawn By	:	Party	**Date of Completion**	:	07-04-2022
Test Location	:	TCR Navi Mumbai	**Enclosure**	:	NIL
Test	:	SPECTRO CHEMICAL ANALYSIS			

Batch No	32KI1047
Size	32mm Dia

I. Chemical Testing

1. Metals and Alloys

SPECTRO CHEMICAL ANALYSIS

Test performed on : 07-04-2022

	Result	Test Method	Requirement
% Carbon	0.43	ASTM E415:2017	0.40-0.45
% Sulphur	0.030	ASTM E415:2017	0.05 max.
% Phosphorus	0.030	ASTM E415:2017	0.05 max.
% Manganese	0.73	ASTM E415:2017	0.70-0.90
% Silicon	0.15	ASTM E415:2017	0.10-0.40
Result	Satisfactory		

Remark: The above result(s) meets the specified requirements of BS 970 part 3:1991 Grade 080A42 (EN 8D) with respect to elements analysed.

CHECKED BY TCR Srs/-

Checked By

******END OF REPORT******

Reviewed & Authorised By

D.N. GAICHOR
(HOD Chemical)

TCR/QF/5101

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TCR Engineering Services Pvt. Ltd.
VKB House, EL-182 MIDC-TTC
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TEST REPORT

ULR - TC690521000023042F

Page 1 of 1

T.C. No. : CE3825

Date: 14-10-2021

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208

Party Ref.	:	Email	Condition of Sample	:	Test Piece
Ref. Date	:	08-10-2021			
Description of Sample	:	Coupler with TMT Steel Bars, Coupler Grade: EN 8D.			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 500D / IS 16172:2014	Sample Received on	:	13-10-2021
Sample Drawn By		Party	Date of Completion	:	14-10-2021
			Enclosure	:	NIL

Test : STATIC TENSILE

ID No	20KI3014
Heat No	21D01677
Size	20mm

I. Mechanical Testing

1. Mechanical Properties of Metals

STATIC TENSILE TEST — **Test Method : IS 16172 : 2014**

Equipment : ZD 100/0-1000KN

		Requirement
Nominal Cross- sectional area (mm^2)	314.3	
Overall Gauge length, (mm)	200.13	
Gauge length at maximum force (mm)	210.00	
Ultimate tensile load (N)	219000	
U.T.S (N/mm^2)	696.79	565 min.
Total elongation at maximum force (%)	4.93	3.00 min.
Distance of fracture from centre of coupler	191.60	
Location of failure	Outside the length of the mechanical splice	
Result	Satisfactory	

Remark: The above result(s) meets the specified requirements of IS 1786:2008 (Ra 2018) Grade Fe 500D / IS 16172:2014 with respect to test(s) carried out.

Test Witnessed By: 1)Mr.Nabajyoti Dutta of L&T 2)Mr.Anikit Thakur of PEPL 3)Mr. Ashfaque Ahmad of Kamar Infrastructure on 13-OCT-21

******END OF REPORT******

vk/-

CHECKED BY TCR

Checked By

Reviewed & Authorised By
AVINASH TAMBEWAGH
(Head-Advanced Testing)

TCR/QF/5101

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ISO/IEC 17025 : 2017 Accredited Testing Laboratory by NABL Vide Certificate No. TC - 6905

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Electronic Zone, Mahape
Navi Mumbai - 400 710, India
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TEST REPORT

ULR - TC690522000008836F

Page 1 of 1

T.C. No. : CG2380

Date: 09-04-2022

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208
Contact No.:9137157166,Email Id:info@kamargroup.com

Party Ref.	:	Ltr/01608	**Condition of Sample**	:	Test Piece
Ref. Date	:	09-03-2022	**Sample Received on**	:	23-03-2022
Description of Sample	:	Rebar Coupler With TMT Steel Bar, Coupler Grade : EN8D			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014	**Testing Started on**	:	23-03-2022
Sample Drawn By	:	Party	**Date of Completion**	:	07-04-2022
Test Location	:	TCR Navi Mumbai	**Enclosure**	:	NIL
Test	:	STATIC TENSILE			

Batch No 25KI2031
Size 25mm Dia

I. Mechanical Testing

1. Mechanical Properties of Metals

STATIC TENSILE TEST — **Test Method : IS 1608 Part 1:2018**

Equipment : ZD 100/0-1000KN ; Calibration Due Dt:13-06-2022 — Test performed on : 07-04-2022

		Requirement
Nominal Cross- sectional area (mm²)	491.1	
Overall gauge length, (mm)	250.00	
Gauge length at maximum force (mm)	262.00	
Ultimate tensile load (N)	349030	
U.T.S (N/mm²)	710.71	600 min.
Total elongation at maximum force (%)	4.80	3.0 min.
Distance of fracture from centre of coupler	121.50	
Location of failure	Outside the length of the mechanical splice	
Result	Satisfactory	

Remark: The above result(s) meets the specified requirements of IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014 with respect to test(s) carried out.

******END OF REPORT******

CHECKED BY Srs/-

Checked By

Reviewed & Authorised By
AVINASH TAMBEWAGH
(Head-Advanced Testing)

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A NABL/ISO 17025 : 2017and BIS accredited Material Testing, Metallurgical Evaluation, Corrosion Testing, NDT/Inspection, Civil Audit, Engineering Consulting & Research Laboratory.

1. The results that are reported in this Test Report only relate to the sample(s) provided and tested.
2. This Test Report cannot be re-produced either in part or in full without the explicit written approval of TCR.
3. TCR always strives to provide accurate and reliable reporting for all its customers. However, it is not responsible for any financial/legal liability arising out of any errors or ommissions. Refer to Terms & Conditions of the report overleaf.

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VKB House, EL-182 MIDC-TTC
Electronic Zone, Mahape
Navi Mumbai - 400 710, India
T: +91-9022137295 I W: www.tcreng.com

TEST REPORT

ULR - TC690522000008831F

Date: 09-04-2022

T.C. No. : CG2375

Issued To. : **M/s KAMAR INFRASTRUCTURE PVT. LTD.**
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208
Contact No.:9137157166,Email Id:info@kamargroup.com

Party Ref.	:	Ltr/01608	**Condition of Sample**	:	Test Piece
Ref. Date	:	09-03-2022	**Sample Received on**	:	23-03-2022
Description of Sample	:	Rebar Coupler With TMT Steel Bar, Coupler Grade : EN8D			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014	**Testing Started on**	:	23-03-2022
Sample Drawn By	:	Party	**Date of Completion**	:	07-04-2022
Test Location	:	TCR Navi Mumbai	**Enclosure**	:	NIL
Test	:	STATIC TENSILE			

Batch No	32KI1047
Size	32mm Dia

I. Mechanical Testing

1. Mechanical Properties of Metals

STATIC TENSILE TEST — **Test Method : IS 1608 Part 1:2018**

Equipment : ZD 100/0-1000KN ; Calibration Due Dt:13-06-2022 — Test performed on : 07-04-2022

		Requirement
Nominal Cross- sectional area (mm^2)	804.6	
Overall gauge length, (mm)	319.95	
Gauge length at maximum force (mm)	337.00	
Ultimate tensile load (N)	539970	
U.T.S (N/mm^2)	671.10	600 min.
Total elongation at maximum force (%)	5.33	3.0 min.
Distance of fracture from centre of coupler	108.30	
Location of failure	Outside the length of the mechanical splice	
Result	Satisfactory	

Remark: The above result(s) meets the specified requirements of IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014 with respect to test(s) carried out.

CHECKED BY TCR Srs/-

Checked By

******END OF REPORT******

Reviewed & Authorised By
AVINASH TAMBEWAGH
(Head-Advanced Testing)

TCR/QF/5101

TCR Engineering Services

TCR ENGINEERING SERVICES PVT.LTD.

ENGINEERING MATERIAL TESTING, CERTIFICATION INSPECTION
CONSULTING, SURVEYING, NDT SERVICES, HEAT TREATMENT,
PHYSICAL,CHEMICAL & METALLURGICAL TESTING.
APPROVED BY GOVT. OF INDIA - DEPT. OF SCIENCE & TECHNOLOGY FOR CHEMICAL, MECHANICAL and NDT TESTING

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VIRENDRA K. BAFNA
B. E. M. Eng. (Canada)
M.S.I.M. (U.S.A.) M. A. S. T. M

TCR / QF / 5101

Regd. Office :
35, Pragati Industrial Estate,
N .M. Joshi Marg, Mumbai - 400 011.
Tel.: 23097921, 23097923,
23092347, 23091938
Fax : 91-22-23080197
Website : www.tcreng.com

Laboratory :
VKB. House, EL - 182, M.I.D.C., TTC,
Electronic Zone, Mahape,
Navi Mumbai - 400 710.
Ph.: 022-67380900 / 9022137295
Fax : 2761 2044
Email : sales@tcreng.com

Certificate No. NABL-T-367, NABL-T-368 & NABL-T-3304 NABL ISO 17025 ACCREDITED LABORATORY

ULR - TC690518000003726F

TEST CERTIFICATE

T.C. No. : **BS9505** **Date:** 26-11-2018

Issued To. : **M/s KAMAR INFRASTRUCTURE PVT LTD**
KAMAR ESTATE, DEVICHA PADA, BEHIND DEEPAK NITRIDE LIMITED, TALOJA MIDC, TAL.PANVEL,DIST.RAIGAD-410 208

Party Ref.	: Ltr/0381	**Condition of Sample**	: Test piece
Ref. Date	: 22-11-2018		
Nature of Sample	: Rebar Coupler With TMT Bars, Make : Kamar, Batch No. 20KI3002, Material Grade : EN8D		
Specification	: IS 16172:2014 / Grade 500D	**Sample Received on**	: 23-11-2018
Sample Drawn By	Party	**Date of Completion**	: 26-11-2018
		Enclosure	: NIL

Test : Slip.

Size 20mm Dia

Slip Test. **Test Method : IS 16172 : 2014**

Equipment : ZD 100/0-1000KN

		Requirement
Rebar diameter (mm)	20.00	
Nominal Cross-sectional Area (mm)	314.3	
Extensometer Gauge Length (mm)	200.00	
Length of the mechanical splice measured before loading (L2) (mm)	119.89	
Applied load (0.6 × Fy) in Newton (N)	94290	
Length of the mechanical splice measured after loading (L1) (mm)	119.98	
ΔLs (L1-L2)	0.09	
Load released on 20 N/mm2	6286	
Extensometer Reading	0.067	
Total slip (mm)	0.0785	0.1max
Ultimate Tensile Load in Newton (N)	201280	
Ultimate Tensile Strength (N/mm2)	640.41	
Location Of Failure	Outside of Mechanical Splice Length	
Remark	Pass	

Remark: The material conforms to IS 16172:2014 / Grade 500D with respect to test/s carried out

Test witnessed by: Mr.Mohd Muzammil of Kamar Infrastructures Pvt.Ltd on 23-NOV-18

********END OF REPORT********

vk/-

CHECKED BY

Checked By

Authorised Signatory

AVINASH TAMBEWAGH
(Head-Advanced Testing)

1) The results relate only to the sample tested.
2) Test Certificate shall not be re - produced except in full without the written approval of laboratory.
3) While 'TCR' has made their best endeavors to provide accurate and reliable information, 'TCR' is not responsible for any financial / legal liability due to any act of omission or error made. T & C Overleaf
4) NABL Cert No. T - 0367 - Chemical Testing, T - 0368 - Mechanical Testing, T-3304 - Non Destructive Testing.

TCR Engineering Services Pvt. Ltd.

Plot No. EL-182, MIDC-TTC, Electronic Zone, Mhape, Navi Mumbai-400 710, Maharashtra, India www.tcreng.com
Email : sales@tcreng.com, Phone : 09022137295 , 022-67380900

TCR/FR/001

Test Record

T.C. No.	:	CI3309	**Condition of Sample**	:	Test Piece
Issued To.	:	**M/s KAMAR INFRASTRUCTURE PVT. LTD.** Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208			
Party Ref.	:	Ltr/0687	**Sample Received on**	:	10-09-2022
Ref. Date	:	29-08-2022	**Testing Started on**	:	10-09-2022
Description of Sample	:	Coupler with TMT Steel Bars, Coupler Grade: EN8D.			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014			
Sample Drawn By	:	Party	**Date of Completion**	:	16-09-2022
Test Location	:	TCR Navi Mumbai	**Enclosure**	:	NIL
Test	:	Slip.			

Batch No	25KI2035
Size	25mm

Slip Test. **Test Method : IS 16172 : 2014 (Amd.1-2019)**

Equipment : ZD-100/0-1000KN ; Calibration Due Dt:13-06-2023 Test performed on : 16-09-2022

		Requirement
Rebar diameter (mm.)	25.00	
Nominal Cross-sectional Area (mm^2).	491.1	
Extensometer Gauge Length (mm).	250.00	
Length of the mechanical splice (mm).	250.00	
Minimum Specified Yeild,Fy (N/mm^2).	330	
Applied load (0.6 × Fy) in Newton (N).	162063	
Load released on 20 N/mm^2.	9822	
Total slip (mm).	0.090	0.1 max.
Ultimate Tensile Load in Newton (N).	362590	
Ultimate Tensile Strength (N/mm^2).	738.32	
Location of Failure.	Outside the length of the mechanical splice	
Result.	Slip within specified limit	

sn/- ----------

Tested By

Remark: The above result(s) meets the specified requirements of IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014 with respect to test(s) carried out.

******END OF TEST RECORD******

20/09/22

Reviewed &Authorised By **Test Witnessed By**

1. The results relate only to the samples tested.
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Email : sales@tcreng.com, Phone : 09022137295 , 022-67380900

TCR/FR/001

Test Record

T.C. No.	:	CI3311	**Condition of Sample**	:	Test Piece
Issued To.	:	**M/s KAMAR INFRASTRUCTURE PVT. LTD.** Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208			
Party Ref.	:	Ltr/0687	**Sample Received on**	:	10-09-2022
Ref. Date	:	29-08-2022	**Testing Started on**	:	10-09-2022
Description of Sample	:	Coupler with TMT Steel Bars, Coupler Grade: EN8D.			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014			
Sample Drawn By	:	Party	**Date of Completion**	:	16-09-2022
Test Location	:	TCR Navi Mumbai	**Enclosure**	:	NIL
Test	:	Slip.			

Batch No	32KI1053
Size	32mm

Slip Test. **Test Method : IS 16172 : 2014 (Amd.1-2019)**

Equipment : ZD-100/0-1000KN ; Calibration Due Dt:13-06-2023 Test performed on : 16-09-2022

		Requirement
Rebar diameter (mm.)	32.00	
Nominal Cross-sectional Area (mm^2).	804.6	
Extensometer Gauge Length (mm).	320.00	
Length of the mechanical splice (mm).	320.00	
Minimum Specified Yeild,Fy (N/mm^2).	330	
Applied load (0.6 × Fy) in Newton (N).	265518	
Load released on 20 N/mm^2.	16092	
Total slip (mm).	0.086	0.1 max.
Ultimate Tensile Load in Newton (N).	593250	
Ultimate Tensile Strength (N/mm^2).	737.32	
Location of Failure.	Outside the length of the mechanical splice	
Result.	Slip within specified limit	

sn/- ----------
Tested By

Remark: The above result(s) meets the specified requirements of IS 1786:2008 (Ra 2018) Grade Fe 550D / IS 16172:2014 with respect to test(s) carried out.

******END OF TEST RECORD******

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Navi Mumbai - 400 710, India
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TEST REPORT

ULR - TC690522000009104F

T.C. No. : CG4648 Date: 12-04-2022

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208
Contact No.:9137157166,Email Id:info@kamargroup.com

Party Ref.	:	Ltr/0050	Condition of Sample	:	Test Piece
Ref. Date	:	07-04-2022	Sample Received on	:	11-04-2022
Description of Sample	:	Coupler with TMT Steel Bars, Coupler Grade: EN8D, Project Name: Raymond Realty - The Address.			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 500 / IS 16172:2014	Testing Started on	:	11-04-2022
Sample Drawn By	:	Party	Date of Completion	:	11-04-2022
Test Location	:	TCR Navi Mumbai	Enclosure	:	NIL
Test	:	Cyclic Tensile (100 Cycle)			

Batch No	20KI3017
Size	20mm Dia

I. Mechanical Testing

1. Mechanical Properties of Metals

Cyclic Tensile Test (100 Cycle) — **Test Method : IS 16172 : 2014 (Amd.1-2019)**

Equipment : 250KN UTM ; Calibration Due Dt:05-12-2022 — Test performed on : 11-04-2022

Rebar nominal diameter (mm).	20.00
Nominal cross-sectional area (mm^2).	314.30
Upper Stress (N/mm^2) (90% of Yield Stress)	450.00
Lower Stress(N/mm^2) (5% of Yield Stress)	25.00
Maximum Load (kN)	141.43
Minimum Load (kN)	7.85
Frequency (Hz)	0.70
Specified no. of cycles	100
Sustained no. of cycles	100
Ultimate Tensile Load (N) After 100 cycles	211320.00
U.T.S (N/mm^2) After 100 cycles	672.35
Location of Failure	Outside the length of the mechanical splice.

Test Witnessed By : Mr. Rohil Julaniya of (Raymond Realty) & Mr. Gorakh Patil of (CIL) & Mr. Asir. Dangra of (Kamar Infra.) on 11-APR-22

******END OF REPORT******

CHECKED BY TCR vk/-

Checked By

Reviewed & Authorised By
AVINASH TAMBEWAGH
(Head-Advanced Testing)

TCR/QF/5101

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TCR Engineering Services Pvt. Ltd.
VKB House, EL-182 MIDC-TTC
Electronic Zone, Mahape
Navi Mumbai - 400 710, India
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TEST REPORT

ULR - TC690522000009101F

Date: 12-04-2022

T.C. No. : CG4645

Issued To. : M/s KAMAR INFRASTRUCTURE PVT. LTD.
Kamar Estate, Devicha Pada, Behind Deepak Nitride Limited, Taloja MIDC, Tal.Panvel, Dist.Raigad-410 208
Contact No.:9137157166,Email Id:info@kamargroup.com

Party Ref.	:	Ltr/0050	Condition of Sample	:	Test Piece
Ref. Date	:	07-04-2022	Sample Received on	:	11-04-2022
Description of Sample	:	Coupler with TMT Steel Bars, Coupler Grade: EN8D, Project Name: Raymond Realty - The Address.			
Specification	:	IS 1786:2008 (Ra 2018) Grade Fe 500 / IS 16172:2014	Testing Started on	:	11-04-2022
Sample Drawn By	:	Party	Date of Completion	:	11-04-2022
Test Location	:	TCR Navi Mumbai	Enclosure	:	NIL
Test	:	Cyclic Tensile (100 Cycle)			

Batch No	25KI2031
Size	25mm Dia

I. Mechanical Testing

1. Mechanical Properties of Metals

Cyclic Tensile Test (100 Cycle) — **Test Method : IS 16172 : 2014 (Amd.1-2019)**

Equipment : 250KN UTM ; Calibration Due Dt:05-12-2022 — Test performed on : 11-04-2022

Rebar nominal diameter (mm).	25.00
Nominal cross-sectional area (mm^2).	491.10
Upper Stress (N/mm^2) (90% of Yield Stress)	450.00
Lower Stress(N/mm^2) (5% of Yield Stress)	25.00
Maximum Load (kN)	220.99
Minimum Load (kN)	12.27
Frequency (Hz)	0.70
Specified no. of cycles	100
Sustained no. of cycles	100
Ultimate Tensile Load (N) After 100 cycles	322750.00
U.T.S (N/mm^2) After 100 cycles	657.20
Location of Failure	Outside the length of the mechanical splice.

Test Witnessed By : Mr. Rohil Julaniya of (Raymond Realty) & Mr. Gorakh Patil of (CIL) & Mr. Asir. Dangra of (Kamar Infra.) on 11-APR-22

******END OF REPORT******

CHECKED BY vk/-

Checked By

Reviewed & Authorised By

AVINASH TAMBEWAGH

(Head-Advanced Testing)

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R&D 03-TSP 5639-CR-Final
June 2020

Cyclic Tensile and Low Cycle Fatigue Tests on Reinforcing Bar Couplers

for

M/s. Kamar Infrastructure Private Limited
Kamar Estate, Taloja MIDC
Panvel, Raigad - 410 208
Navi Mumbai

M. Saravanan
S. Vishnuvardhan
P. Gandhi

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CSIR Campus, Taramani, CHENNAI - 600 113

CSIR - Structural Engineering Research Centre	Document Sheet	Class: Restricted
Project Title	Cyclic Tensile Tests and Low Cycle Fatigue Tests on Reinforcing Bar Couplers	Project No.: TSP 5639
Report Title	Cyclic Tensile and Low Cycle Fatigue Tests on Reinforcing Bar Couplers	Report No.: **R&D 03-TSP 5639-CR-Final**
Project Team/ Author(s)	M. Saravanan, S. Vishnuvardhan and P. Gandhi	
Area	Fatigue and Fracture	
Type	Consultancy	Month and Year: June 2020
Name and Address of the Sponsor	M/s. Kamar Infrastructure Private Limited, Kamar Estate, Taloja MIDC, Panvel Raigad - 410 208, Navi Mumbai	
Keywords	Reinforcing bar coupler, static tensile test, cyclic tensile test, low cycle fatigue test	Contents Text : 12 Tables : 3 Figures : 12 Reference : 1 Appendices : -- Total pages : 18

Abstract:

Cyclic tensile tests on 32 mm diameter reinforcing bar coupler and low cycle fatigue tests on reinforcing bar couplers of 20 mm and 25 mm diameter were carried out as per Indian Standard Code of Practice IS 16172 : 2014 "Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification". Cyclic tensile tests were carried under constant amplitude cyclic loading in the stress range of $0.05f_y$ to $0.90f_y$ and low cycle fatigue tests were carried out under fully reversed cyclic loading with a stress range of ±173 MPa. Subsequent to cyclic tensile and low cycle fatigue tests, static tensile tests were carried out on the reinforcing bar couplers to determine the ultimate tensile strength and the location of failure. The rebar coupler of 32 mm diameter withstood 100 cycles of specified loading in the stress range of $0.05f_y$ to $0.95f_y$ without any failure. The average ultimate tensile strength obtained for 32 mm diameter rebar coupler from static tensile tests carried out after cyclic tensile tests was 634.5 MPa. The reinforcing bar couplers of 20 mm and 25 mm diameters withstood 10,000 cycles of specified loading in the stress range of +173 MPa to -173 MPa without any failure. The average ultimate tensile strength obtained for 20 mm and 25 mm diameters reinforcing couplers from static tensile tests carried out after low cycle fatigue tests were 667.5 MPa and 687.3 MPa respectively. This report gives details of the studies carried out and the test results.

Cyclic Tensile Tests and Low Cycle Fatigue Tests on Reinforcing Bar Couplers

1.0 INTRODUCTION

M/s. Kamar Infrastructure Private Limited, Navi Mumbai approached CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai for carrying out cyclic tensile tests on reinforcing couplers of 32 mm diameter and low cycle fatigue tests on reinforcing bar couplers of 20 mm and 25 mm diameters. This report presents the results of experimental studies carried out on 20 mm, 25 mm and 32 mm diameter reinforcing bar couplers at the Advanced Materials Laboratory and the Fatigue & Fracture Laboratory of CSIR-SERC, Chennai.

2.0 SCOPE OF THE PROJECT

- Cyclic tensile tests on reinforcing bar couplers of 32 mm diameter (3 nos.) up to 100 cycles of loading in the stress range of $0.05f_y$ to $0.9f_y$ as per IS 16172 : 2014. The frequency of loading will be 0.70 Hz. Subsequent to completion of cyclic tensile tests, static tensile tests to be carried out to determine the ultimate tensile strength and the location of failure.
- Low cycle fatigue tests on reinforcing bar couplers of 20 mm and 25 mm diameters (3 nos. in each diameter) up to 10,000 cycles of loading under fully reversed condition with a stress range of ±173 MPa as per IS 16172 : 2014. The frequency of loading will be 0.35 Hz. Subsequent to completion of low cycle fatigue tests, static tensile tests to be carried out to determine the ultimate tensile strength and the location of failure.

3.0 EXPERIMENTAL STUDIES

Experimental studies were carried out on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters using ±2500 kN servo-controlled UTM at the Advanced Materials Laboratory and ±500 kN servo-controlled UTM at the Fatigue & Fracture Laboratory of CSIR-SERC, Chennai.

3.1 Cyclic Tensile Tests

Cyclic tensile tests were carried out on reinforcing bar couplers of 32 mm diameters (3 nos.). The reinforcing bar couplers were subjected to 100 cycles of constant amplitude sinusoidal loading in the stress range of $0.05f_y$ to $0.90f_y$. The frequency of loading was 0.70 Hz. During the cyclic tensile tests, maximum and minimum load values were monitored and time history data was acquired using a high speed data acquisition system at regular intervals of loading cycles. Subsequent to completion of cyclic tensile tests, static tensile tests were carried out under monotonic loading till failure of reinforcing bar coupler to determine the ultimate tensile strength and the location of failure.

3.2 Low Cycle Fatigue Tests

Low cycle fatigue tests were carried out on reinforcing bar couplers of 20 mm and 25 mm diameters (3 nos. in each diameter). The reinforcing bar couplers were subjected to 10,000 cycles of constant amplitude completely reversed sinusoidal loading with a stress range of ±173 MPa. The frequency of loading was 0.35 Hz. During the low cycle fatigue tests, maximum and minimum load values were monitored and time history data was acquired using a high speed data acquisition system at regular intervals of loading cycles. After successful completion of 10,000 cycles of loading, static tensile tests were carried out on the reinforcing bar couplers under monotonic loading till failure of reinforcing bar coupler to determine the ultimate tensile strength and the location of failure.

4.0 RESULTS AND DISCUSSION

4.1 32 mm Diameter Reinforcing Bar Couplers

Cyclic tensile tests: Figure 1 shows typical set-up for carrying out cyclic tensile test on a reinforcing bar coupler. Figure 2 shows close-up view of cyclic tensile test. The reinforcing bar couplers were subjected to 100 cycles of constant amplitude sinusoidal loading in the stress range of $0.05f_y$ to $0.90f_y$ at a frequency of 0.70 Hz. The specimens were of Fe 500 supplied by M/s. Kamar Infrastructure Private Limited, Navi Mumbai. The yield strength of the parent bar was 500 MPa as specified by the client and the same was used in deciding the stress range and the corresponding load values. Thus, the minimum and maximum load values for 32 mm diameter reinforcing bar coupler were 20.1 kN and

361.9 kN respectively. Figure 3 shows typical load versus time plot used for 32 mm diameter reinforcing bar coupler during cyclic tensile test. All the three specimens tested withstood 100 cycles of specified loading without any fracture or failure. Subsequently, static tensile tests were carried out on the reinforcing bar couplers under monotonic loading and load versus displacement measurements were recorded. Figure 4 shows load versus displacement plots for 32 mm diameter reinforcing bar couplers during static tensile tests carried out after cyclic tensile tests. From the static tensile tests, ultimate tensile strength and failure location were determined. The nominal cross-sectional area of reinforcing bar, the length and diameter of coupler, failure location and the ultimate tensile strength obtained from the static tensile tests on the reinforcing bar couplers are given in Table 1.

Fig. 1 Test set-up for cyclic tensile test on a reinforcing bar coupler of 32 mm diameter

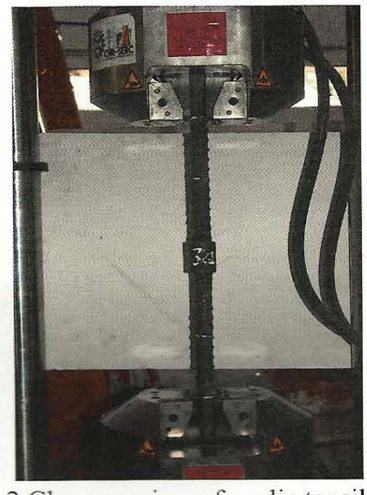


Fig. 2 Close-up view of cyclic tensile test on a reinforcing coupler of 32 mm diameter

Figure 5 shows view of failed specimens during static tensile tests carried out after cyclic tensile tests. The average ultimate tensile strength of 32 mm diameter reinforcing bar coupler was found to be 634.5 MPa. The failure at the end of static tensile tests was observed to be away from the coupler location for all the specimens tested.

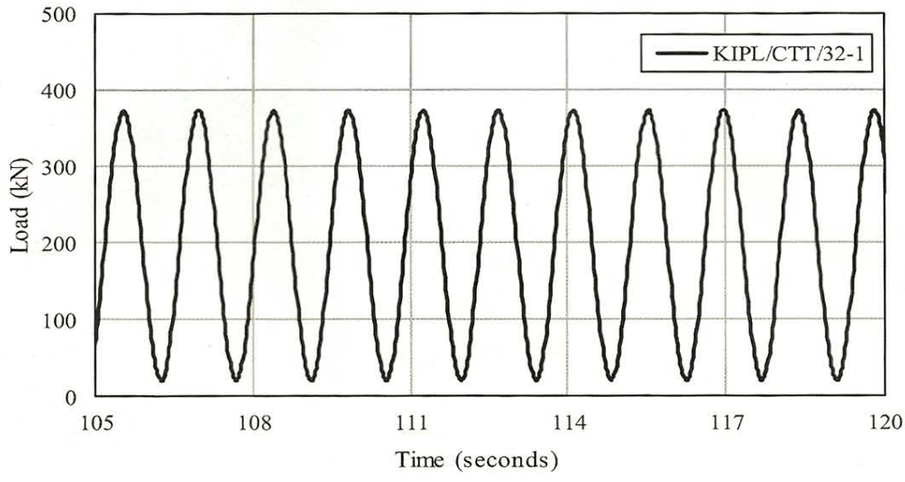


Fig. 3 Load versus time plot during cyclic tensile test

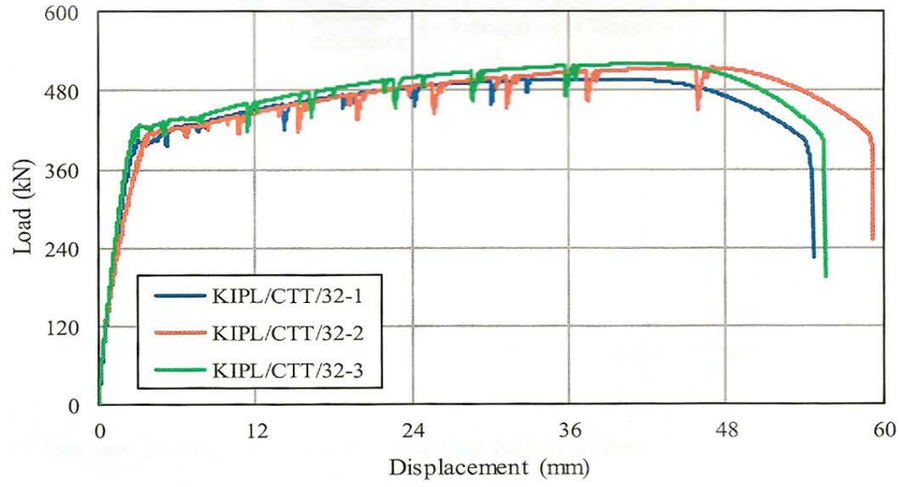


Fig. 4 Load versus displacement plots during static tensile tests carried out after cyclic tensile tests

(a) (b)

Fig. 5 View of failed specimens of 32 mm diameter reinforcing bar couplers during static tensile tests carried out after cyclic tensile tests

Table 1 Results of static tensile tests carried out on 32 mm diameter reinforcing bar coupler after cyclic tensile tests

Specimen ID	Nominal cross-sectional area of reinforcing bar (mm^2)	Outer diameter of coupler (mm)	Length of coupler (mm)	Ultimate tensile strength (MPa)	Remarks
KIPL/CTT/32-1	804.25	50.2	64.0	618.15	Failed at 155 mm away from the coupler face
KIPL/CTT/32-1	804.25	50.2	64.0	638.79	Failed at 82 mm away from the coupler face
KIPL/CTT/32-1	804.25	49.8	63.8	646.61	Failed at 92 mm away from the coupler face

4.2 20 mm and 25 mm Diameter Reinforcing Bar Couplers

Low cycle fatigue tests: The reinforcing bar couplers were subjected to 10,000 cycles of constant amplitude completely reversed sinusoidal loading in the stress range of +173 MPa to -173 MPa at a frequency of 0.35 Hz. The minimum and maximum load values varied for each reinforcing bar coupler based on the actual cross-sectional area. The minimum and maximum load values for 20 mm diameter reinforcing bar coupler were 54.35 kN

(compressive) and 54.35 kN (tensile) respectively. The minimum and maximum load values for 25 mm diameter reinforcing bar coupler were 84.92 kN (compressive) and 84.92 kN (tensile) respectively.

Figure 6 shows set-up for carrying out low cycle fatigue test on a reinforcing bar coupler of 20 mm diameter and Fig. 7 shows close-up view of the low cycle fatigue test set-up on a reinforcing coupler of 20 mm diameter. Figure 8 shows test set-up for carrying out low cycle fatigue test on a reinforcing bar coupler of 25 mm diameter and close-up view of low cycle fatigue test set-up on a reinforcing coupler of 25 mm diameter.

Fig. 6 Test set-up for low cycle fatigue test on a reinforcing bar coupler of 20 mm diameter

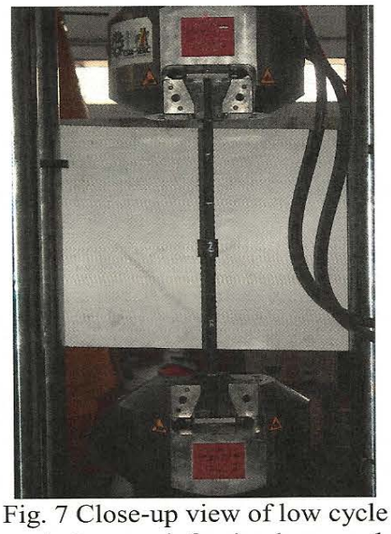


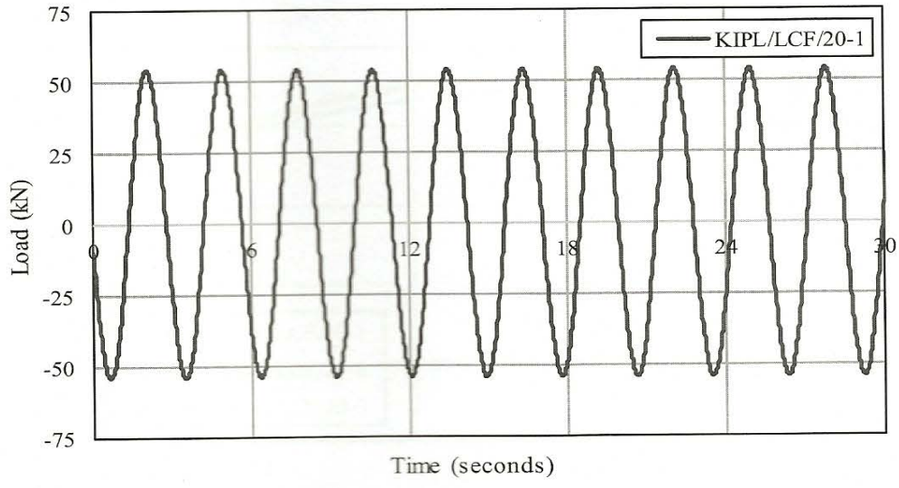
Fig. 7 Close-up view of low cycle fatigue test on a reinforcing bar coupler of 20 mm diameter

During each cycle, minimum and maximum load values were recorded with respect to time. Figure 10 shows typical load versus time plot for 20 mm and 25 mm diameter reinforcing bar couplers during low cycle fatigue tests. All the six specimens (three samples in each diameter) withstood 10,000 cycles of specified loading without any fracture or failure. Subsequently, static tensile tests were carried out on the reinforcing bar couplers under monotonic loading and load versus displacement measurements were recorded. Figure 11 shows load versus displacement plots for 20 mm and 25 mm diameter reinforcing bar couplers during static tensile tests carried out after low cycle fatigue tests. From the static tensile tests, ultimate tensile strength and failure location were determined. The nominal cross-sectional area of reinforcing bar, the length and diameter of coupler,

failure location and the ultimate tensile strength obtained from the static tensile tests on the reinforcing bar couplers of 20 mm and 25 mm diameters are given in Table 2 and 3.

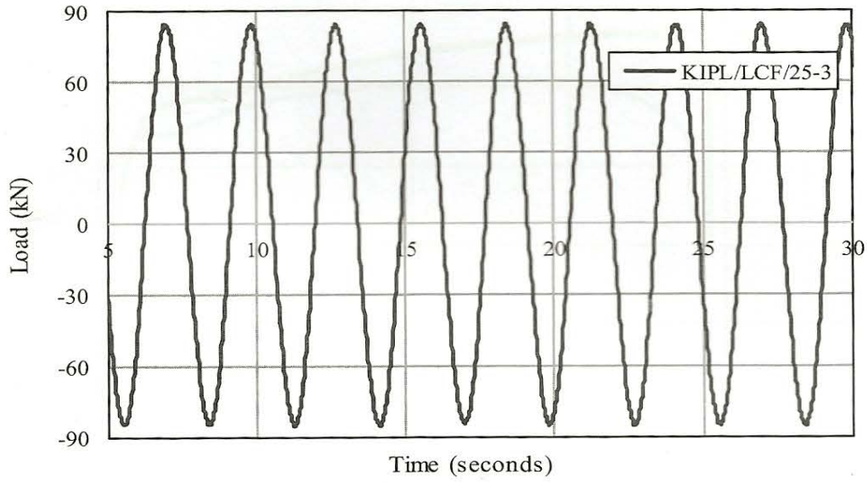
Fig. 8 Test set-up for low cycle fatigue test on a reinforcing bar coupler of 25 mm diameter

Fig. 9 Close-up view of low cycle fatigue test on a reinforcing bar coupler of 25 mm diameter



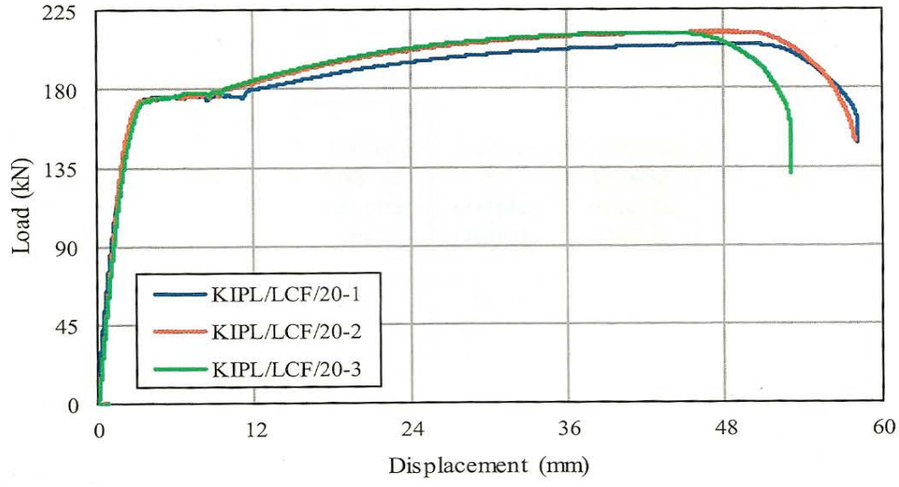
(a) Reinforcing bar coupler of 20 mm diameter

Fig. 10 Load versus time plots during low cycle fatigue tests



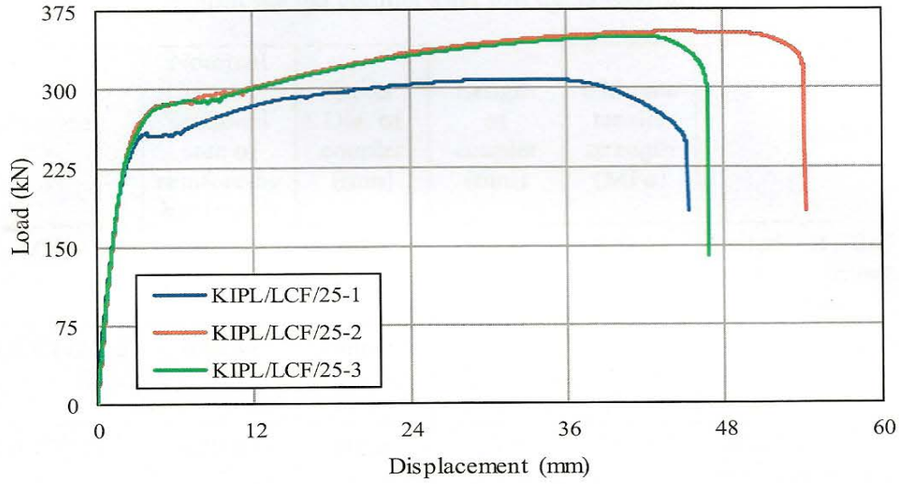
(b) Reinforcing bar coupler of 25 mm diameter

Fig. 10 Load versus time plots during low cycle fatigue tests (contd.)



(a) Reinforcing bar coupler of 20 mm diameter

Fig. 11 Load versus displacement plots during static tensile tests carried out after low cycle fatigue tests



(b) Reinforcing bar coupler of 25 mm diameter

Fig. 11 Load versus displacement plots during static tensile tests carried out after low cycle fatigue tests (contd.)

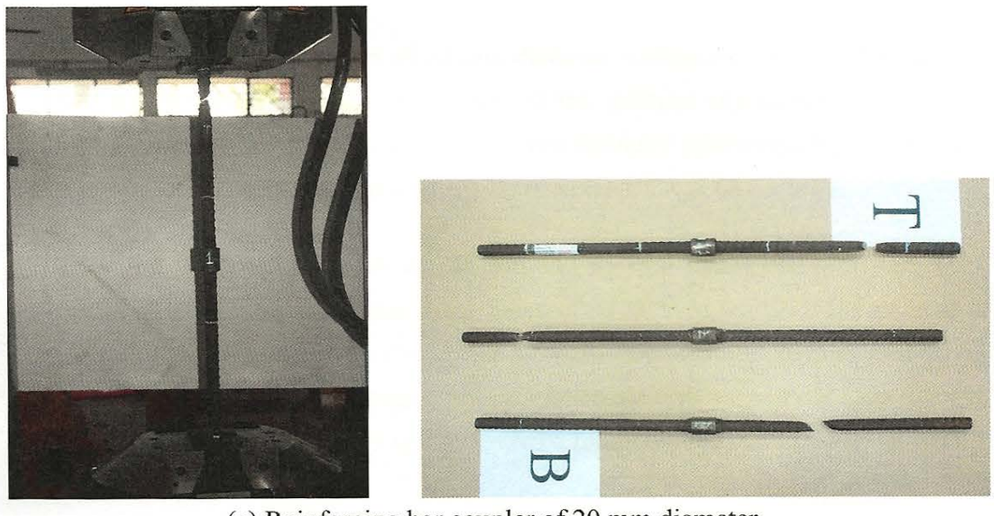
Table 2 Results of static tensile tests carried out on 20 mm diameter reinforcing bar coupler after low cycle fatigue tests

Specimen ID	Nominal cross-sectional area of reinforcing bar (mm^2)	Outer Dia. of coupler (mm)	Length of coupler (mm)	Ultimate tensile strength (MPa)	Remarks
KIPL/LCF/20-1	314.16	32.1	40.0	653.16	Failed at 259 mm away from the coupler face
KIPL/LCF/20-2	314.16	32.0	40.0	674.99	Failed at 293 mm away from the coupler face
KIPL/LCF/20-3	314.16	32.1	40.0	674.36	Failed at 160 mm away from the coupler face

Table 3 Results of static tensile tests carried out on 25 mm diameter reinforcing bar coupler after low cycle fatigue tests

Specimen ID	Nominal cross-sectional area of reinforcing bar (mm^2)	Outer Dia. of coupler (mm)	Length of coupler (mm)	Ultimate tensile strength (MPa)	Remarks
KIPL/LCF/25-1	490.87	40.0	49.6	629.49	Failed at 215 mm away from the coupler face
KIPL/LCF/25-2	490.87	40.0	50.0	721.09	Failed at 106 mm away from the coupler face
KIPL/LCF/25-3	490.87	40.0	50.0	711.37	Failed at 79 mm away from the coupler face

The failure at the end of static tensile tests was observed to be away from the coupler location for all the specimens tested. Figure 12 shows view of failed specimens during static tensile tests carried out after low cycle fatigue tests for the reinforcing bar couplers of 20 mm and 25 mm diameters. The average ultimate tensile strength of 20 mm and 25 mm diameter reinforcing bar couplers was found to be 667.5 MPa and 687.3 respectively.



(a) Reinforcing bar coupler of 20 mm diameter

Fig. 12 View of failed specimens of reinforcing bar couplers during static tensile tests carried out after low cycle fatigue tests

(b) Reinforcing bar coupler of 25 mm diameter

Fig. 12 View of failed specimens of reinforcing bar coupler during static tensile tests carried out after low cycle fatigue tests (contd.)

5.0 CONCLUSIONS

Based on the cyclic tensile tests on reinforcing couplers of 32 mm diameter and low cycle fatigue tests carried out on reinforcing bar couplers of 20 mm and 25 mm diameters, the following conclusions are drawn.

- The reinforcing bar couplers of 32 mm diameter withstood 100 cycles of specified loading in the stress range of $0.05f_y$ to $0.95f_y$ without any failure. The average ultimate tensile strength obtained for 32 mm diameter reinforcing bar coupler from static tensile tests carried out after cyclic tensile tests was 634.5 MPa.

- The reinforcing bar couplers of 20 mm and 25 mm diameters withstood 10,000 cycles specified loading in the stress range of +173 MPa to -173 MPa without any failure. The average ultimate tensile strength obtained for 20 mm and 25 mm diameters reinforcing bar coupler from static tensile tests carried out after low cycle fatigue tests were 667.5 MPa and 678.3 MPa respectively.

6.0 ACKNOWLEDGEMENT

The authors thank the Technical Staff of Advanced Materials Laboratory (AML) and Fatigue & Fracture Laboratory (FFL) of CSIR-SERC for their cooperation in carrying out the experimental investigations.

7.0 REFERENCE

[1] IS 16172 : 2014, Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification, Bureau of Indian Standards, New Delhi

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ENGINEERING SUSTAINABLE STRUCTURES

Restricted

R&D 03-TSP 5683-CR-Final
November 2021

Low Cycle Fatigue Studies on 32 mm Diameter Reinforcing Bar Couplers

for

M/s. Kamar Infrastructure Private Limited
Kamar Estate, Taloja MIDC
Panvel, Raigad - 410 208
Navi Mumbai

M. Saravanan
S. Vishnuvardhan

CSIR - Structural Engineering Research Centre
(Council of Scientific & Industrial Research)
CSIR Campus, Taramani, CHENNAI - 600 113

CSIR - Structural Engineering Research Centre	Document Sheet	Class: Restricted
Project Title	Low Cycle Fatigue Studies on 32 mm Diameter Reinforcing Bar Couplers	Project No.: TSP 5683
Report Title	Low Cycle Fatigue Studies on 32 mm Diameter Reinforcing Bar Couplers	Report No.: **R&D 03-TSP 5683-CR-Final**
Project Team/ Author(s)	M. Saravanan and S. Vishnuvardhan	
Area	Fatigue and Fracture	
Type	Consultancy	Month and Year: November 2021
Name and Address of the Sponsor	M/s. Kamar Infrastructure Private Limited Kamar Estate, Taloja MIDC, Panvel Raigad - 410 208, Navi Mumbai	
Keywords	Reinforcing bar coupler, low cycle fatigue test, static tensile test	Contents Text : 6 Table : 1 Figures : 5 Reference : 1 Appendices : -- Total pages : 12

Abstract:

Low cycle fatigue tests on 32 mm diameter reinforcing bar couplers were carried out as per Indian Standard Code of Practice IS 16172 : 2014 "Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification". Low cycle fatigue tests were carried out under fully reversed cyclic loading with a stress range of ±173 MPa. Subsequent to low cycle fatigue tests, static tensile tests were carried out on the reinforcing bar couplers to determine the ultimate tensile strength and the location of failure. The rebar couplers of 32 mm diameter withstood 10,000 cycles of loading in the stress range of +173 MPa to -173 MPa without any failure. The average ultimate tensile strength obtained for 32 mm diameter rebar couplers from static tensile tests carried out after low cycle fatigue tests was 710.59 MPa. This report gives details of the studies carried out and the test results.

Low Cycle Fatigue Studies on 32 mm Diameter Reinforcing Bar Couplers

1.0 INTRODUCTION

M/s. Kamar Infrastructure Private Limited, Panvel, Navi Mumbai approached CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai for carrying out low cycle fatigue tests on reinforcing bar couplers of 32 mm diameter (three samples). This report presents the details of studies carried out and the results of 32 mm diameter reinforcing bar couplers at Fatigue & Fracture Laboratory and Advanced Materials Laboratory of CSIR-SERC, Chennai.

2.0 SCOPE OF THE PROJECT

- Low cycle fatigue tests on reinforcing bar couplers of 32 mm diameter (three nos.) up to 10,000 cycles of loading under fully reversed condition with a stress range of ±173 MPa as per IS 16172: 2014. The frequency of loading has to be 0.35 Hz for 32 mm diameter reinforcing bar couplers. Subsequent to completion of low cycle fatigue tests, static tensile tests have to be carried out to determine the ultimate tensile strength and the location of failure.

3.0 EXPERIMENTAL STUDIES

Experimental studies were carried out on reinforcing bar couplers of 32 mm diameter using ±500 kN servo-controlled UTM at the Fatigue & Fracture Laboratory and 2500 kN UTM at the Advanced Materials Laboratory of CSIR-SERC, Chennai.

3.1 Low Cycle Fatigue Tests and Static Tensile Tests

Low cycle fatigue tests were carried out on reinforcing bar couplers 32 mm diameter (three nos.) as per IS 16172 : 2014. The reinforcing bars were of Fe 550D grade. The couplers were made of EN8D grade steel (as informed by the client) and the batch number of coupler was 32KI1038. The reinforcing bar couplers were subjected to 10,000 cycles of constant amplitude completely reversed sinusoidal loading with a stress range of ±173 MPa. The frequency of loading used was 0.35 Hz for 32 mm diameter reinforcing bar couplers. During the low cycle fatigue tests, maximum and minimum load values were

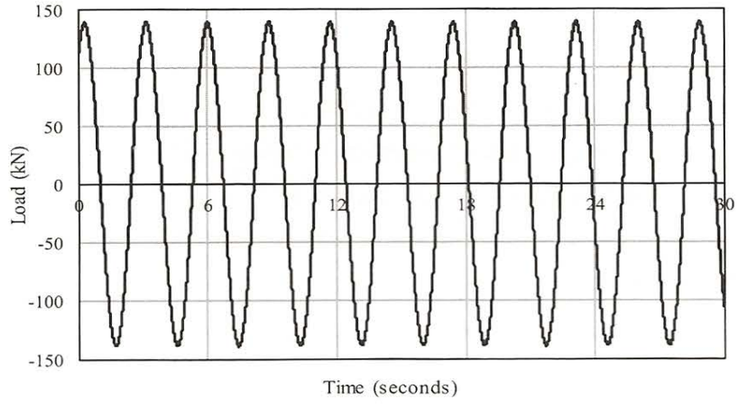
monitored and time history data was acquired using a high speed data acquisition system at regular intervals of loading cycles. After successful completion of 10,000 cycles of loading, static tensile tests were carried out on the reinforcing bar couplers under monotonic loading till failure of reinforcing bar couplers to determine the ultimate tensile strength and the location of failure.

4.0 RESULTS AND DISCUSSION

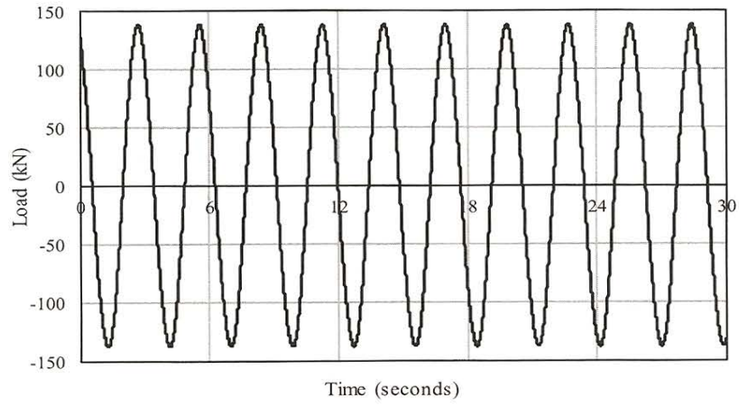
The reinforcing bar couplers were subjected to 10,000 cycles of constant amplitude completely reversed sinusoidal loading in the stress range of +173 MPa to -173 MPa. The minimum and maximum load values for each reinforcing bar coupler are evaluated based on the actual cross-sectional area to produce the stress range of +173 MPa to -173 MPa on the reinforcing bar coupler. Figure 1 shows typical set-up for carrying out low cycle fatigue test on a reinforcing bar coupler and Fig. 2 shows close-up view of low cycle fatigue test on a reinforcing coupler. Figure 3 shows typical load versus time plot for reinforcing bar coupler of 32 mm diameter.

Fig. 1 Set-up for low cycle fatigue test on a reinforcing bar coupler of 32 mm diameter

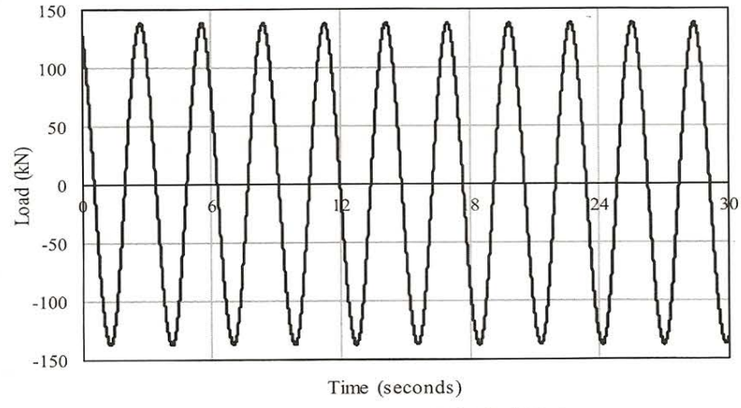
Fig. 2 Close-up view of low cycle fatigue test on a reinforcing bar coupler of 32 mm diameter



(a) Specimen ID: KIPL/LCF/32-1



(b) Specimen ID: KIPL/LCF/32-2



(c) Specimen ID: KIPL/LCF/32-3

Fig. 3 Load versus time plots for reinforcing bar couplers of 32 mm diameter

4.1 32 mm Diameter Reinforcing Bar Couplers

The minimum and maximum load values for 32 mm diameter reinforcing bar couplers were 139.13 kN (compressive) and 139.13 kN (tensile) respectively. All the three samples tested withstood 10,000 cycles of specified loading without any fracture or failure. Subsequently, static tensile tests were carried out on the reinforcing bar couplers under monotonic loading, and load versus displacement measurements were recorded. The load versus displacement plots for 32 mm diameter reinforcing bar couplers obtained from the static tensile tests after the low cycle fatigue tests are shown in Fig. 4.

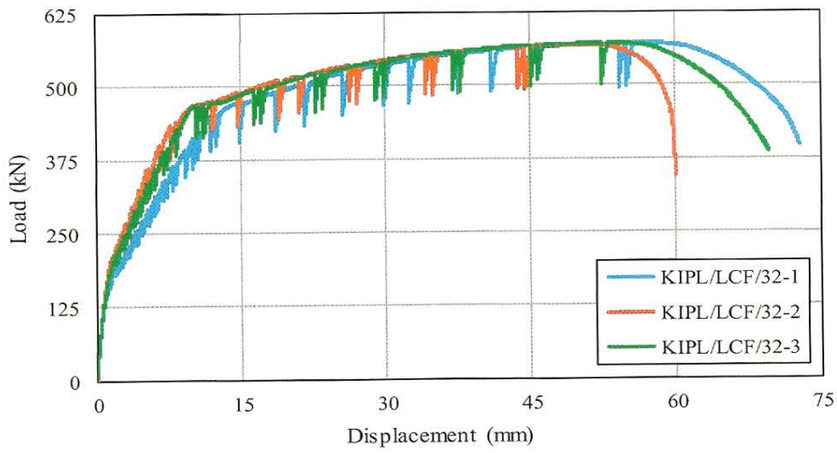


Fig. 4 Load versus displacement for 32 mm diameter reinforcing bar couplers during static tensile tests carried out after low cycle fatigue tests

From the static tensile tests, the ultimate tensile strength and the failure location were determined. The nominal cross-sectional area of reinforcing bar, the length and diameter of coupler, the ultimate tensile strength and the failure location obtained from the static tensile tests on the reinforcing bar couplers of 32 mm diameters are given in Table 1. The failure at the end of static tensile tests was observed to be away from the coupler location for all the three specimens tested. The failure pattern of 32 mm diameter reinforcing bar couplers observed from static tensile tests carried out after low cycle fatigue tests are shown in Fig. 5. The average ultimate tensile strength of 32 mm diameter reinforcing bar couplers was found to be 710.59 MPa.

Table 1 Results of static tensile tests carried out on 32 mm diameter reinforcing bar couplers after low cycle fatigue tests

Specimen ID	Nominal cross-sectional area of reinforcing bar (mm^2)	Outer dia. of coupler (mm)	Length of coupler (mm)	Ultimate tensile strength (MPa)	Remarks
KIPL/LCF/32-1	804.25	50.40	63.80	711.74	Failed at 190 mm away from the face of the coupler
KIPL/LCF/32-2		50.60	64.30	708.34	Failed at 90 mm away from the face of the coupler
KIPL/LCF/32-3		50.80	64.20	711.69	Failed at 230 mm away from the face of the coupler

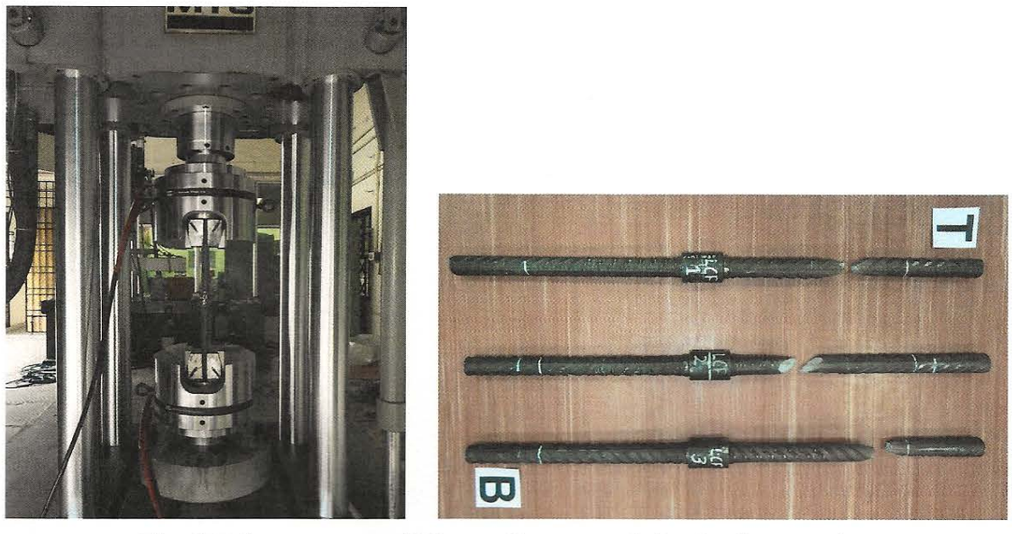


Fig. 5 Failure pattern of 32 mm diameter reinforcing bar couplers observed during static tensile tests after low cycle fatigue tests

5.0 CONCLUSIONS

Based on the low cycle fatigue tests and static tensile tests carried out on three numbers of reinforcing bar couplers of 32 mm diameter, the following conclusions are drawn.

- The reinforcing bar couplers of 32 mm diameter withstood 10,000 cycles of specified loading in the stress range of +173 MPa to -173 MPa without any failure.
- The average ultimate tensile strength obtained for 32 mm diameter reinforcing bar couplers from the static tensile tests carried out after low cycle fatigue tests was 710.59 MPa respectively.
- The failure at the end of static tensile tests was observed to be away from the coupler location for all the specimens tested.

6.0 ACKNOWLEDGEMENT

The authors thank the Technical Staff of Fatigue & Fracture Laboratory (FFL) and Advanced Materials Laboratory (AML) of CSIR-SERC for their cooperation in carrying out the experimental investigations.

7.0 REFERENCE

[1] IS 16172: 2014, Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification, Bureau of Indian Standards, New Delhi

CSIR–SERC
ENGINEERING SUSTAINABLE STRUCTURES

Restricted

R&D 03-CNP 6658-CR-Final
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High Cycle Fatigue Studies on Reinforcing Bar Couplers

for

M/s. Kamar Infrastructure Private Limited
Kamar Estate, Taloja MIDC
Panvel, Raigad - 410 208
Navi Mumbai

M. Saravanan
S. Vishnuvardhan

CSIR - Structural Engineering Research Centre
(Council of Scientific & Industrial Research)
CSIR Campus, Taramani, CHENNAI - 600 113

CSIR - Structural Engineering Research Centre	Document Sheet	Class: Restricted
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Report Title	High Cycle Fatigue Studies on Reinforcing Bar Couplers	Report No.: **R&D 03-CNP 6658-CR-Final**
Project Team/ Author(s)	M. Saravanan and S. Vishnuvardhan	
Area	Fatigue and Fracture	
Type	Consultancy	Month and Year: April 2022
Name and Address of the Sponsor	M/s. Kamar Infrastructure Private Limited Kamar Estate, Taloja MIDC, Panvel Raigad - 410 208, Navi Mumbai	
Keywords	Reinforcing bar coupler, high cycle fatigue test	Contents Text : 10 Tables : 3 Figures : 12 Reference : 1 Appendices : -- Total pages : 16

Abstract:

High cycle fatigue tests on 20 mm, 25 mm and 32 mm diameter reinforcing bar couplers were carried out as per Indian Standard Code of Practice IS 16172 : 2014 "Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification". The reinforcing bars were of Fe 550 D grade. The batch numbers of 20 mm, 25 mm and 32 mm diameter reinforcing bar couplers were 20KI3104, 25KI2026 and 32KI1039 respectively. Three samples were tested in each diameter. High cycle fatigue tests were carried out under constant amplitude sinusoidal cyclic loading with a maximum stress equal to $0.60f_y$ and stress range of 60 MPa using a ±500 kN capacity UTM. Where f_y is the yield strength of the reinforcing bar. The maximum and minimum stress values for the reinforcing bar couplers were 330 MPa and 270 MPa respectively. The tests were terminated upon fracture of the test piece or reaching the specified number of cycles of 2,000,000 without fracture. All the reinforcing bar couplers tested withstood 2,000,000 cycles of specified loading without any failure and complied with IS 16172 : 2014 specification. This report gives details of the studies carried out and the test results.

High Cycle Fatigue Studies on Reinforcing Bar Couplers

1.0 INTRODUCTION

M/s. Kamar Infrastructure Private Limited, Navi Mumbai approached CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai for carrying out high cycle fatigue studies on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters (three samples in each diameter). This report presents the results of high cycle fatigue tests carried out on 20 mm, 25 mm and 32 mm diameter reinforcing bar couplers at Fatigue & Fracture Laboratory of CSIR-SERC, Chennai.

2.0 SCOPE OF THE PROJECT

- High cycle fatigue tests on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters (three samples in each diameter) have to be carried out as per IS 16172 : 2014. The reinforcing bar couplers have to be subjected to two million cycles of loading with a maximum stress of $0.60f_y$ and stress range of 60 MPa. Where f_y is the yield strength of the reinforcing bar. The frequency of loading cycles has to be between 1 Hz and 200 Hz and shall be constant during the fatigue test. The test has to be terminated upon fracture of the test piece or reaching the specified number of cycles of 2,000,000 without fracture.

3.0 EXPERIMENTAL STUDIES

Experimental studies were carried out on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters using ±500 kN fatigue rated UTM at the Fatigue & Fracture Laboratory of CSIR-SERC, Chennai.

3.1 High Cycle Fatigue Tests

High cycle fatigue tests were carried out on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters (three samples in each diameter) as per IS 16172 : 2014. The reinforcing bars were of Fe 550 D grade. The batch numbers of 20 mm, 25 mm and 32 mm diameter reinforcing bar couplers were 20KI3104, 25KI2026 and 32KI1039 respectively. The reinforcing bar couplers were subjected to two million cycles of loading

with a maximum stress equal to $0.60f_y$ and stress range of 60 MPa. Where f_y is the yield strength of the reinforcing bar. The test was terminated upon fracture of the test piece or reaching the specified number of cycles of 2,000,000 without fracture. The frequency of loading was maintained in the range of 10 Hz to 20 Hz. During the high cycle fatigue tests, maximum and minimum load values were monitored and time history data was acquired using a high speed data acquisition system at regular intervals of loading cycles.

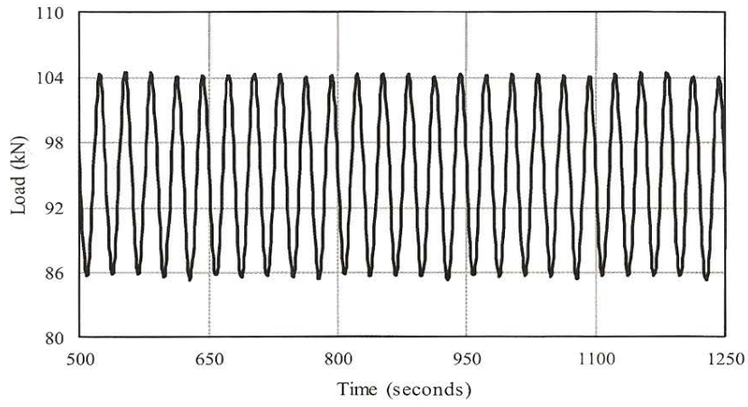
4.0 RESULTS AND DISCUSSION

4.1 20 mm Diameter Reinforcing Bar Couplers

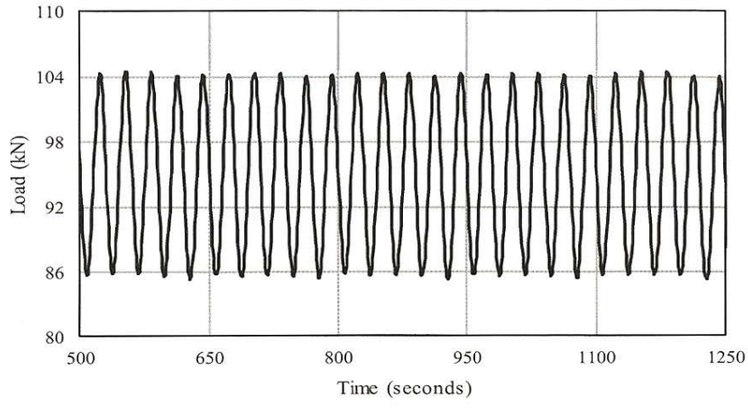
The reinforcing bar couplers were subjected to two million cycles of loading with a maximum stress of 330 MPa ($0.60f_y$) and stress range of 60 MPa. The maximum and minimum load values for each reinforcing bar coupler were evaluated based on the actual cross-sectional area to produce stress values of 330 MPa and 270 MPa on the reinforcing bar coupler. Figure 1 shows typical set-up for high cycle fatigue test on 20 mm diameter reinforcing bar coupler and Fig. 2 shows close-up view of high cycle fatigue test on 20 mm diameter reinforcing bar coupler. Figure 3 shows typical load versus time plots for reinforcing bar couplers of 20 mm diameter. All the three samples withstood 2,000,000 cycles of specified loading without any failure and complied with IS 16172 : 2014 specification.

Fig. 1 Set-up for high cycle fatigue test on a reinforcing bar coupler of 20 mm diameter

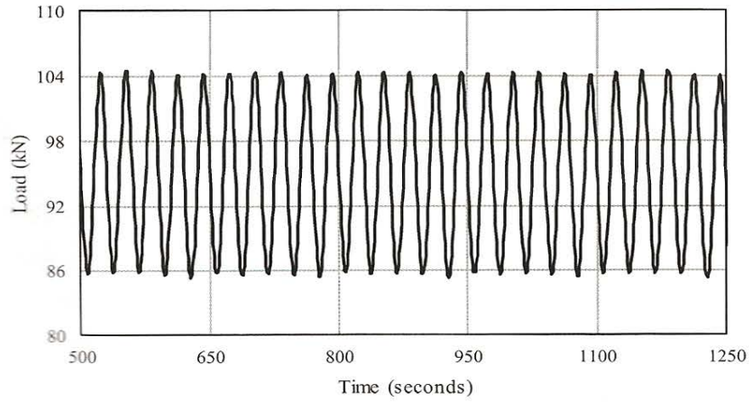
Fig. 2 Close-up view of high cycle fatigue test on a reinforcing bar coupler of 20 mm diameter



(a) Specimen ID: KIPL/HCF/20-1



(b) Specimen ID: KIPL/HCF/20-2



(c) Specimen ID: KIPL/HCF/20-3

Fig. 3 Load versus time plots for reinforcing bar couplers of 20 mm diameter

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Table 1 gives the results of high cycle fatigue tests on 20 mm diameter reinforcing bar couplers. Figure 4 shows reinforcing bar couplers of 20 mm diameter after completion of high cycle fatigue tests.

Table 1 Results of high cycle fatigue tests on 20 mm diameter reinforcing bar couplers

Specimen ID	Length of coupler (mm)	Diameter of coupler (mm)	Load corresponding to maximum stress (kN)	Load corresponding to minimum stress (kN)	No. of cycles completed	Remarks
KIPL/HCF/20-1	45.50	36.00	103.67 (Tensile)	84.82 (Tensile)	2,000,000	Passed
KIPL/HCF/20-2	45.50	36.20			2,000,000	Passed
KIPL/HCF/20-3	45.20	36.00			2,000,000	Passed

Fig. 4 Reinforcing bar couplers of 20 mm diameter after completion of high cycle fatigue tests

4.2 25 mm Diameter Reinforcing Bar Couplers

The reinforcing bar couplers were subjected to two million cycles of loading with a maximum stress of 330 MPa ($0.60f_y$) and stress range of 60 MPa. The maximum and minimum load values for each reinforcing bar coupler were evaluated based on the actual cross-sectional area to produce stress values of 330 MPa and 270 MPa on the reinforcing bar coupler. Figure 5 shows typical set-up for high cycle fatigue test on 25 mm diameter reinforcing bar coupler and Fig. 6 shows close-up view of high cycle fatigue test on 25 mm diameter reinforcing bar coupler. Figure 7 shows typical load versus time plots for

reinforcing bar couplers of 25 mm diameter. All the three samples withstood 2,000,000 cycles of specified loading without any failure and complied with IS 16172 : 2014 specification. Table 2 gives the results of high cycle fatigue tests on 25 mm diameter reinforcing bar couplers. Figure 8 shows reinforcing bar couplers of 25 mm diameter after completion of high cycle fatigue tests.

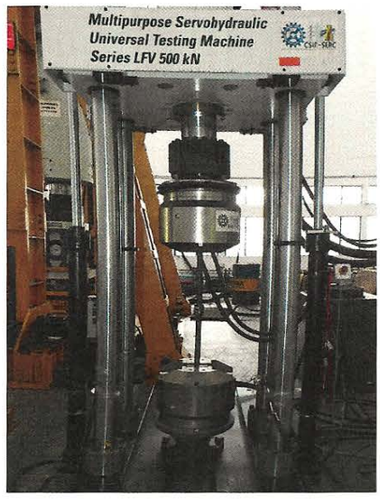


Fig. 5 Set-up for high cycle fatigue test on a reinforcing bar coupler of 25 mm diameter

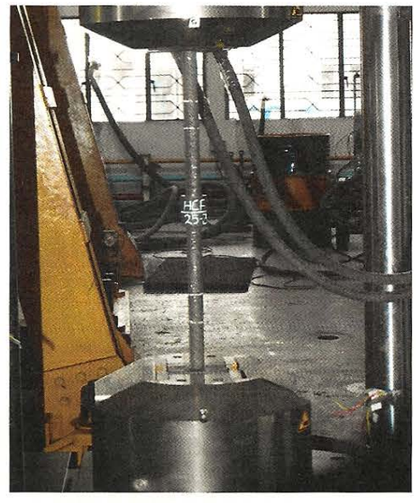
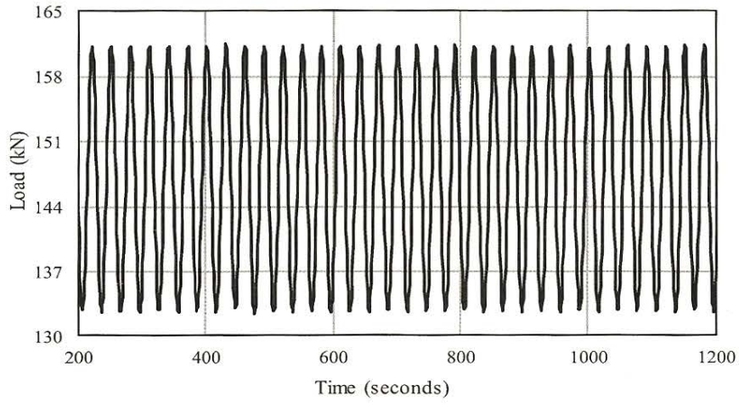
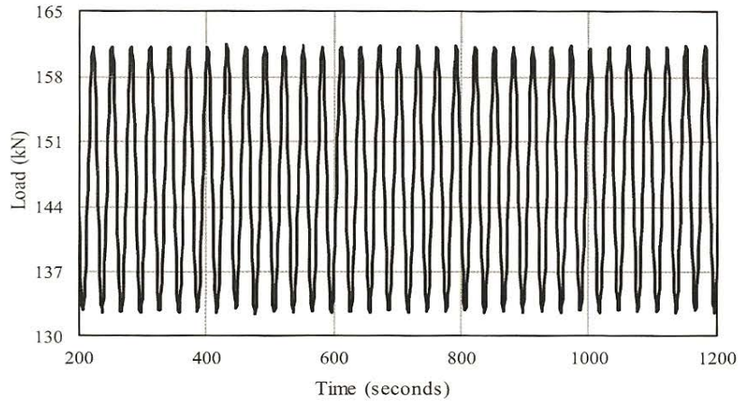


Fig. 6 Close-up view of high cycle fatigue test on a reinforcing bar coupler of 25 mm diameter

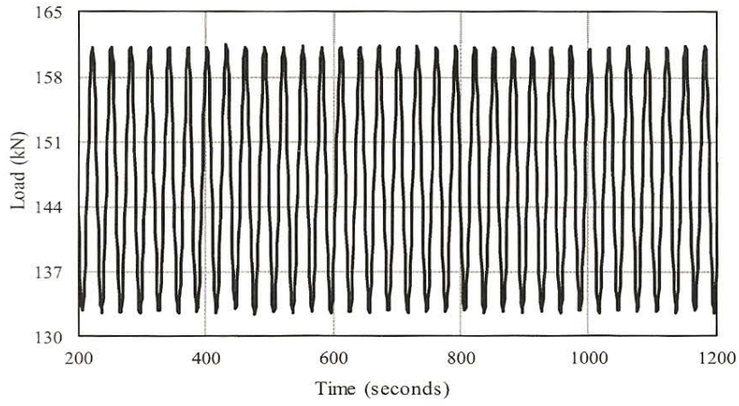


(a) Specimen ID: KIPL/HCF/25-1

Fig. 7 Load versus time plots for reinforcing bar couplers of 25 mm diameter



(b) Specimen ID: KIPL/HCF/25-2



(c) Specimen ID: KIPL/HCF/25-3

Fig. 7 Load versus time plots for reinforcing bar couplers of 25 mm diameter

Table 2 Results of high cycle fatigue tests on 25 mm diameter reinforcing bar couplers

Specimen ID	Length of coupler (mm)	Diameter of coupler (mm)	Load corresponding to maximum stress (kN)	Load corresponding to minimum stress (kN)	No. of cycles completed	Remarks
KIPL/HCF/25-1	56.20	45.40	161.98 (Tensile)	132.53 (Tensile)	2,000,000	Passed
KIPL/HCF/25-2	56.10	45.40			2,000,000	Passed
KIPL/HCF/25-3	56.10	45.30			2,000,000	Passed

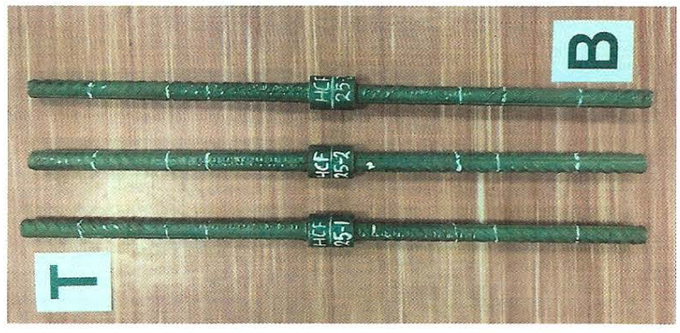


Fig. 8 Reinforcing bar couplers of 25 mm diameter after completion of high cycle fatigue tests

4.3 32 mm Diameter Reinforcing Bar Couplers

The reinforcing bar couplers were subjected to two million cycles of loading with a maximum stress of 330 MPa ($0.60f_y$) and stress range of 60 MPa. The maximum and minimum load values for each reinforcing bar coupler were evaluated based on the actual cross-sectional area to produce stress values of 330 MPa and 270 MPa on the reinforcing bar coupler. Figure 9 shows typical set-up for high cycle fatigue test on 32 mm diameter reinforcing bar coupler and Fig. 10 shows close-up view of high cycle fatigue test on 32 mm diameter reinforcing bar coupler.

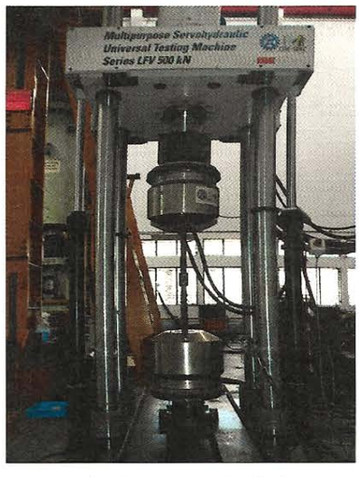


Fig. 9 Set-up for high cycle fatigue test on a reinforcing bar coupler of 32 mm diameter

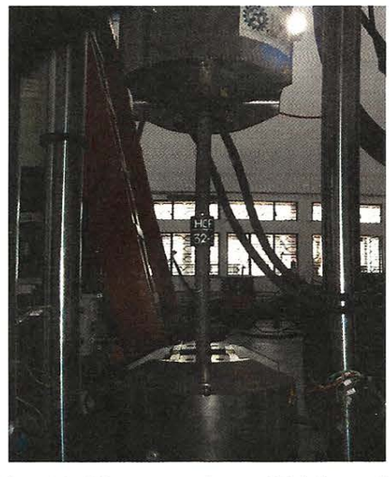
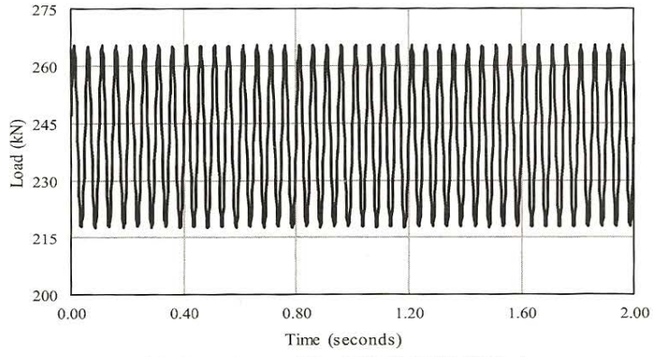
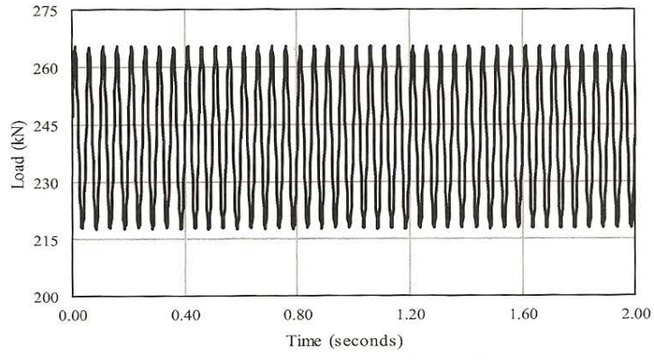


Fig. 10 Close-up view of high cycle fatigue test on a reinforcing bar coupler of 32 mm diameter

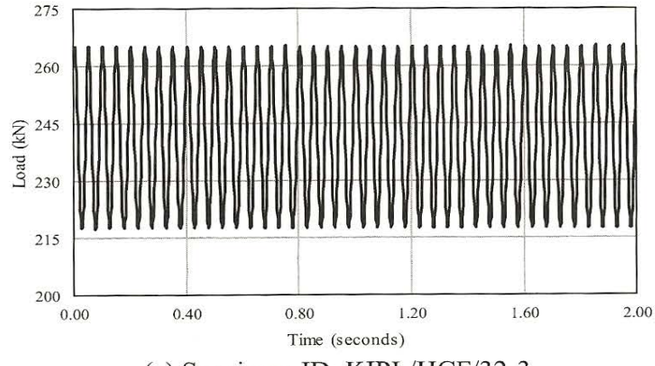
Figure 11 shows typical load versus time plots for reinforcing bar couplers of 32 mm diameter. All the three samples withstood 2,000,000 cycles of specified loading without any failure and complied with IS 16172 : 2014 specification. Table 3 gives the results of high cycle fatigue tests on 32 mm diameter reinforcing bar couplers. Figure 12 shows reinforcing bar couplers of 32 mm diameter after completion of high cycle fatigue tests.



(a) Specimen ID: KIPL/HCF/32-1



(b) Specimen ID: KIPL/HCF/32-2



(c) Specimen ID: KIPL/HCF/32-3

Fig. 11 Load versus time plots for reinforcing bar couplers of 32 mm diameter

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Table 3 Results of high cycle fatigue tests on 32 mm diameter reinforcing bar couplers

Specimen ID	Length of coupler (mm)	Diameter of coupler (mm)	Load corresponding to maximum stress (kN)	Load corresponding to minimum stress (kN)	No. of cycles completed	Remarks
KIPL/HCF/32-1	72.70	53.40	265.40 (Tensile)	217.14 (Tensile)	2,000,000	Passed
KIPL/HCF/32-2	71.00	53.10			2,000,000	Passed
KIPL/HCF/32-3	71.40	53.30			2,000,000	Passed

Fig. 12 Reinforcing bar couplers of 32 mm diameter after completion of high cycle fatigue tests

5.0 SUMMARY AND CONCLUSIONS

High cycle fatigue tests were carried out on reinforcing bar couplers of 20 mm, 25 mm and 32 mm diameters (three samples in each diameter) as per IS 16172 : 2014. The reinforcing bar couplers were subjected to two million cycles of loading with a maximum stress of 330 MPa ($0.60f_y$) and stress range of 60 MPa. All the reinforcing bar couplers tested withstood 2,000,000 cycles of specified loading without any failure and complied with IS 16172 : 2014 specification.

6.0 ACKNOWLEDGEMENT

The authors thank the Technical Staff of Fatigue & Fracture Laboratory (FFL) of CSIR-SERC for their cooperation in carrying out the experimental investigations.

7.0 REFERENCE

[1] IS 16172: 2014, Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification, Bureau of Indian Standards, New Delhi

	DESCRIPTION	PROCESS	TOOLS	ACCEPTANCE CRITERIA	RECORDS
STEP 1	PROCUREMENT OF RAW MATERIAL	DIMENSION CHECK	VERNIER CALIPER	SHOULD CONFIRM TO COUPLER O.D. DIMENSION	MANUFACTURER RAW MATERIAL MILL TC WITH OD DIMENSION
		CHEMICAL CHECK OF RAW MATERIAL	TEST CERTIFICATE FROM RAW MATERIAL	CONFIRMING TO CHEMICAL COMPOSITION	MANUFACTURER RAW MATERIAL MILL TC
STEP 2	CUTTING	LENGTH CUTTING ACCORDING TO REQUIRED SIZE	VERNIER CALIPER	CONFIRM TO COUPLER LENGTH	IN HOUSE DIMENSIONAL CHECK DOCUMENTS
STEP 3	MACHINING TO DIMENSION	DIMENSION CHECK ON O.D, LENGTH & THREAD DIMENSION	VERNIER, THREAD PLUG GAUGE	CONFIRM TO COUPLER DIMENSION	IN HOUSE MARKING NUMBER DOCUMENTS
STEP 4	MARKING OF COUPLER IDENTIFICATION NUMBER	TRACE TO HEAT NO.OF MATERIAL	VISUAL CHECK AGAINST RECORDS OF CHEMICAL TEST	TRACE TO IDENTIFICATION LIST RECORD	IN HOUSE MARKING NUMBER DOCUMENTS
STEP 5	FINAL INSPECTION	CHECKING GO AND NO GO	GO AND NO GO GAUGE	CHECKING 1 FOR EVERY 100 NOS RANDOMLY	CERTIFICATE
STEP 6	TRACEABILITY REPORT	DOCUMENT AUDIT	PROCESS RECORD SHEETS	MATCHING FROM PURCHASE TILL MARKING ALL FOR TRACEABILITY WITH REF. MTC	OLD PROCESS DOCUMENTS FOR TRACEABILITY
STEP 7	PACKING	PLACE COUPLERS INSIDE PAPER BOXES	ADHESIVE TAPE FOR PACKING	TO BE PACKED AS PER PAPER BOX DIMENSION	BOX DOCUMENTS

	DESCRIPTION	RECORDS	MACHINE	TOOLS	ACCEPTANCE CRITERIA	TESTING FREQUENCY	REMARKS
STEP 1	RECEIPT OF BARS	CHECK BAR THREADING SCHEDULE	------	------	SHOULD CONFIRM WITH BBS	NOT APPLICABLE	RECEIVED BARS WILL AGAIN CHECKED WHILE DELIVERY
STEP 2	CUTTING OF BARS	------	CUTTING MACHINE / SHEAR CUT MACHINE	VISUAL INSPECTION FOR PERPENDICULARITY / ANGLE GAUGE	------	3/4 AFTER EACH CHANGE OF DIA. BLADE THERE AFTER EVERY 25/30 NOS.	VISUAL INSPECTION
STEP 3	PRESSING OF REBARS	DIE HEAD PRESSURE CHART FOR DIFFERENT DIAMETERS	PRESSURE MACHINE / COLD FORGING MACHINE	VISUAL READING OF PRESSURE	PRESSURE CONFIRMING TO PRESSURE CHARTS	CHECKING OF PRESSURE SETTING PER SHIFT	FOR EACH DIA REBAR PRESSED UP TO DIE POCKET ONLY, HENCE NO REGULAR CHECK
STEP 4	THREADING OF REBAR	CHECK DIA & LENGTH OF THREADS REFER COUPLERS DIAMETERS CHART OR THREADING SCHEDULE	THREADING MACHINE	GO GAUGE, NO-GO GAUGE THREAD CHASER FOR DIFFERENT SIZE PITCH	GO SHOULD COUPLE TO THREADS, NO-GO SHOULD NOT COUPLE TO THEADS	3/4 CHESS AFTER EVERY CHANGE IN DIAMETER OR DIE CHANGE THERE AFTER EVERY 25/30 NOS.	GO & NO-GO GAUGE FOR CHECKING DIAMETER CONFORMANCE
STEP 5	TESTING OF REBAR COUPLER JOINT	REFER TENSILE TESTING DOCUMENTS	(UNIVERSAL TESTING MACHINE)	RECORD READING ON U.T.M FOR YIELD STRESS & FINAL BREAKING LOAD. DERIVE BREAKING STRESS FROM THE AVAILABLE DATA	BREAKING STRESS SHOULD EXCEED AT 10% OF YEILD STRESS OF TMT REBAR	1 TEST AFTER 10,000 JOINT BY THIRD PARTY DONE BY CLIENT	------

Sr. #	Name of the Customers	Project Name	Project Type	Locations
1	Afcons Infrastructure Limited	Chenab Bridge	KRCL Bridge	Jammu & Kashmir, India
2		Annaram Barrage	Barrage	Hyderabad, India
3		Mumbai Pune Expressway	National Highway	Mumbai, India
4		Samruddhi Express Highway	National Highway	Mumbai, India
5	Ansari Erectors Engineers & Contractor	NHAI, PIU- Devbhumidwarka	National Highway	Gujarat, India
6	Capacite Infraprojects Limited	Kalpatru Magnus	Residential Building	Mumbai, India
7		One Mahalaxhmi	Residential Building	Mumbai, India
8		Kohinoor Square	Commercial Building	Mumbai, India
9		25 South Wadhwa	Residential Building	Mumbai, India
10		ABIL Mansion	Residential Building	Mumbai, India
11		Raymond Aspirational Tower	Residential Building	Mumbai, India
12		Sheth-One Marina	Residential Building	Mumbai, India
13		Piramal Mahalaxmi	Residential Building	Mumbai, India
14		Magus-Four Season	Residential Building	Mumbai, India
15		JJ Hospital	Commercial Building	Mumbai, India
16		Oberoi Enigma	Residential Building	Mumbai, India
17	Gammon Engineers & Contractors Pvt. Ltd.	NH-04 Highway	National Highway	Goa, India
18	Greenworld Construction Pvt. Ltd.	Agua	Residential Building	Mumbai, India
19		Nebula	Residential Building	Mumbai, India
20	ITD Cementation India Limited	Pune International Airport	Airport	Pune, India
21		Tiruchirappalli International Airport	Airport	Tamil Nadu, India
22		Mangalore Refinery and Petrochemicals	Rehabilitation	Mangalore, India
23		Upgradation of Liquid Jetty	Marine Project	Gujarat, India
24	J. Kumar Infrastructure Limited	Vahal Casting Yard	Casting Yard	Mumbai, India
25		Mumbai Metro Line 2	Metro	Mumbai, India
26		Lodha	Residential Building	Mumbai, India
27	Jaatvedas Construction Co. Pvt. Ltd.	Northern Lights by Shapoorji Pallonji	Residential Building	Mumbai, India
28		Sirius Land Holding	Residential Building	Mumbai, India
29		One Avighna Park	Residential Building	Mumbai, India
30	Larsen & Toubro Ltd. Construction	Government Medical College	Institutional Building	West Bengal, India
31		Medigadda Barrage	Barrage	Telangana, India
32		KRC Hetero Towers	Residential Building	Hyderabad, India
33		Dwarka Expressway	National Highway	Haryana, India
34		L&T Tech Park	Commercial Building	Bengaluru, India

Sr. #	Name of the Customers	Project Name	Project Type	Locations
35	Larsen & Toubro Ltd. Construction	Wipro SEZ	Commercial Building	Bengaluru, India
36		Piramal Aranya	Residential Building	Mumbai, India
37		Chalet Hotel	Commercial Building	Mumbai, India
38		Thane Creek Bridge 3	National Highway	Mumbai, India
39		Sitamma Sagar Multi Purpose Project	Barrage	Telangana, India
40		UKTL Project	Commercial Project	Kerala, India
41		Chennai Metro	Metro	Chennai, India
42		Drinking Water Project	Water Project	Gujarat, India
43		Reliance Office	Commercial Building	Mumbai, India
44		Prestige Jasdan Classic	Residential Building	Mumbai, India
45	Megha Engineering & Infrastructure Ltd.	MEIL - GANGA Drinking Water Project	Water Project	Bihar, India
46	Navayuga Engineering Company Limited	NECL - Kalpatru Project	Residential Building	Andhra Pradesh, India
47		Polavaram Irrigation Project	Barrage	Andhra Pradesh, India
48	Shapoorji Pallonji & Company Pvt. Ltd.	Guwahati International Airport	Airport	Guwahati, India
49		Ascendas - IT Park	Commercial Building	Hyderabad, India
50		Northern Lights by Shapoorji Pallonji	Residential Building	Mumbai, India
51		Guwahati Convention Center	Commercial Building	Guwahati, India
52	Simplex Infrastructure Limited	Bangalore Metro	Metro	Bengaluru, India
53	Shankarnarayan Construction Pvt. Ltd.	TBWC Aqueduct	Aqueduct	Karnataka, India
54	SNB Infrastructure Pvt. Ltd.	Dhirubhai Ambani Institute	Institutional Building	Mumbai, India
55	Thakur - Mhatre JV Pvt. Ltd.	Mumbai Trans Harbour Link Project (Package-3)	National Highway	Mumbai, India
56	Vaishnovi Construction	Chanakha - Korata Barrage	Barrage	Hyderabad, India
57	G R Infraprojects Limited	Bangalore Metro	Metro	Bangalore, India
58	Ramkrishy Infrastructure Pvt. Ltd.	Government Hospital	Commercial Building	Bangalore, India
59	Gayatri Projects Ltd.	Hydrabad-Bhopalpatnam	National Highway	Hyderabad, India
60	MCCS Infra Pvt. Ltd.	Srinagar-Baramulla Rail Link Project	Railway Project	Jammu & Kashmir, India
61	Tattva & Mittal Lifespaces Pvt. Ltd.	Bombay 11	Residential Building	Mumbai, India
62	NCC Limited	Gaya Rubber Dam Project	Rubber Dam	Patna, India
63	IL&FS Engineering & Construction Co. Ltd.	Bangalore Metro	Metro	Bangalore, India
64	The Civil Engineers	Nuclear Power Plant	Nuclear Power Plant	Bangladesh
65	Vishwa Samudra Engineering	Kerela Package 2	National Highway	Kerala, India

ISO 9001 : 2008
Quality Management System
Cert. No. 8490

JAS-ANZ

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

संदर्भ संख्या :
Ref. No. :

दिनांक :.....
Date :.....

AAI/GHY/AGM (E-C)-III/NITB/18-19/167

20-08-2018

To,
M/s Shapoorji Pallonji and Company Private Ltd,
P.S Srijan Corporate Park, Tower-1, 7th floor,
Plot No. G-2, Block- GP, Sector-V,
Salt Lake, Kolkata- 700091,
West Bengal, India.

Name of Work: Construction of a New Integrated Terminal building at Guwahati Airport.
Sub: Approval of Vendor for Reinforcement of Coupler.

Sir,

Competent authority as agreed and hereby approves **M/s Kamar Infrastructure Private Limited, Kamar Estate, Devich Pada, Behind Deepak Nitrite Ltd. Taloja MIDC, Taluka Panvel, District Raigad-410208, Navi Mumbai, India, Email:mum@kamargroup.com"** is a vendor for Reinforcement Coupler for BOQ item No:3.9.1 to 3.9.4.

Thanking You

आदर सहित/With Regards

पी . रविशेखर/P. Ravisekhar
ए जी एम)सिविल)-III/AGM. Engg. (Civil)-III
AAI, LGBI Airport, Ghy-15
E-mail: pravisekhar@aai.aero
9283747741(M)

Internal:

1. ED (Engg) NER, AAI, CHQ,Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi-110003. (E-Mail: edengg_ner@AAI.AERO)
2. GM (Project), NITB, Guwahati, (E-Mail gmproject-ght@aai.aero)

Copy to:

1. M/s Shapoorji Pallonji and Company Pvt. Ltd. Site office, LGBI Airport Guwahati-15 (E-mail: saikat.dey@shapoorji.com)
2. M/s AECOM Asia Company Ltd. Sh. Dinesh Kr. Vats (Project Director) SOS Village Road NITB Project, LGBI Airport, site office Guwahati, Assam (E-mail: DINESH.VATS@AECOM.COM)
3. Kamar Infrastructure Private Limited. 20, Husain Patel Marg, Wadi Bunder Mumbai-400010 India, (E-mail: info@kamargroup.com).
4. Prasad S. Patil, SM (C) (E-mail: prasadspatil@AAI.AERO)
5. Kallol Debbarma, SM (Engg-Civil) (E-mail: Kallold@AAI.AERO)
6. Tathagata Paul, Jr. Ex (Civil) AAI, LGBI Airport, Guwahati-15 (E-mail: tathagata@aai.aero)

क्षेत्रीय कार्यपालक (उत्तर पूर्वी क्षेत्र) का कार्यालय,
O/o General Manager (Engg. Project)
New Terminal Building Project

क्षेत्रीय मुख्यालय, उत्तर पूर्वी क्षेत्र
Regional Headquarter, North Eastern Region,

गुवाहाटी-781015(असम)
Guwahati-781015 (Assam)

दूरभाष: 0361-2841324
Phone: 0361-2841324

फैक्स: 0361-2840042
Fax: 0361-2840042

CIN No. U74899DL 1995G0I068150

दूरभाष Tel. : 23417910/12
फैक्स Fax : 23417921

दिल्ली मेट्रो रेल कॉर्पोरेशन लि०
DELHI METRO RAIL CORPORATION LTD.

(भारत सरकार एंव दिल्ली सरकार का संयुक्त उपक्रम)
(A JOINT VENTURE OF GOVERNMENT OF INDIA AND GOVT. OF DELHI)

No. DMRC/Corp/20/Design/001/99 **November 27, 2017**

Kamar Infrastructure Pvt. Ltd.,
Kamar Estate, Devicha Pada,
Behind Deepak Nitrite Ltd.,
Taloja MIDC, Taluka Panvel,
Distt. Raigad – 410 208
Mumbai

Kind Attn:- Mohd. Mubeen

Sub:- Approval to Kamar Infrastructure Pvt. Ltd. for supplying of TMT Bar Coupler for metro rail projects.

Ref:- Your letter no. 01/DMRC/011 dated November 24, 2017

Dear Sir,

This has reference to your letter and technical documents/credentials submitted by you to this office for approval of your product **(TMT Bar Coupler)** for Delhi Metro Rail Projects/Metro Rail Projects in various other cities.

While going through the credentials, it is observed that **M/s Kamar Infrastructure Pvt. Ltd.,** an ISO 9001:2015 certified company, has supplied its product/s **(TMT Bar Coupler)** to numbers of esteemed projects in Delhi and other cities.

We have **'no objection'** in case you **(M/s Kamar Infrastructure Pvt. Ltd.)** supply your product viz; **TMT Bar Coupler** for our ongoing and upcoming metro rail projects in Delhi NCR/metro rail projects in various other cities, subject to the suitability and fulfillment with the technical requirements.

Since our ongoing Phase-III project has already reached an advanced stage of completion, the name of **M/s Kamar Infrastructure Pvt. Ltd.** will be incorporated in our Approved list of manufacturers/vendors in Phase-IV project, to be commenced shortly.

The quality of the product/products should meet the required strength and other DMRC specifications. However, the Corporation wholly reserves the rights to revoke/suspend the enlistment on the basis of review any time.

Contd . . .

(मेट्रो भवन, फायर ब्रिग्रेड लेन, बाराखम्बा रोड़, नई दिल्ली-110001)
Metro Bhawan, Fire Brigade Lane, Barakhamba Road, New Delhi-110001

This approval has been accorded on the condition of maintaining of quality intact. In case of any negative feedback and deterioration in quality, this approval will stand cancelled automatically. Mandatory checks about the quality will also be carried out as and when required so as to satisfy the site/s about the quality and the performance.

The above authorization, however, does not bind the Corporation in any way for use of your products/services in the works.

Yours faithfully,

(Rajan Kataria)
Executive Director/Technical

RAJAN KATARIA
Executive Director (Technical)
Delhi Metro Rail Corporation Ltd.
Metro Bhawan, Fire Brigade Lane,
Barakhamba Road, New Delhi-110001

ನಮ್ಮ ಮೆಟ್ರೋ namma metro

ಬೆಂಗಳೂರು ಮೆಟ್ರೋ ರೈಲ್ ನಿಗಮ ನಿಯಮಿತ
(ಸಹಭಾಗಿತ್ವದ – ಕರ್ನಾಟಕ ಸರ್ಕಾರ ಹಾಗೂ ಕೇಂದ್ರ ಸರ್ಕಾರ ಉದ್ಯಮ)
ನೊಂದಾಯಿತ ಕಚೇರಿ : ಬಿ.ಎಂ.ಟಿ.ಸಿ. ಕಾಂಪ್ಲೆಕ್ಸ್, 3ನೇ ಮಹಡಿ, ಕೆಂಗಲ್ ಹನುಮಂತಯ್ಯ ರಸ್ತೆ, ಶಾಂತಿನಗರ
ಬೆಂಗಳೂರು – 560 027, ಭಾರತ

Bangalore Metro Rail Corporation Ltd.
(A Joint Venture of Government of Karnataka & Government of India)
Regd. Office : B.M.T.C. Complex, 3rd Floor, K.H. Road, Shanthinagar, Bangalore - 560 027. INDIA

No: BMRCL/PH2/CE(R2B)/SOMA/2017/ 1108/9894 Date: 12.10.2017

M/s. Soma Enterprise Ltd
Survey No. 11, Ganekallu Village,
Banashankari Hobli, 6th Stage,
Near Basaweshwara Temple,
Bangalore-560060

Dear Sir,

Sub: Construction of Elevated Structures of Length 4.869 km (approx) from Pattanagere Station to be beginning of Challagatta Depot including 2 Nos. of Elevated Metro Stations viz Mailsandra Station and Kengeri station in the extension on west side of E-W Corridor of Bangalore Metro Rail Project,Phase-2. **Regarding Approval for using Rebar splicing system of brand M/s KAMAR infrastructure Pvt. Ltd**

Ref: 1. LOA No. : BMRCL/PH2/R2 EXT/R2B Via & Stns/2015/LOA Date 09/03/2016.
2. SOMA Letter no. SOMA/Phase-2/R2B/BMRCL/17/0657/6123 dated 06.09.2017.

The submitted documents have been verified, and we have no objection if the Rebar splicing is used at Mylasandra Station location, with the following comments:

a) Rebar coupler shall be sent for tests and the test results may be produced for further scrutiny.
b) The Re bar coupler from the said manufacturer shall be used only for Mylasandra station works.
c) No mix and match between already threaded Reinforcement from other sources shall be ensured.
d) All threading shall be identified and segregated for respective sources.
e) Only parallel threading shall be ensured.

Thanking you,

12 OCT 2017

Yours Sincerely,

12-10-17

(Vijay Kumar Maurya)
CE(R2,4B)/Phase-2

o/c

Phone : +91-(0)80-2296 9300 / 22969301, Fax : + 91-(0)80-2296 9222, E-mail : bmrcl@dataone.in Web : www.bmrc.co.in
CIN No. : U16236KA1994GOI016286

PADECO | MEINHARDT

AUTHORITY ENGINEER FOR THANE CREEK BRIDGE (TCB-III)

TCB-III

Ref: PMC/MSRDC/AE-TCB-III/37009/2019/093 May 20, 2019

To
The Project Manager,
Larsen & Toubro Ltd. HCIC
Project Office,TCB-III
Flat 1102,Plot no.40
Krishna Regency / Vivek Tower
Sector 30, Vashi, Navi Mumbai-400705
India

Sub: Construction of Major Bridges across Thane Creek (TCB-III) on Sion-Panvel Road in the state of Maharashtra under EPC mode.

-Regarding submission of Test Reports of third party laboratory Couplers -Sanfield / Kamar Infra and Sonic tube- Sanfield.

Ref: 1. L&T Letter No. LTC/HCIC/TCB III/PADECO/AE/Vol.II / 237 dated 30.01.2019 (Sonic Tubes- Sanfield)
2. PADECO Letter PMC/MSRDC/AE-TCB-III/37009/038 dated 07.02.2019
3. L&T Letter No. LTC/HCIC/TCB III/PADECO/AE/Vol.II / 272 dated 20.03.2019 (Coupler-Kamar Infra)
4. L&T Letter No. LTC/HCIC/TCB III/PADECO/AE/Vol.II / 273 dated 20.03.2019 (Coupler-Sanfield)
5. PADECO Letter PMC/MSRDC/AE-TCB-III/37009/071 dated 26.03.2019
6. L&T Letter No. LTC/HCIC/TCB III/PADECO/AE/Vol.II / 286 dated 08.05.2019 (Test Reports)

Dear Sir,

With reference to the above letters, the Test Reports of third-party laboratory, resubmitted along with above L&T letter are reviewed.

The test reports are found to be meeting the specifications requirements; however, you are requested to conduct the tests on the materials as and when received at site as per QAP approved manual.

Thanking you.

Yours Faithfully,

For PADECO - MEINHARDT Consortium

SR Jamkar 20/5/19

Authorised Signatory

L&T CONSTRUCTION
Thane Creek Bridge-III
RECEIVED
Date 21/5/2019
Name Amruta B. Bmayam.

CC : The Executive Engineer M.S.R.D.C. Ltd (K. Attn-Shri. Rahul Giribuwa)
– For your kind information.

Magnum Opus, 4th Floor, Shantinagar Industrial Estate, Vakola, Santacruz East
Mumbai - 400 055, India • Tel: +91-22-4543-5400 • E-mail: tcb@padeco.co.in

LEA Associates South Asia Pvt. Ltd.
Sri Ananthapuri, CP X 254/A. Onaparamba
P. O. Chirakkal, Kannur- 670011 (Kerala)
Tel: +91- 497 2774222, Mob: +91- 9946229559
Email: lasakannur1@gmail.com, www.lea.ca
Corporate Identification Number: U74899DL1993PTC055750

Ref: LASA/73808/TM/2022-23/454 Dated: 04th July,2022

To,

The Authorized Signatory,
M/s Vishwa Samudra Kannur Expressway Private Limited,
House No: - XXIII/752,
Near CSI Church, Mission Compound,
Mela Chovva, Kannur 670 006, Kerala.
Email: klpkg2@vishwanasamudra.in &
gsrao@vishwasamudra.in

Subject: Six Laning of Thaliparambha- Muzhapilangad section from km 134.650 (existing km 137.900) to km.164.958 (existing km 170.600) of NH-17 (New NH-66) (Project Length - 29.948 km) in the State of Kerala on Hybrid Annuity mode under Bharatmala Pariyojana – **Review on submission of M/s Kamar Infrastructure Private Limited Factory Visit Inspection Reports for Rebar coupler for source approval – reg.**

Reference:

1. Concessionaire letter no. VSKEPL-SO/IE/Thali-Muzha/21-22/417 date 29.06.2022

Dear Sir,

With reference to the above cited letter on the captioned subject, a factory visit has been carried out for verification of method of manufacturing process and testing facilities of the Mechanical rebar couplers by the IE along with Concessionaire representative. During the joint factory site visit conducted on 27.06.2022 to the **M/s Kamar Infrastructure Private Limited,Panvel, Dist.Raigad (Mumbai),** it is found that the manufacturing and testing facilities are found in order.

As the Source is meeting all the requirements as per IS codal provisions, we hereby accord the source approval for procuring the Rebar couplers of the above mentioned said source.

However, each batch of couplers lot shall be tested before procuring to site as mentioned in clause F-1.3 & Table 1 of IS 16172-2014, along with manufacturing test (accredited NABL lab) certificate as per codal provisions. And before placing at site, epoxy coating shall be applied.

This is for your information and further needful action.

Thanking you.

Yours Sincerely,
For LEA Associates South Asia Pvt. Ltd.

LEA ASSOCIATES SOUTH ASIA PVT. LTD. Kannur

Jagadeesh Sondur
Team Leader

Copy to:

1. **Project Director, NHAI**, PIU-Kannur, Kerala – for kind information.

eptisa Authority's Engineer for
Package 14 MUMBAI - NAGPUR Expressway

Ref: ESI-AFCONS/TL/ 310 /2020 Date:07.01 2020

To **AFCONS Infrastructure**
Attn. **Mr. Sekhar Das, Project Manager**

Copy to **Nagpur-Mumbai Super communication Expressway Ltd. (NMSCEL)**
Attn. **Mr. Hemant Jagtap, Executive Engineer**
Mr. S. K. Survase, Superintending Engineer (Nodal)

Subject: Test results to be conducted of M/s Kumar Infrastructure Pvt. Ltd. For Reinforcing Bar Couplers.

Rep: 3456/NMSCEW/TL/508/2019 dated 02.12.2019

Mr. Sekhar Das,

With reference to above subject cited, your submitted Credentials of M/s Kumar Infrastructure Pvt. Ltd. for Reinforcing Bar Couplers has been reviewed and found to be satisfactory.

However, the contractor is hereby accorded acceptance for the above source and you are advised to get third party test as per IS:16172-2014 duly witnessed by our representative prior to use the above material at site.

The right to reject the above source without any prior notice is hereby reserved, if it is not meeting the Specification.

For and on behalf of
EPTISA Servicios de Ingenieria S.L.
AE-TL
Pablo Angel Corrales Martinez,
Team Leader

for T.L
07/01/2020.

Global Head Office
Emilio Muñoz, 35-37.
28037 Madrid.
T +34 915 949 500
F +34 915 473 934

Gurgaon Office
Office No. 208 & 209, 2nd Floor,
JMD Regent Square,
M.G. Road, Gurgaon - 122002,
T +91-124-4056714

South Asia Head Office
Unit No. 1203, 12th Floor,
PS SrijanCorporate Park,
Tower 1, Block EP & GP,
Sector V, Salt Lake,
Kolkata – 700091

Project Office
Kasar Building Ground Floor,
Near VipassanaCenter,
Dhammagiri, Igatpuri,
PIN – 422 403, Maharashtra

Chennai Metro Rail Limited

(A Joint Venture of Govt. of India and Govt. of Tamil Nadu)

T. Livingstone Eliazer
Chief General Manager (PP & D)

Tel: 044 2379 2000
livingstone.eliazer@cmrl.in

Lr. No. CMRL/CON/DES/448/2022

Date: 29.10.2022

To Whomsoever it may concern

Sub: No objection to use Products of M/s Kamar Infrastructure Pvt Ltd in CMRL Projects – Reg.

****

CMRL has "No objection" in usage of the Rebar Couplers of **M/s Kamar Infrastructure Pvt Ltd** by the contractors of Chennai Metro Project, provided the quality of the products meet the specifications as stipulated in the Contract.

The approval is subject to the following conditions.

1. This approval is here by accorded on the condition of maintaining of quality as per stipulated Standards.
2. Mandatory quality checks will be carried out as and when required so as to satisfy the qualitative requirements.
3. Satisfactory performance tests to be conducted as site/approved laboratory initially & from time to as per standard practice / codes and also as directed by the Engineer in-charge.
4. In case of negative feedback or deterioration in quality, this approval will stand cancelled automatically.
5. CMRL reserves the right to suspend the usage on the basis of review any time.

However, it will not be binding on CMRL or their Contractors in any way for the usage of the above products in the project.

For Chennai Metro Rail Ltd.

T. Livingstone Eliazer 29/10/2022

CGM – Project Planning and Design

Copy to: DP/CMRL for kind information please.

CMRL Depot, Admin Building, Poonamallee High Road, Koyambedu, Chennai - 600 107.
Phone : 23792000 Fax : 23792200
Email : chennaimetrorail@cmrl.in Website : www.chennaimetrorail.org
CIN : U60100TN2007SGC065596

GAMMON

TO WHOM IT MAY CONCERN

This is hereby certified that M/s. Kamar Infra Structure Pvt. Ltd. is working at our NH-17B Road and Elevated Project as a Sub-Contractor for supplying of Rebar Coupler Sep-18. M/s. Kamar Infra Structure Pvt. Ltd has executed work of Rs. 7,20,000/-

This certificate is issued on request of M/s. Kamar Infra Structure Pvt. Ltd and shall not be used for any other purpose in the court of law.

(Authorized Signatory)

GAMMON ENGINEERS AND CONTRACTORS PRIVATE LIMITED
GAMMON HOUSE, VEER SAVARKAR MARG, P. O. BOX NO. 9129, PRABHADEVI, MUMBAI-400 025. INDIA.
Telephone : 91- 22 - 6115 3000 / 2430 6761 • Fax : 91 - 22 - 2430 0221 / 2430 0529
CIN No.: U45100MH2014PTC260191

PROJECT OFFICE ADDRESS :
JOB NO. : 2629
Ward No.3,
Main Chowk Baradari,
Post & Vill.-Seela
Distt. : Reasi
State (J&K) Pin : 182311

AFCONS INFRASTRUCTURE LIMITED
A Shapoorji Pallonji Group Company

Shapoorji Pallonji

To Whom It May Concern

This is hereby certified that M/s Kamar Infrastructure Pvt. Ltd. is working at our Katra-Dharma Konkan Railway Bridge Project as a Sub-contractor for supplying and fixing of Rebar Coupler .Upto July'17 M/s Kamar Infrastructure Pvt. Ltd. has executed work of Rs 350,000.00.

This Certificate is issued on request of M/s Kamar Infrastructure Pvt. Ltd.

(Authorized Signatory)

Regd. Office : Afcons House, 16, Shah Industrial Estate, Veera Desai Road, Azad Nagr P.O., Post Box No. 11978, Andheri(W), Mumbai-400 053.
Tel.: +91-22-6719 1000 / 2673 0042 Fax : +91-22-2673 0047 / 2673 0026 | www.afcons.com

QUALITY CERTIFICATION

Certificate of Registration

This is to certify that
The Quality Management System of

KAMAR INFRASTRUCTURE PVT. LTD.

Kamar Estate, Devicha Pada, Behind Deepak Nitrate Ltd., Taloja, Panvel, Navi Mumbai - 410208. Maharashtra, India.

has been assessed and found to be in compliance with the requirements of the standard

ISO 9001:2015

for the following scope :

Manufacture of Mechanical Splicing System & Pre-stressed Anchor System.

CERTIFICATE NO. : 22ZOCZ10380Q

ISSUED DATE : 20/08/2022
EXPIRY DATE : 19/08/2025

1ST SURVEILLANCE : 19/08/2023
2ND SURVEILLANCE : 19/08/2024

UKAC
UK ACKREDITERING CERTIFICATION LIMITED

Authorised Signatory

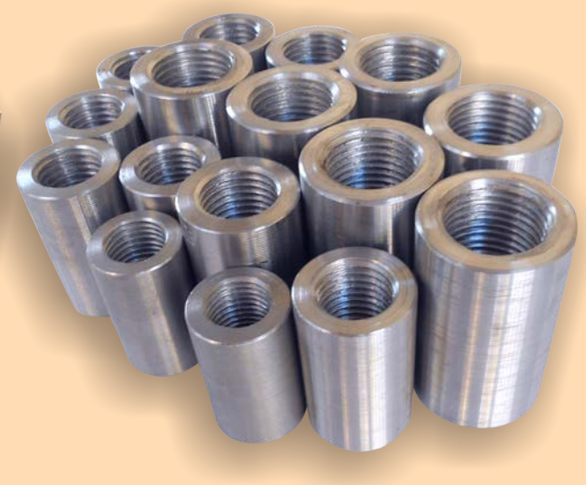
INTERNATIONAL QUALITY CERTIFICATION SERVICES UK LTD
272, Bath Street, Glasgow, G2 4JR, U.K.

Conclusion

Reason To Purchase Rebar Couplers From Kamar Infrastructure:
Using KAMAR Rebar Splicing offers various advantages over the method of overlapping of reinforcement bars. Some of the prime reasons are as follows.

- Splice rebar performs like continuous reinforcement due to mechanical joint, unlike lapping which has complete dependency on concrete.
- Steel wastage is reduced significantly, save lap length steel.
- Steel congestion is reduced due to elimination of laps .This also aides in proper flow of concrete in the critical zones and hence improves the quality of the overall structure.
- Using couplers provides superior cyclic performance as compared to lap joint it also allows greater flexibility for the designer.
- It is possible to easily verify joint strength in case of coupler as compared to lap splice where testing is cumbersome and not regulated.
- For the contractor usage of coupler reduces labour cost for installation and handling of steel. The construction schedule is improved and there is saving on valuable crane time on project.
- In last steel wastage and lap is reduced that is definitely save MONEY AND PRECIOUS TIME.



Prestigious Clients

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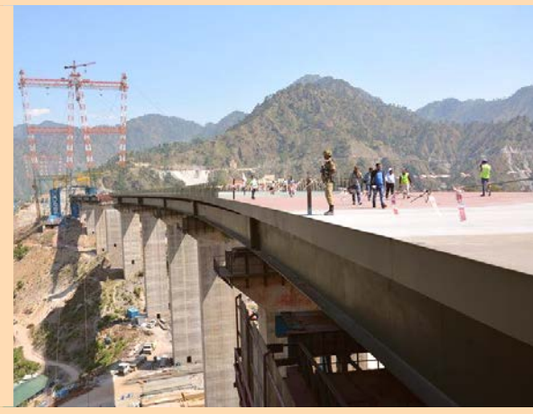

We firmly believe that Customer is our Asset

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"Our experienced project delivery teams work closely with our clients throughout the project life cycle ensuring the development runs to time and budget"

HEAD OFFICE :
Kamar Estate, Devicha Pada, Behind Deepak Nitrite Ltd,
Taloja MIDC, Panvel, Raigad – 410 208.

CORPORATE OFFICE :
20, Hussain Patel Marg, Wadi Bunder, Mazgaon, Mumbai - 400 010.

Tel.: +91 9821831097, +91-22-27410768
Email : info@kamargroup.com, minaam@kamargroup.com

www.kamarcouplers.com