

SUCCESSFUL REINFORCED EARLY INVOLVEMENT

The benefits of engaging with your
reinforcement fabricator



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The British Association of Reinforcement (BAR) is the trade association of UK manufacturers and fabricators of steel reinforcement products including cut and bent bar and mesh.

BAR aims to add value to the reinforcement industry through market and product development, promotion of good industry and health and safety practices and forwarding the development of the reinforced concrete industry as a whole.

1. INTRODUCTION

This guide from the British Association of Reinforcement outlines how the early involvement of and engagement 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 the benefits of collaboration that include increased efficiencies and reduced costs. The same reasoning should be used for the early involvement of specialist subcontractors by the main contractors.

This is especially so for steel reinforcement. 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, possible cost reduction, increased material efficiencies, and the potential of prefabricated repetition for faster and less labour-intensive installation. This will have subsequent added-value benefits for the construction process as a whole.

This new updated edition includes an overview of the practical early engagement services provided by BAR members together with a useful check list of the top value engineering opportunities often missed by designer consultants.



Figure 1. Early involvement facilitates the use of digital technology to redesign or even design out rebar thereby saving both construction time and money

2. EARLY SUBCONTRACTOR INVOLVEMENT (ESCI)

On traditional construction contracts, the client first appoints consultants to design the project in detail and then a contractor is appointed to construct to works. This approach often results in a fragmented and adversarial construction process where the contractor is unable to contribute to the development of the design that they are required to construct.

The development of non-procurement routes that embrace Early Contractor Involvement [ECI] offers an alternative whereby the contractor's skills and knowledge are introduced early in the design stage in order to increase buildability and cost and material efficiencies.

The early involvement increases collaboration and innovation, improved management of risk mitigation and health and safety plus better planning and implementation on the construction process.

For similar reasons, the main contractor should embrace and realise the potential of early reinforcement subcontractor involvement. Fully utilising the experience and expertise of the steel reinforcement fabricator will provide for a more cost-effective, sustainable and robust reinforcement solution that will have a range of resultant critical benefits for the overall construction project.

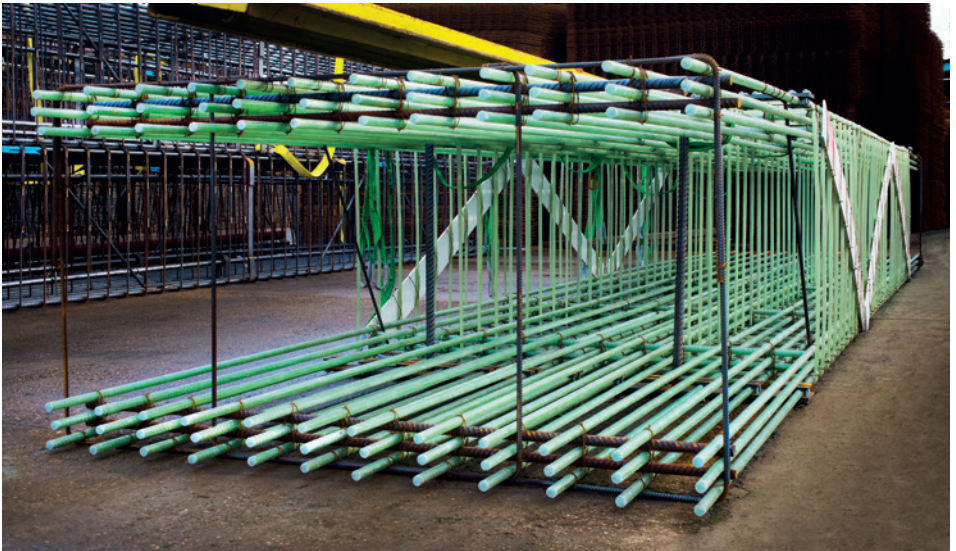


Figure 2. Early fabricator involvement increases collaboration and innovation

Early engagement is particularly important for reinforcement which is one of the major sectors where the construction process is one of fragmented elements delivered by different parties with different drivers. Typically, these include:

- **The designer** – carries out analysis of structural stresses and specifies required reinforcement. The design intent can be conservative and based on assumptions. Critically, the designer may not fully carry out reinforcement detailing and passes this on to subcontractors.
- **The detailer** – normally remote from the other involved parties (often based in India, Philippines and Middle East). Carries out CAD reinforcement detailing often driven by minimisation of reinforcement quantity rather than the practicalities of fabrication or installation.
- **The fabricator** – often tied to supply order based solely on price per tonne without any advance visibility of detail design and so

denied any opportunity to offer efficiencies and innovation.

- **The pre-fabricator** – if involved, will usually need to re-detail in order to provide a design suitable for manufacture and assembly. Project times restrictions often prohibit design rationalisation.
- **The steel fixer** – usually labour-only paid on price-per-tonne and so the main driver is installing the maximum reinforcement in the minimum time.
- **The contractor/specialist subcontractor** – reduced cost being a major driver increases the attraction of combining the cheapest reinforcement with the cheapest installation.

Early engagement with the reinforcement fabricator would combine the activities of the detailer, the fabricator and the pre-fabricator and so remove much of the fragmentation and greatly increase the efficiency of the whole process.

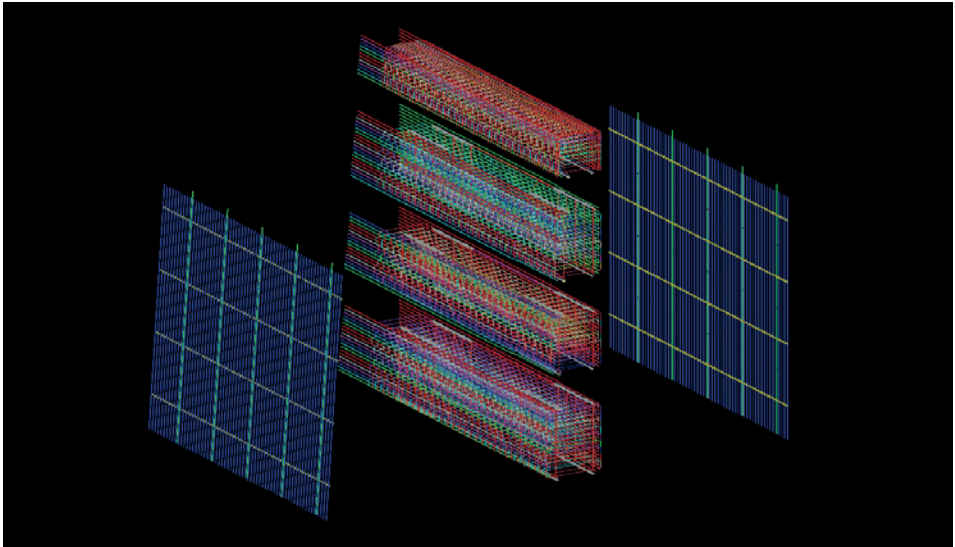


Figure 3. Early involvement facilitates the use of digital technology to redesign or even design out rebar thereby saving both construction time and money

Key points for successful reinforcement ESCI:

- The earlier that the fabricator is involved the greater the potential benefits that they can bring,
 - Involvement and engagement with the fabricator should be fully committed and not perfunctorily,
 - Ensure that the designers are well informed on reinforcement types, lengths and specifications,
 - Ensure that the fabricator chosen has the technical expertise, the resource capacity, is fully UK accredited and complies with the latest British Standards to provide an assured quality product.
- Replacement of over-designed reinforcement design with more efficient solutions due to identification and removal of waste from design, detailing, manufacture, assembly and placement of reinforcement,
 - Increased ability to attain required carbon emission levels for the project,
 - Introduction of innovation based on expertise and experience,
 - Provision of reinforcement solutions that are rational and efficient,

Is the final benefit, the provision of rational and efficient reinforcement solutions, that has the most resultant impact in terms of simplified detailing, checking and scheduling. It ensures that stock reinforcement lengths and available fabrication plant is fully utilised. For the construction site, it ensures efficient installation that is faster and requires less man-hours.

Resultant reinforcement benefits include:

- Fabricator commitment to invest in resource capacity



Figure 4. Early involvement encourages fabricator commitment to invest in resource capacity

3. PREFABRICATED REINFORCEMENT

The use of prefabrication offers significantly increased on-site productivity benefits not least of which are reduced skilled labour requirements. With the construction industry, like many other sectors, facing a skills shortage, this is increasingly important.

Prefabricated reinforcement can be used for a wide range of structural elements including floors, columns, beams and walls. Accordingly, it is available in various forms including reinforcement pile and column cages, ground beams and floor mats. They are quality-controlled, factory manufactured products that are delivered to site, ready-to install on a just-in-time basis.

Early involvement and meaningful engagement with the reinforcement fabricator means that the full benefits of repetitive prefabrication with all the advantages of rationalisation and

economies of scale are realised. It means that the most efficient prefabricated unit is designed, manufactured and delivered to site ready for fast installation.

Given the difficulties of many sites with greatly reduced space and vehicle access, prefabrication offers the customer the ability to take the prefabricated items directly from the delivery vehicle straight to installation therefore reducing site congestion.

Another important benefit offered by prefabricated reinforcement is the increased level of safety offered by welded construction against traditional tied reinforcement. All BAR member prefabricated assemblies are subject to the requirements of the most up to date standards for reinforcement, their fabrication and welding.



Figure 5. Early fabricator involvement ensures that the full benefits prefabrication can be realised

4. REINFORCED TRUST

Key to the collaboration and team working resulting from ESCI is trust. For there to be trust, all parties must be fully committed to ensuring that early involvement delivers the required outcomes.

For their part, BAR fabricators work to ensure their customers can have the utmost trust in the steel reinforcement products and services being provided. They meet and conform to all relevant UK and international standards and are fully signed-up to recognised industry certification schemes. In addition, all are committed to reducing their environmental impact and increasing their sustainability credentials. Reinforcement steel is produced using recycled steel via the Electric Arc Furnace (EAF) method, giving a 98% recycled content to the finished product. The commitment of BAR members to ongoing environmental improvement is underlined by their accreditation to recognised sustainable certification schemes such as EcoReinforcement, the CARES Sustainable

Construction Steels scheme and standards such as BES6001 and ISO14001. In addition, BAR fabricators are fully signed-up to comprehensive responsible sourcing and health and safety programmes, anti-human slavery and equality policies, and the implementation of robust supply chain traceability and corporate accountability.

For the main contractor's part, early involvement calls for a commitment to meaningful and ongoing engagement. Provision of that will provide the fabricator with the incentive and committed to plan for and invest in any additional labour resource and required fabrication plant.

The successful manufacture, delivery and installation of steel reinforcement is on the critical path to the success of a construction project. Early involvement of a BAR fabricator can ensure the reinforcement element of that path is smooth, rational and efficient.



5. VALUE ENGINEERING SERVICES

Early engagement allows full access to the range of value engineering services offered by BAR reinforcement fabricators. These services aim to optimise reinforcement solutions, reduce client risk and improve efficiencies. They include:

- Finite element analysis

Review of structural designs to economise the amount of rebar and so provide cost and carbon savings.

- BIM 3D rebar detailing service

Enhances the accuracy and buildability of designs by providing a 3D model that displays the reinforcement in full geometrics. This identifies potential rebar or cast-in clashes and facilitates viable solutions that offer direct time and material savings. 3D modelling also checks that the correct reinforcement bar size has been specified, ensures that required reinforcement has included, addresses potential reinforcement over-lapping and congestion points, provides a construction software model to enable input from project team.

- Project sequence design

Detailing can be carried out to suit the concrete pour sequence, delivery and installation of prefabricated reinforcement and special mesh products to further onsite productivity and reduce costs.

- Smart construction

BAR fabricators are at the forefront of smart construction technology that facilitates the supply of prefabricated reinforcement elements for all stages of the structural off-site construction.

All of the above services add real value to the reinforcement design process. BAR fabricator members have the experience and expertise to ensure optimised solutions.



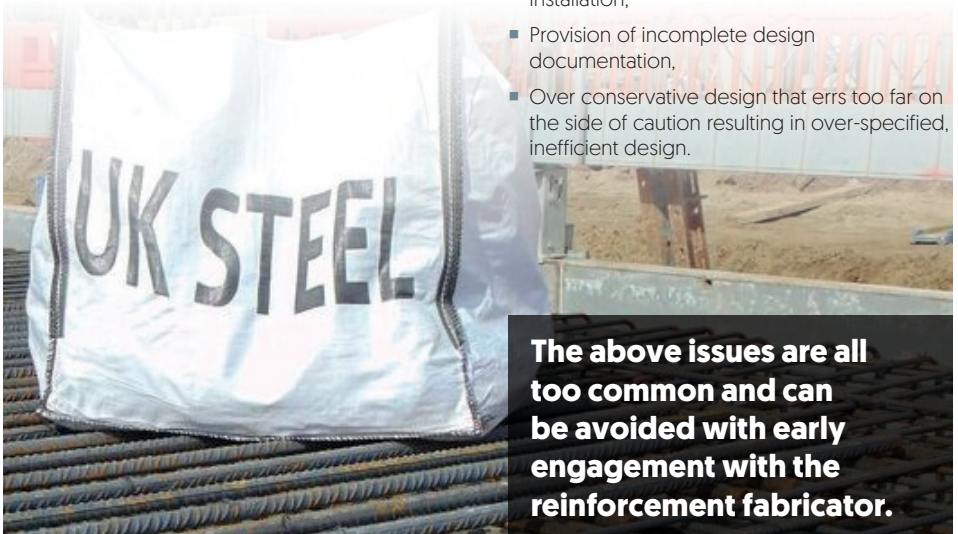
6. VALUE ENGINEERING CHECKLIST

Lack of engagement with the fabricator can often result in value engineering efficiency and productivity opportunities being missed. BAR fabricators consistently find that design consultants, not fully understanding the reinforcement sector's real capabilities and failing to realise range of services and depth of expertise and experience offered, make the same incorrect design assumptions.

An example of where things can go wrong is where consultants forwarded a 3-part pile cage design that had different reinforcement diameter bars to reduce the reinforcement weight when a 1-part cage with a little extra weight would have sufficed. The proposed 3-part cage was over-designed and would have required increased temporary works steel, increased welding and fabrication, increased handling and transportation, and increased additional site work. This was corrected by the fabricator who provided a more efficient and rational design.

Below is a check list, provided by BAR member AcelorMittal Kent Wire, of the most common errors resulting from a lack of early engagement with the reinforcement fabricator:

- Not considering the follow-on works that can result in risks to the project works schedule,
- Specification of inconsistent bar centres can result in difficulties for pile cage and mesh prefabrication,
- Not utilising longer bar lengths in order to reduce the number of elements,
- Designing for individual reinforcement arrangements for each floor and failing to realise the benefits of rationalised repetition and standardisation,
- Not appreciating how increased coupler use can, for certain reinforcement situations, reduce congestion and simplify assembly and installation of cages,
- Failing to be open to alternative arrangements – such as shear links – which can increase the efficiency of fabrication and installation,
- Provision of incomplete design documentation,
- Over conservative design that errs too far on the side of caution resulting in over-specified, inefficient design.



The above issues are all too common and can be avoided with early engagement with the reinforcement fabricator.

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