

REINFORCE

JOURNAL OF THE BRITISH ASSOCIATION OF REINFORCEMENT

2022

Is cross laminated timber a Trojan Horse?

Reinforced reduction industry seminar

Successful early engagement

The need to audit operational CO₂

Coupler champions

Steel industry sets out net zero vision



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REINFORCED CONCRETE CONSTRUCTION
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NO ADDITIONAL CO₂ AND
NO ADDITIONAL COSTS**

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- FIRE RESISTANCE
- SOUND INSULATION
- FLOOD RESILIENCE
- VIBRATION DAMPENING
- MINIMUM MAINTENANCE
- STRUCTURAL ROBUSTNESS

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REINFORCE

2022

Welcome

Welcome to Reinforce 2022, the annual journal of the British Association of Reinforcement.

The heatwaves of this summer have underlined the need to address the issue of climate change. In particular, the need to reduce carbon emissions and achieve net zero. BAR members, and the steel and cement sectors as a whole, are investing in a wide range of initiatives and are developing new innovative ways of working in order to reduce their CO₂ impact with a view of reaching net zero. This includes new and better manufacturing processes, active participation in the circular economy and harnessing the potential of carbon capture. These and other ways forward to reduce carbon emissions will be examined at the BAR industry seminar Reinforced Reduction. Details are included in this issue.

While the embodied CO₂ of reinforced concrete is being addressed, there needs to be greater focus on the operational CO₂ of buildings which can equate to 80% of a building's total CO₂ impact. Here, reinforced concrete with its high level of thermal efficiency that can reduce energy usage for heating and for air conditioning plus its inherent fire resistance, flood and rot resilience, sound and vibration proofing means, that unlike other construction solutions, it does not need the additional finishes, chemicals and products that come with a hefty baggage of additional CO₂.

In addition to addressing their carbon emissions, BAR members continue to be focused on providing construction solutions and products that are cost and time effective. These include encouraging early engagement and collaboration between clients and the reinforcement sector plus providing products that increase site installation efficiency.

At the centre of this, is the British Association of Reinforcement, that aims to provide the UK reinforcement sector with a focal point where clients and supply chain can work together and 'raise the bar'.

Stephen Elliott
Chairman of the British Association of Reinforcement

The British Association of Reinforcement (BAR) is the industry association for UK Manufacturers and fabricators of steel reinforcement products including cut-and-bent and mesh.

BAR aims to add value to the reinforcement industry via market and product development, the promotion of health and safety as well as social value and environmental best practice and providing a forum to help forward the reinforced concrete industry as a whole.

T: 07802 747031 | E: condialogue@aol.com | W: uk-bar.org

FRONT AND BACK COVER IMAGE: Construction underway at EDF's Hinkley Point C nuclear power station for which BAR member Express Reinforcements is supplying 200,000 tonnes of steel reinforcement.

IS CROSS LAMINATED TIMBER CONSTRUCTION A TROJAN HORSE?

A new report has questioned the assumed environmental and structural benefits of cross laminated timber (CLT) construction. The British Association of Reinforcement (BAR) report, 'Is Cross Laminated Timber a potential Trojan Horse?', calls for the advocated benefits of CLT not to be taken at face value. Instead, they should be closely examined.



In particular, the report explains that when it comes to sustainability the belief that 'wood is good' is naively simplistic. Consideration should be given to the CO₂ emissions resulting from timber harvesting and rotting tree stumps, the energy used for the industrial process to dry

the timber and fabricate the CLT panels and the CO₂ impact of timber transportation often from several thousand miles away. In addition, there is the environmental impact of the necessary polyurethane glues, fire retardants, waterproofing and insect repellents. Furthermore, the industrial plantations grown to replace natural harvested forests are uniformed monocultures that bear little resemblance to the natural ecosystems that they have replaced.

Steve Elliott, BAR Chairman said: "When you consider the destructive harvesting, industrial manufacturing process, additional chemicals and monoculture plantations it may be that too much credit has been given to timber being a green material. Indeed, it may better to keep the 'wood' alive rather than cut it down and build with it."

Elliott also highlighted the need to consider the operational CO₂ impact of a timber building. "The embodied CO₂ used to make the materials is estimated to be 10 to 20% of a building, the rest, 80 to 90% results from its use and operation. CLT, compared to heavyweight concrete construction, has low thermal mass. This means it has limited ability to absorb heat and even out temperature fluctuations. Concrete's heavyweight thermal mass can play an active role in reducing heating and air conditioning requirements. Lightweight construction is far more reliant on mechanical air conditioning. He explained: "Air condition a CLT building and, over its lifetime, its operational CO₂ emissions will far surpass any supposed initial embodied savings. Then there are all the additional finishes and materials to provide what concrete inherently provides. The lightweight structure's need for additional fire proofing, flood resilience, sound insulation all come with additional CO₂ impacts."

Furthermore, the long-term structural performance should be considered. Elliott points to the Oregon State University school building built to showcase CLT whose floor collapsed after it became unglued. Whilst post-Grenfell, the potential fire risk of hi-rise timber buildings should not be under-estimated.

Elliott said: "Cross laminated timber is a relatively new construction material having only been developed in the 1990's. The jury should, therefore, be out on its long-term performance just as the jury should also closely examine its so-called green credentials".

To download a copy of 'Reinforced Insight: Is cross laminated timber construction a Trojan Horse?' visit: <https://bit.ly/3HCy3J4>

GUIDE TO SUCCESSFUL REINFORCEMENT EARLY INVOLVEMENT

A new guide from the British Association of Reinforcement outlines how early involvement with its reinforcement fabricator members can result in significant benefits for construction projects.



Early contractor involvement (ECI) has been widely embraced by clients and their main contractors. It encourages collaboration and innovation that result in increased efficiencies and reduced costs. BAR argues that the same reasoning should be used for the early involvement of specialist sub-contractors by the main contractors.

The placement of reinforcement is often on the critical path of the construction process. To fully involve the specialist reinforcement fabricator at the early design stage will capitalise on their experience and expertise of rationalised design, enable possible cost reductions and increased material efficiencies. In particular early

involvement will replace over-designed, wasteful designs with rational and efficient reinforcement solutions that deliver simplified detailing, checking and scheduling and ensures that stock reinforcement lengths and available fabrication plant are fully utilised.

The guide outlines the benefits of early involvement for client, contractor and fabricator. It highlights how its use enables achievement of the full benefits of prefabricated reinforcement. The use of prefabrication offers significantly increased on-site productivity benefits not least of which is reduced skilled labour requirements. Early involvement means that the most efficient prefabricated unit is designed, manufactured and delivered to site ready for fast installation.

The new guide 'Successful Reinforced Early Involvement' is available as a free download, visit: www.uk-bar.org/Industry-Guidance-Notes

BAR MEMBER LEADS SUPPORT TO **SAVE CHATHAM DOCKS**

**ArcelorMittal** BAR member ArcelorMittal is leading the support to the Save Chatham Docks Campaign and its masterplan, prepared by architects SPPARC, to create nearly 100,000 sqm of new industrial floorspace, save 800 existing jobs and create up to 2,500 new jobs at Chatham Docks making full use of the port's unique position as the only non-tidal dock in the South East.

The masterplan is an alternative to plans forwarded by freeholders Peel L&P to close the docks in 2025 and redevelop the site for high density blocks of flats. The proposed residential development has drawn criticism for already being marketed as an investment opportunity for overseas buyers rather than providing much needed housing for local people.

With Chatham being recognised as being one of the highest deprived areas in Kent, the employment

potential is a key benefit for local residents. Indeed, the employment importance of Chatham Docks is underlined by Medway Council's current development plan, The Medway Plan 2003, that protects existing employment uses for Chatham Docks and states in policy ED1: Existing Employment Areas that: "proposals for development resulting in the loss of existing industrial, business or storage and distribution development to other uses will not be permitted."

In addition to the employment opportunities, the masterplan provides for the creation of a green landscaped riverfront route linking St Mary's Island to Chatham Waters, new enhanced public green spaces and upgrading of the port facilities including the erection of new piers and upgrading of the lock gates.

The masterplan may be viewed and commented on the Save Chatham Docks website: www.savechathamdocks.co.uk

SUMMER HEATWAVE MISERY

This year's high temperatures and heatwaves has meant uncomfortable living and sleeping conditions for those living in lightweight constructed apartment blocks and high-rise flats.

Summer temperatures reached unprecedented levels. In July, the heatwave broke all records as the hottest ever temperature of 40.3°C was recorded in Coningsby, Lincolnshire.

Unlike timber and steel lightweight construction, concrete heavyweight construction can do much to mitigate the impact of heatwaves. Heavyweight construction provides innate thermal mass which can absorb heat during the day and then release it at night. Often referred to as Fabric Energy Storage (FES), thermal mass especially when used as part of an integrated passive design solution that includes building orientation, shading and natural ventilation can significantly reduce the need for air-conditioning which is expensive to run both financially and in terms of CO₂ emissions. Lightweight timber and steel buildings do not offer a comparable level of thermal mass are so more likely to overheat.

Admittedly, the use of concrete construction can raise questions concerning the level of construction embodied CO₂ when compared to other structural



Lightweight constructed homes may over-heat during the summer

materials such as timber. However, if you have to mechanically ventilate and cool a timber building the resulting operational CO₂ emissions, over the lifetime of the building, will far outweigh any initial construction embodied CO₂ savings.

AUDIT OPERATIONAL CARBON IMPACT

The British Association of Reinforcement has welcomed the recognition from Parliament's Environmental Audit Committee (EAC) of the commitment of the cement and reinforced concrete sectors to reduce carbon in construction. However, it warns against too much emphasis being placed on the embodied carbon of construction materials and calls for more focus on the whole life operational carbon of buildings which accounts for up to 80% of carbon emissions from buildings.

The EAC select committee report, 'Building to net zero: costing carbon in construction', examines how to improve sustainability of the UK's built environment. For concrete, the benefits of longevity, low maintenance, fire, rot and flood resistance were highlighted as was the negative issue of significant CO₂ impacts resulting from cement manufacture. However, the report acknowledged the considerable work being done to reduce this via the development of new manufacturing processes, carbon capture and storage and new low CO₂ cements. It also recognised the locally sourced benefits of an UK industry that supplies 95% of the UK's concrete demand – compared with timber which imports 80% of required timber with most being

imported by North America, Russia, China and Brazil with significant CO₂ shipping consequences.

Whilst welcoming the thrust of the EAC's report call for mandatory whole life carbon assessments, dedicated carbon targets for the built environment and policies to incentivise retrofit over new-build, the report's focus on embodied CO₂ is misplaced. There needs to be an appreciation of the impact of a building's operational CO₂. A typical building's CO₂ is split between 20% embodied CO₂ to build it and 80% to run it.

The inherent benefits of reinforced concrete construction such as fabric energy storage can significantly reduce heating and air-conditioning requirements. Built-in fire, flood and rot resistance is provided without the need for additional finishes and materials and so without their additional CO₂. Concrete buildings are often easier to re-use and re-configure for future change of use compared with lightweight timber and steel construction. For a true calculation of a building's CO₂ impact, its operational CO₂ must be taken into account.

BAR INDUSTRY SEMINAR 2022: **REINFORCED REDUCTION – REDUCING THE CO₂ IMPACT OF REINFORCED CONCRETE**

The British Association of Reinforcement is to hold an industry seminar: 'Reinforced reduction – reducing the CO₂ impact of reinforced concrete'. The seminar will be held from 10.00 – 13.00 hrs on Friday 30th September 2022 at the East Dock 5 meeting room, Tobacco Dock, London. The seminar will be followed by lunch. It will precede CONSTRUCT Day which is being held later in the afternoon and evening.



BAR at CONSTRUCT Day

The British Association of Reinforcement will have an exhibition stand at the CONSTRUCT industry day on Friday 30th September at Tobacco Dock, London. Come and say hello and pick-up copies of our latest industry best practice guides and reinforced concrete reports.

The seminar will hear from manufacturers on their plans to reduce the CO₂ impact of reinforcement manufacturing. Delegates will learn how to achieve CO₂ reduction from efficient concrete frame design. There will also be a concrete contractor's view and moving from the present to the future, a new innovative initiative will explain how the future is net zero concrete.

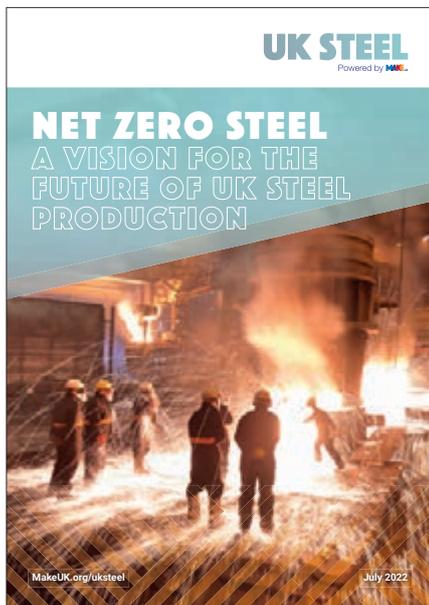
Speakers include:

- Gabriella Nizam, Celsa
- Neil Tilley, ArcelorMittal
- Jenny Burrige, The Concrete Centre
- Ben Azoula-Victory, Bryne Bros
- Sid Pourfalah, Concrete4Change

Places are strictly limited. Registration is free. Contact: condialogue@aol.com

STEEL INDUSTRY SETS OUT VISION TO BE NET ZERO WORLD LEADER

UK Steel has launched a ground-breaking report 'Net Zero Steel: A Vision for the Future of UK Steel Production'. The report examines the potential future of the steel sector in Britain and sets out how the UK could meet Climate Change Committee obligations and substantially reduce emissions by 2035.



Any major industrial nation must now seek to safeguard its industry's future, and there is an opportunity here to be seized. No steel sector in the world has successfully decarbonised, but customers are beginning to view low or zero-emission steel as necessary. For the UK steel

sector, dramatically reducing emissions would present an opportunity to lead the world and export technology and expertise worldwide.

Steel production is responsible for 7-9% of all greenhouse gasses globally, giving rise to an average 1.85 tonnes of CO₂ per tonne of steel produced. The UK's annual consumption of steel results in over 29mt CO₂, which contributes to the emissions of the construction sector. To seriously combat climate change, a way to produce steel without generating emissions must be initiated. This will be the biggest industrial shift since the industrial revolution.

It will not be easy and will require massive investment into facilities, equipment, and the introduction of new production methods. It will need the Government to step in and address the critical barriers to decarbonising the sector: uncompetitive electricity prices, which are some of the highest in Europe and deter investment; support for energy efficiency; introduction of Carbon Border Adjustment Mechanism, which will ensure that imported steel face similar carbon prices as domestic

producers; and scrap market reforms. The UK must act now, as other countries in Europe and North America are making crucial investments in modern, Net Zero steel production. Without strategic intervention, UK steel users will be wholly dependent on imported steel, hindering the construction sector's route to Net Zero.

The UK could become the first decarbonised steel sector in the world: a global example of a partnership between government and industry. Net Zero represents an opportunity to re-industrialise the UK where low-emission UK manufactured steel is a reality and not just an aspiration.

Commenting on report UK Steel Director General, Gareth Stace, said: "No steel sector or steel company in the world has yet successfully decarbonised. There is a first-mover opportunity for the UK to become the first steel sector which delivers on Net Zero. If we accomplish this, we will transform almost 35,000 steel jobs into green jobs. These roles already underpin communities that have made steel for a century.

There is no one single technology to decarbonise, but a range, including electrified steelmaking, carbon capture and storage and hydrogen. We export much of our scrap steel only to reimport it, meaning there is fertile ground for electric arc steelmaking. Our location near the North Sea means we are perfectly placed to harness cost-effective carbon capture and storage steelmaking. In the future, hydrogen-based steelmaking may also become more attractive."

To download a copy of the report 'Net Zero Steel: a vision for the future of UK steel production' visit: <https://bit.ly/3PZGf9F>



ArcelorMittal

X FACTOR XCARB

ArcelorMittal Construction Solutions and ArcelorMittal Kent Wire Ltd are continually aiming to reduce their carbon emissions to meet the not only the UK Government requirements but also to achieve their own goal to minimize their environmental impact.

For this, the companies are using 100% renewable electricity sources, which result in zero carbon emissions in the energy used at their works in Chatham, Kent.

To further support the reduction in carbon emissions ArcelorMittal Europe has created the XCarb initiative which consists of 3 principles focused on reducing the emissions to net zero in all of their works by 2050.

The three-core principle consist of:

- XCarb Innovation funds
- XCarb Green Steel certificates
- XCarb recycled and renewable products

ArcelorMittal Construction Solutions and Kent Wire are focused on the last of these initiatives.

Being part of ArcelorMittal, AMCS and Kent Wire have direct access to XCarb rebar products when their customer's specification requires a low carbon alternative to traditionally produced rebar. Producing fabric reinforcement and prefabricated rebar cages using steel with a dramatically reduced volume of embedded carbon is easily achievable for both businesses. Manufacturing rebar using XCarb steel will contribute only 300 kg CO₂/tonne of steel thanks to the XCarb initiative.

This is achieved by using 100% certified renewable electricity to provide energy to the Electric Arc Furnace and 100% segregated and graded recycled steel – scrap. This process offers a 60% reduction in the CO₂ generated in the steel making process.

XCarb steel is independently verified and certified with an XCarb Green Steel certificate issued by ArcelorMittal Europe. These certificates will pass the CO₂ savings achieved by ArcelorMittal Europe Long Products to AMCS' and Kent Wire's customers.

To further enhance the CO₂ reduction, XCarb rebar produced at ArcelorMittal's Warsaw mill will be transported by train to the port at Gdansk, transhipped and sailed directly to Chatham Docks for use in the facility on the quayside. This journey will only generate 30kg CO₂/tonne, significantly less than being transported by road.

Kent Wire and AMCS are also using additional solutions to further drive the emissions to zero in transportation by optimising onward journeys of finished product and working with hauliers best suited to making deliveries using the shortest overall journeys possible.



XCarb®

Recycled and renewably
produced

THE BENEFIT OF GOING AROUND IN CIRCLES

There is a growing recognition of the need to transform our take-make-dispose economy into a circular one, in which resources are kept in use for as long as possible while maximum value is extracted. Celsa believes that steel can play an important part of that circular economy.

Steel manufacture is currently responsible for over 7% of global emissions. Steel is mainly produced by one of two methods: ore based via Blast Furnace/Basic Oxygen Steelmaking (BF/BOS) or by melting ferrous scrap waste in an Electric Arc Furnace (EAF). The EAF production route equates to 27% of total global production and yet accounts for only 9% of the sector's total CO₂ emissions. Celsa's method of steelmaking uses EAF, which is currently the lowest carbon technology for steel production, emitting less than a quarter of the CO₂ of the BF/BOS route.

The Celsa method of steel making uses 98% recycled scrap metal, all of which is sourced from the UK. The company's prioritisation of vertical integration extends throughout the supply chain where it valorises more than 90% of the waste and by-products generated. These are then reused by third parties. For example, slag is used to produce asphalt whilst zinc is recovered from EAF dust.

Sustainability has always been a core objective. Products are certified to Eco-Reinforcement and BES6001, which provides customers with the certainty that they are purchasing steel from a supply chain that is pro-actively addressing issues of sustainability.

Net Zero

Celsa is an energy intensive user, principally consuming electricity in the melting process. Therefore, decarbonisation of the electricity is paramount to reducing carbon emissions. Celsa is working with electricity providers to increase the amount of renewable energy supplied to its facilities with the aim of working to 100% renewable electricity in order to reduce Scope 2 emissions to zero.

Natural gas feeds the rolling mills reheat furnaces and is responsible for well over half of total Scope 1 emissions. Celsa is currently investigating the conversion of its reheat furnaces to hydrogen through the Industrial Energy Transformation Fund scheme and is working in consultation with SWIC (South Wales Industrial Cluster) to offer itself as a significant potential user for hydrogen in Cardiff when bulk hydrogen supplies are made available to the area. The eventual conversion of both reheat furnaces would represent the elimination of the largest scope 1 carbon emissions.

Another area of focus is the replacement of coke and anthracite coal with sustainable alternatives like the use of biochar and tyre crumb. Renewed focus on raw material reduction and replacement will contribute towards a further reduction in our Scope 1 emissions, as well as preventing the depletion of natural resources.

A shared challenge is emissions relating to Scope 3, where the complexity of supply chains poses new hurdles. Celsa is currently undertaking work to quantify and categorise impacts including how sustainable procurement practices and effective collaboration with the supply chain can drive down emissions.

For the construction industry to meet its net zero targets, it will need the materials supplied to be low carbon in the short term with a pathway to the net zero ambition. Reinforced concrete will need both constituent parts [the steel and the concrete] to deliver. Celsa is confident that its part - steel reinforcement - are confident will be fully able to be part of a combined low carbon solution.



CONSTRUCTING SUSTAINABILITY

CONSTRUCT, the Concrete Structures Group, is working with its membership to advance sustainability in all working areas including material production, transportation, supply chain improvements, energy efficiency, the waste hierarchy and working practices.

CONSTRUCT members are developing and implementing a range of sustainability initiatives. For example:

- **Basaltex** has produced Basalt, a fibre composite reinforcement where each use of a ton of Basalt can save standard coal 5.24TCE carbon emissions.
- **Celsa Group** manufacture steel by recycling scrap metal, using electric arc furnaces to melt steel scrap metal, as arc heating permits better thermal control than basic oxygen process. Electric arc furnaces produce less CO₂ emissions than traditional steel making methods.
- **CEMEX (CONSTRUCT Supplier member)** produces Resilia Reinforced Concrete which uses fibres to replace the need for steel reinforcement with concrete technology engineered to achieve mechanical performance and durability resulting in high strength and high ductility concrete structures.
- **CEMEX** also produce Vertua, a new range of low carbon concrete with bespoke designs enabling embodied carbon reductions greater than 70% versus standard concretes [CEM I]. Vertua also provides additional benefits including increased durability and aesthetic finishes.
- **Green concrete** is a form of eco-friendly concrete manufactured from waste or residual materials from different industries and requires less amount of energy for production. It produces less carbon dioxide than traditional concrete and is considered cheap and more durable. Green concrete is about lessening the burden on natural resources and increasing the dependency on recyclable materials, it is about re-using wash water to reduce water consumption and partial replacement of energy-consuming cement with reusable materials to achieve eco-friendly construction material such as replacing cement with Fly Ash, Silica Fume, etc.
- **MPA, The Concrete Centre** [CONSTRUCT partner] has been researching and calculating how to reduce carbon and cost of reinforcement. They have produced data showing how to reduce the quantity

of reinforcement in designs without any impact on the performance, leading to lower costs and a reduction in the embodied carbon of the structure. MPA have also issued a Specifying Sustainable Concrete handout, which can be downloaded free from www.concretecentre.com/publications.

Some may say using these products and working practices is more expensive than the standard systems. When sustainable products are more expensive than conventional products this is generally due to demand: low demand translates to a higher price. When more construction organisations opt for sustainable products, the demand goes up and the price should come down.

Wastage – Another area of high concern involves the wastage of material which could be attributed to poor site management or poor design techniques, resulting in some materials being surplus to requirements or due to damage during delivery or storage. Ordering materials requires a lot of planning and organising, and this is where the quantity survey can play a vital part in accurately estimating the number of materials needed. Identifying materials that can be easily reused and once chosen, making sure they are reused, so everything that can possibly be recycled is recycled.

Construction can get a bad press and has been blamed for environmental failings but let's not forget that construction contributes nearly £90bn to the UK economy, 6.7% of the total economy, there are 2.9 million jobs in construction and the UK has the sixth largest green construction sector in the world [Source: HM Government Policy paper Construction 2025: strategy www.gov.uk/government/publications/construction-2025-strategy].

Working together, the industry can continue to contribute to the UK economy while making a positive impact on the environment through open mindedness, embracing new ideas and new technologies. This way, the industry's carbon footprint will be reduced and the targets set out by Government will be met.

HIGH PERFORMANCE 100% PROOF-TESTED REBAR COUPLERS

Different rebar coupler systems achieve different levels of performance and have different levels of quality control measures associated with their manufacture and use. Dextra's Griptec is a high-performance system where 100% of coupler-rebar connections are automatically and systematically proof loaded.

A splice strength greater than the rebar itself

Most rebar couplers assemblies fail before the actual ultimate tensile strength of the adjoining rebar has been reached. Griptec is a guaranteed "bar break" system when used with BS 4449 rebars.

High strength also means greater ductility

There is no minimum ductility requirement for rebar couplers in BS 8597. With Griptec being a "bar break" system, the rebar is taken to failure, meaning that there is no loss of ductility in the connection. This is not the case for non-bar break systems, which fail before the adjoining rebar, resulting in a loss of reinforcement ductility.



Griptec is a "bar break" system giving high levels of strength, safety, and system ductility

Right first time, every time

All Griptec components are factory produced with no threading or processing of the rebar required. A male or female sleeve is extruded onto the end of the rebar via a proprietary Dextra designed and built machine requiring one operator only. A unique quality control feature of the system is that after each and every extrusion process, the connection is automatically proof loaded up to 90% of the rebars characteristic yield stress.

ISO metric threads for high quality

Griptec uses factory produced rolled ISO metric threads, with no threading or processing of the rebar itself. This leads to:

- High quality control, assessed via standard go, no-go gauges
- Thread engagement via visual inspection
- No risk of cross threading [similar to a nut and bolt]
- High fatigue resistance

- High resistance to impact damage compared to a finer thread form
- No specific assembly torque value requirement

By comparison, a taper thread applied directly to the bar is prone to pitch error, taper angle error and taper length error, as highlighted in the Structural Safety CROSS report no. 844 . In addition, threads are hidden in their final connected state hiding any potential defects. Taper threads are often said to be self-aligning, with bars pulling into alignment upon connection. However, this is contingent upon there being enough transverse rebar freedom to allow the bars to align upon connection and there remains a real risk that even after following the manufacturers connection and torquing instructions, the bars are still not properly engaged, leading to a compromised connection strength.



Griptec couplers being used at HS2 Long Itchington Wood Tunnel

Certification

Griptec is certified for use in the UK by CARES, under their schemes TAI-A, TAI-B and TAI-C. It is therefore suitable for building applications, applications requiring a high level of fatigue performance and nuclear applications. Griptec TAI-C approval is to performance Class A, meaning that it is a high ductility "bar break" system.

CROSS [Confidential Reporting on Structural Safety] Newsletter 55, July 2019. Article 844: Defects in taper thread reinforcement bars for coupling.

www.structural-safety.org

PREFABULOUS COUPLERS

Traditional methods of rebar placement can pose multiple safety concerns for installers working on elevated platforms and lead to longer overall construction timelines due to unloading loose cut and bent-steel rebar requirements. They can also prove to be an inefficient use of man-hours—ultimately driving up project costs by utilizing highly-skilled labour for repetitive and time-consuming tasks.



Tunnel wall cages using nVent LENTON Position couplers

There is a better way: prefabrication. Prefabricated rebar cages [PRCs] offer reduced construction time, lower project costs, and a safer onsite working environment. They also have the potential to dramatically accelerate construction schedules and reduce fabrication costs while allowing for more reliable quality control.

Studies show using PRCs result in an approximate average in savings of over 22% on total column cost, 20% on total project time, and 33% on column construction time period. [1]



Pile cages using nVent LENTON Position couplers

Prefabrication Benefits:

- Time Savings
 - Prefabricated cages can be delivered directly to the site and dropped into place in a fraction of the time it takes to manage loose cut and bent-steel rebar.
 - Simplify the re-detailing and cage manufacturing process by catching potential drawing errors and resolving the issue of missing bars or overcrowding prior to the reinforced steel arriving on-site.

- Increase site accuracy and speed during the checking process by ensuring precision in dimension or diameters before final positioning PRCs or loose bars.
- Cost Efficiencies
 - Reduce required crane operation time and save rental costs by performing prefabrication work on the ground.
 - Instead of requiring skilled labor to select the correct bar bundles and follow a set of detailed drawings, PRCs can be placed by simply following a numbered system on colour-coded layouts, allowing most prefab projects to be handled by one skilled foreman with a group of supporting workers.
- Improved Safety
 - By conducting rebar placement work close the ground, PRCs are lifted in to position by a crane, reducing any heavy lifting required.
 - By eliminating the need to tie bars together, the site remains clean of stray bars and tying wire while also limiting the number of workers moving around on a congested job site.

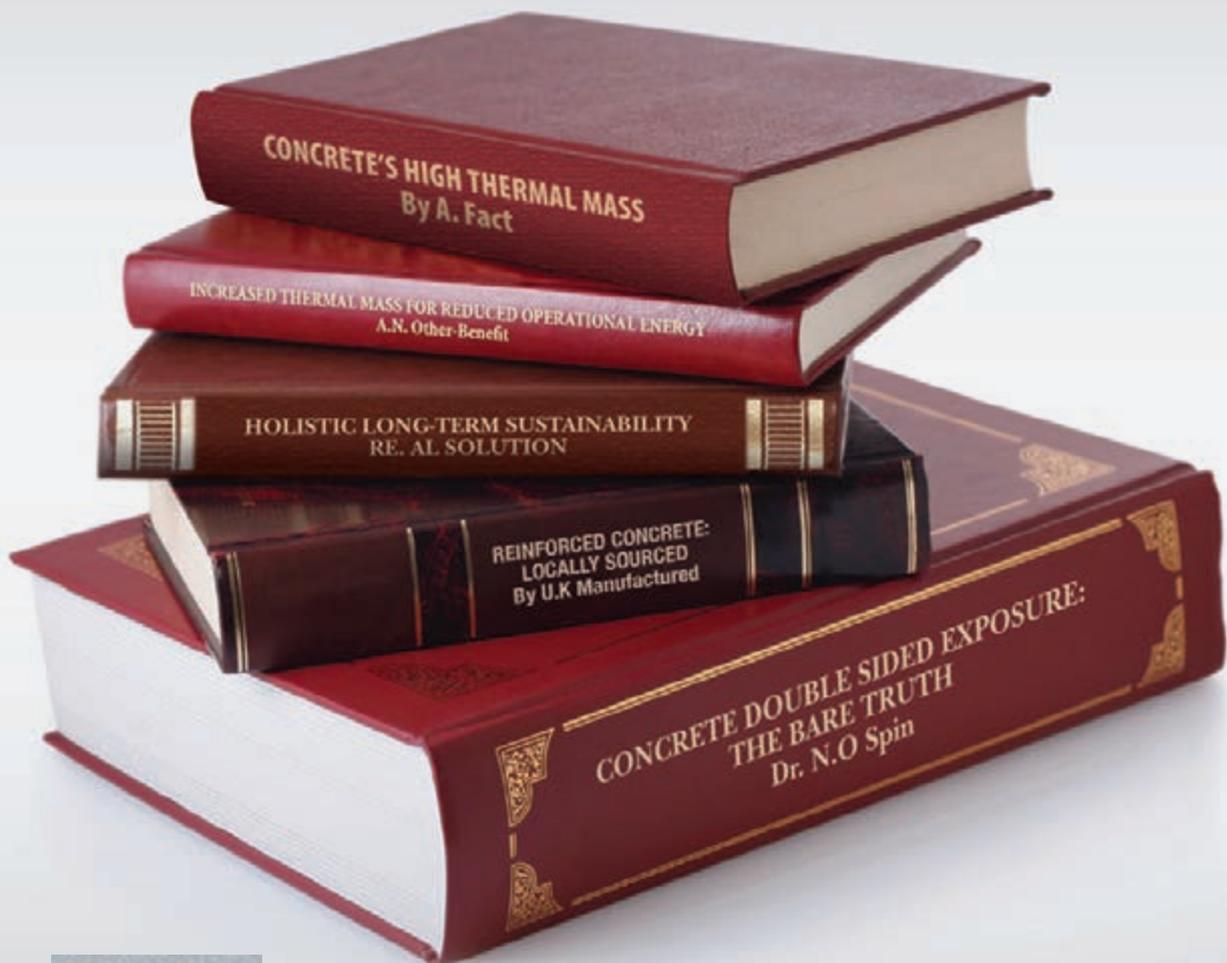
A critical aspect of extracting value from PRCs is using an efficient and reliable method of connecting individual cages. Mechanical couplers—typically threaded connections—are the preferred method for connecting PRCs due to their efficiency in providing load path continuity, stability and making rigid connections in addition to overall steel savings from the elimination of overlap in bars.

nVent LENTON Ultimate is a CARES TAI-A certified system designed for high cycle fatigue applications to maximize performance while increasing installation speed and efficiency in the field. The nVent LENTON self-aligning taper-thread reduces misalignment issues and helps eliminate cross-threading during installation. The Ultimate system is robust, allowing for the inherent variability of rebar while maintaining the highest level of performance in bridge, highway and critical infrastructure applications.

1. "Economic Evaluation of Reinforced Concrete Structures with Columns Reinforced with Prefabricated Cage System"; Shamsai, Whitlatch and Sezen; 2007.

GIVE YOUR PROJECT A REINFORCED ADVANTAGE

THERMAL MASS: HEAVYWEIGHT THINKING OR LIGHTWEIGHT HEADLINES?



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REINFORCED CONCRETE
THE HEAVYWEIGHT SOLUTION

LEADENHALL LEADER

BAR member BRC is supplying 4,300 tonnes of reinforcement bar and 370 tonnes of mesh for the £275 million One Leadenhall development.



Currently under construction with a completion date of 2024, One Leadenhall is adjacent to the historic Grade II* listed Leadenhall Market, it will provide 430,000 sq ft of office, retail and public spaces. At ground level the building responds in massing and materiality to the adjacent stone city buildings and the Leadenhall Market, whilst above a 35-storey tower has a vertical architectural composition that provides a singular, distinctive elegant identity on the skyline. The building is aiming to achieve BREEAM Excellent and a WELL V2 rating of Silver. The skyscraper was designed by the architecture practice Make. Main contractor is Multiplex and the client is Brookfield Properties.



EXPRESS PREFABRICATION



BAR member Express Reinforcements offer a complete offsite reinforcement prefabrication service using skilled labour in controlled factory conditions.

With early involvement in a project, Express Reinforcements can provide engineered 3D solutions on projects saving time, labour costs and improving the project program by increasing the speed of construction on site.

Loose fix rebar projects can often be converted into a prefabricated solution whether it be cages or mat assemblies which can then be delivered to site and placed in position removing the complexity of a project and the health and safety and manual labour issues associated with loose fixing rebar on site.

Working from pre-designed customer solutions or solutions designed by Express Reinforcements in conjunction with the customer, compatibility on site can be assured. Using 3D detailing software, the most efficient design solution can be established with any bar clashes on the project identified early. Our skilled factory labour interprets the complex rebar assembly and fixing drawings in order to fabricate the units, removing this responsibility from the site teams.

Assemblies can be Mig welded or wire tied with additional reinforcement if required to ensure that the integrity of the assembly is maintained during transportation and placing on site.

Quality Assurance

All Express Reinforcements prefabrication facilities, materials and welders meet all relevant UK certification requirements. The company's facilities, materials and operatives are independently audited on a regular basis to ensure the correct procedures are complied with.

Key Benefits

Key benefits of prefabricated reinforced include:

- Improves the accuracy of fixed steel with clashes removed at design stage
- Continuity of manufacture regardless of weather conditions.
- Costly site fixing becomes cost effective placing of prefabricated units.
- Improved safety from reductions in movement of loose bar.
- Assemblies supplied with labels and location plan for ease of identification
- Ease of inspection - prefabricated units checked prior to placement

Typical Items from Express Reinforcements

A wide range of prefabricated reinforcement is available including:

- Ground beams, pile caps, pile cages, diaphragm wall cages, columns, beams, carpet reinforcement, heavy diameter one-way/two-way mats etc.

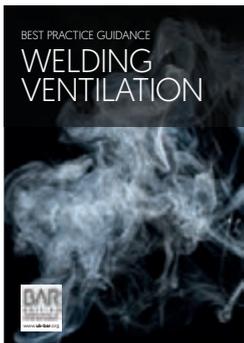


- Removes steel fixing from the critical path.
- Reduces project programme

REINFORCED READING

The British Association of Reinforcement publishes a wide range of industry best practice guides and industry reports. Below are examples of the free downloads from the publications library available at www.uk-bar.org

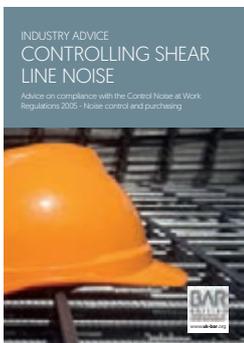
Best practice guidance: Welding ventilation



This best practice guidance is intended for reinforcement suppliers and fabricators in order to provide a safe working environment for all those involved in the welding of steel reinforcement. The guidance aims to avoid the potential health hazards resulting from exposure to welding fumes and explains how mechanical ventilation can

limit over exposure to the fumes and gases resulting from cutting and welding by removing those fumes and gases from the welder's breathing zone.

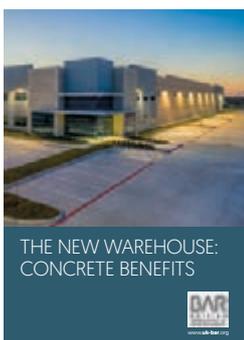
Industry advice: Controlling shear line noise



Shear line machines with no noise control can produce noise levels of around 95dB(A) at the shearline operators position. This means that anyone operating a shear-line with no noise control is likely to be working above The Control of Noise at Work Regulations 2005 [1] action limit value after 45 minutes of operation. This advice note

addresses the issues of regulatory requirements, possible noise control approaches and working with suppliers provide me with built in noise control. The guide has been produced in association with the Health and Safety Executive.

The new warehouse: concrete benefits



Heavyweight concrete construction offers a real alternative to run-off-the-mill lightweight constructed warehouses and distribution centres. It is an alternative that provides inherent fire resistance, enhanced thermal efficiency, robust security, flooding resilience and sustainability. In addition, heavyweight concrete

is better for meeting the changing demands of the evolving warehouse and logistics sector. These free, built-in, concrete benefits provide a construction solution that is better suited to meet the growing demand for highvalue, automated warehouses. Today's and future warehouses are more than just storage spaces. They need a construction solution that works with their evolving requirements. Concrete provides just that.

Critical analysis of building performance benefits and cost comparison between reinforced concrete, steel and timber framed building



Whilst there have been a number of cost comparison studies comparing the costs of concrete, steel and timber construction there has never been a comprehensive study of the costs of additional finishes for long-term occupational performance. There is much anecdotal evidence and understanding of the inherent performance benefits of

concrete construction. Fire resistance, flood resilience, sound insulation, vibration damping, thermal efficiency and robustness are all provided free-of-charge. There have been few specific studies that examine the financial and environmental advantages of these inherent concrete benefits of the extra costs for the additional finishes necessary for steel and timber construction. The research proves that the inherent performance benefits of concrete construction translate into real economic advantages over steel and timber.

RAISE THE BAR

FOR REINFORCED SUCCESS CHOOSE A MEMBER OF
THE BRITISH ASSOCIATION OF REINFORCEMENT

- DELIVERING QUALITY AND ADDED VALUE
- FULL ADHERENCE TO REQUIRED TECHNICAL AND INDUSTRY STANDARDS
- COMPLIANCE WITH RELEVANT CERTIFICATION SCHEMES
- COMMITMENT TO HEALTH & SAFETY, SUSTAINABILITY AND SOCIAL VALUE
- ONGOING PRODUCT INNOVATION AND PROCESS DEVELOPMENT



BAR MEMBERS: GIVING YOUR PROJECT A REINFORCED ADVANTAGE

www.uk-bar.org

RAISING THE BAR



www.uk-bar.org

BAR members are fully supportive of the Association's objectives aimed at raising the bar for the UK reinforcement sector by:

- Providing a forum in which common issues facing the UK reinforcement industry can be addressed.
- Forwarding and supporting the market share of reinforced concrete against competitive structural materials.
- The Association cannot dictate material sourcing but expects its members to, wherever possible, to forward and support the UK steel and reinforcement sectors.
- Enhancing and forwarding overall product and service quality provided by BAR members
- Improving the health and safety record of the UK reinforcement industry.
- Improving the environmental record of the UK reinforcement industry.
- Actively promoting the UK reinforcement industry's products and capabilities to relevant target audiences.
- Representing the UK reinforcement industry with HM Government, in Europe and with other decision makers.

BAR Members' Directory

Arcelor Mittal Kent Wire

Chatham Docks
Chatham
Kent ME4 4SR
Tel: 01634 823604
Email: sales@arcelormittalkentwire.co.uk
Web: www.arcelormittalkentwire.co.uk

BRC Ltd

Corporation Road
Newport
South Wales NP19 4RD
Tel: 01633 280816
Email: enquiries@brc.ltd.uk
Web: www.brc.ltd.uk

Celsa Steel (UK) Limited

Building 58
East Moors Road
Cardiff CF24 5nn
Tel: 029 2035 1800
Email: general@celsauk.com
Web: www.celsauk.com

CONSTRUCT - Concrete Structures Group

The Building Centre
26 Store Street
London
WC1E 7BT
Tel: 0844 249 1355
Email: enquiries@construct.org.uk
Web: www.construct.org.uk

Dextra Manufacturing - UK

34A Ryegate Road
Sheffield S10 5TB
Tel: 0114 3211868
Email: rgoodman@dextragroup.com
Web: www.dextragroup.com

ERICO Europa (GB) Ltd

20-22 Bedford Row
London WC1R 4JS
Tel: 07887 764 210
Email: mallen@erico.com
Web: www.erico.com

Express Reinforcements Ltd

Eaglebush Works
Milland Road
Neath
Wales SA11 1NJ
Tel: 01639 645555
Fax: 01639 645558
Email: commercial@expressreinforcements.co.uk
Web: www.expressreinforcements.co.uk

Max Frank Ltd

Whittle Road
Meir
Stoke-on-Trent
Staffordshire
ST3 7HF
Email: info@maxfrank.co.uk
Website: www.maxfrank.co.uk

Outokumpu Stainless Steel Limited

PO Box 161
Sheffield
South Yorkshire S9 1ZT
Tel: 0114 261 5234
Email: sales.rebar@outokumpu.com
Web: www.outokumpu.com

RFA-Tech

C/O ROM Building
Eastern Avenue
Trent Valley
Lichfield WS13 6RN
Tel: 0870 011 2881
Email: sales@rfa-tech.co.uk
Web: www.rfa-tech.co.uk

ROM Limited

Eastern Avenue
Trent Valley
Lichfield
Staffordshire WS13 6RN
Tel: 0870 011 3601
Fax: 01543 421657
Email: sales@rom.co.uk
Web: www.rom.co.uk

ROM-Tech

Unit 16
Eastern Avenue
Trent Valley
Lichfield
Staffordshire WS13 6RN
Tel: 0870 011 3610
Web: www.rom-tech.co.uk

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