



The Concept

The patented Modular Car Park System has been designed as a bespoke modular structure with speed of erection and flexibility at the core of the design philosophy.

The system can be used in both single and multi-storey situations and it is truly demountable.

Modular System Advantages

The Modular System advantages can be summarised as follows:

- Off-site build
- Truly Modular
- Competitive cost
- Multi-storey capability
- Fits any shape, any size
- Fast programme completions
- Low disruption whilst erecting
- Fully demountable
- Both permanent & temporary
- Bright, secure ambience
- Sustainable
- Integral gutter system, watertight deck surface
- Light weight system savings made on foundation installation

The Modular System

Clear Span removes the use of internal columns and cross bracing, providing clear spans of 15.6m on alternating grid module of 2.4/7.2m (alternative 2.5/7.5m can be offered) this can be adapted for spans up to 16.5m.

The steel structure utilises tubular columns spanned by rectangular hollow section trusses. A paint finish is a 2 coat system usually applied in white or any colour.

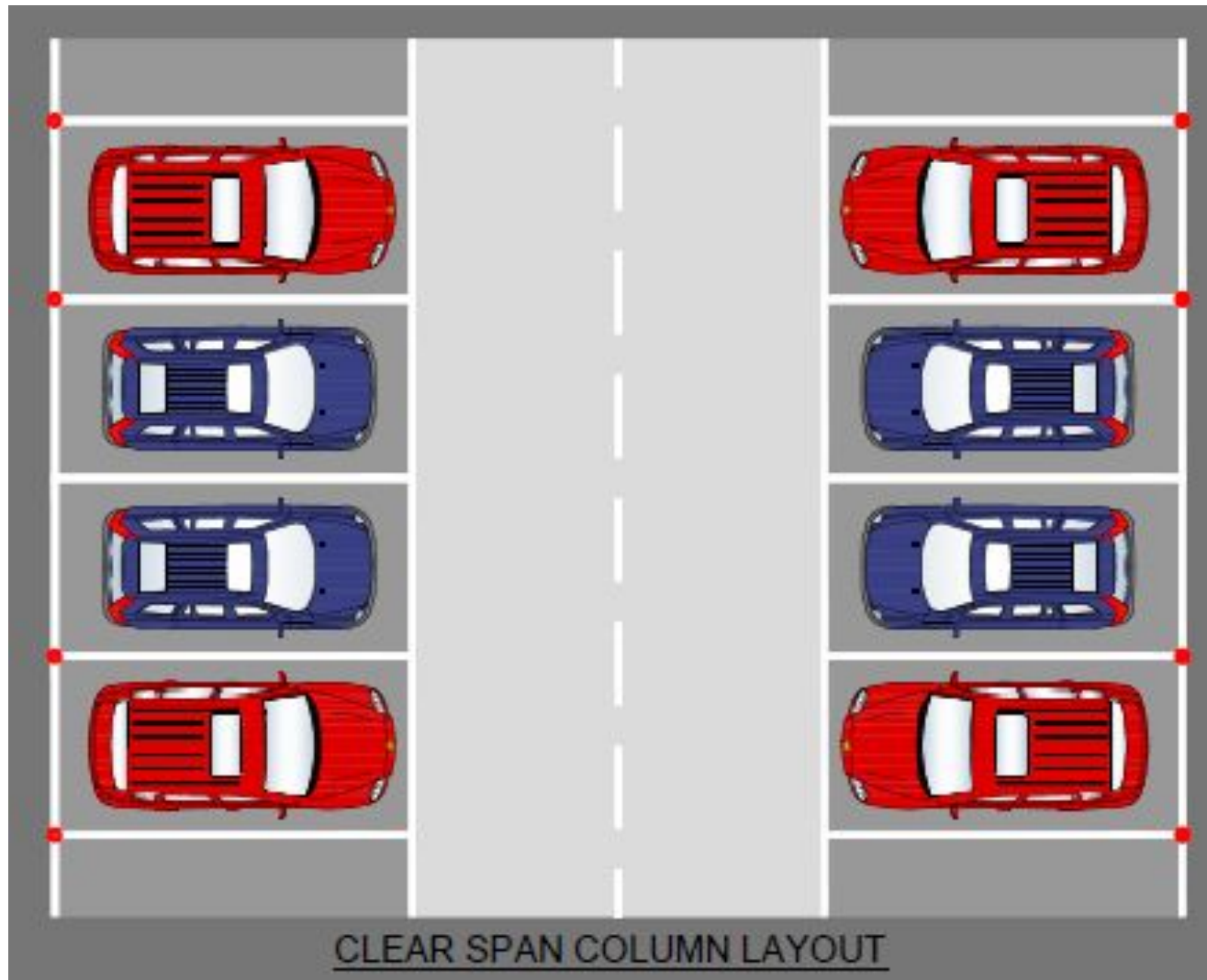
The life expectancy of the GRP deck panels are in excess of 50 years. Other key properties include high UV and chemical resistance and excellent thermal stability.

Ramp layouts are flexible and are designed to suit the specific site constraints.

The systems are available with full underside and topside lighting. This delivers high lux levels, giving a bright and secure ambience.

Due to the modular nature of the system there are a wide range of layouts and car park sizes available. The final layout can be easily modified to suit any future developments or re-arrangements of an existing layout.

TYPICAL COLUMN LAYOUT



The Modular System Engineering Data



Design Standards

The modular system is designed to various design documents and all relevant Eurocodes (British Annex), in particular;

- BS EN 1990 – Basis of Structural Design
- BS EN 1991-1 – Eurocode 1 Actions on Structures
- BS EN 1993-1 – Eurocode 3 Design of Steel Structures
- Design Recommendations for Multi Storey and Underground Carparks 4th Edition - Institution of Structural Engineers March 2011.
- Construction (Design and Management) Regulations

Vertical Loading

- In addition to all dead loads the car park deck is designed for a general uniform live loading of 2.5kN/m², or a concentrated load of 12.5kN on a 50 mm square, at any location.

Lateral Loading

- Barrier and handrail loads are as BS EN 1991-1-1. Barrier impact loading is higher than the wind loading at any location in the UK, therefore the car park design is suitable for use at any location in the UK.

Structural Stability

- Stability for the **Clear Span** system is provided in both directions via a moment framed portal action with pinned bolted joints to all trusses. Similarly the stability for **Triple Bay** is provided in one direction via a moment framed portal action with pinned joints and in the other plane via cross braced frames. The addition of the composite deck transfers horizontal loads arising from the vehicles to the structure via minor diaphragm action. The minimum layout for stability would require two modules and a subsequent infill panel arrangement.

The Modular System Engineering Data



Building Regulations.

- The car park has been designed to comply with current Building Regulations and has been subject to an independent assessment by Approved Building Inspectors.

Foundations

- Maximum single deck level unfactored (SLS) column load is 460kN, for the largest column arrangement connection to the columns, while generally horizontal columns loads are in the order of 30kN. Columns can either be supported on screw piles or on pad foundations dependent on existing ground conditions.

Ramp designs

- Due to the nature of ramp layout, gradients and details, ramps are designed to suit the specific site constraints and required layout. The ramps are constructed of standard structural steel sections, supporting an RC composite steel construction. Ramps with steep gradients have transition areas at the top and bottom of the ramps as per the design recommendations to remove any trip points and provide a smooth transition for vehicular traffic.

Rainwater channels, Lamp posts.

- As with the ramp designs, all of the above are part of the detailed design for specific site layouts, however, all of these are based on standard layouts and details developed for specific use with the system. The gutters are continuous standard aluminium and are connected to drainage pipes which then flow into a surface water drainage system as applicable. The lamp posts are attached to the structure where required, a number of solutions can be provided dependent upon client requirements.

Structural problems with traditional build car parks



Structural problems with traditional build car parks

The UK car parking industry was given an important lesson when the Pipers Row car park in Wolverhampton partially collapsed in 1997: that it is important to avoid complacency. Pipers Row could easily have collapsed when fully occupied with parked cars and members of the public.

The warning signs for car park structures had already been recognised by the Standing Committee on Structural Safety (SCOSS) in their tenth report, published in 1994(5).

In addition to chloride ion contamination, structural deterioration can be caused by other mechanisms during service, including:

- Impact damage from vehicles, reducing the cover to reinforcement
- Carbonation of the concrete over time, resulting in reinforcement corrosion
- Alkali-silica reaction, producing expansion and cracking
- Freeze-thaw action on unprotected or underspecified concrete
- Thermal and shrinkage cracking, providing pathways directly to the reinforcement
- Surface abrasion and wear
- Failure of protective coatings and waterproof membranes
- Poor quality or inadequate cover to steel reinforcement.
- Barrier fixings – holding down bolts

Ground Work

Foundations- Concrete Pad



- Light weight super structure allows for nominal foundations
- Minimal ground disturbance – typical individual foundation just 1 cubic metre
- Cast-in holding down bolts designed to accommodate marginal column offsets
- Concealed foundations able to remain dormant until commencement of steel erection



Ground Work

Foundations - Screw Piles



- Innovative founding solution best described as a large self tapping screw that is torque driven into the ground.
- Consists of circular hollow section lengths of a predetermined diameter and thickness.
- Once installed into strata the shaft transfers the axial load to helical plate.
- Loads are transferred either above or below the helical. Plates maximising the bearing capacity of soil.
- Virtually no soil extraction. Cart away costs minimal.
- Quick install minimises disruption.

Ground Work

Foundations- Ductile Iron Tube Piling



- Fast effective method of forming high capacity driven tube piles with low disruption and vibration.
- Utilises high frequency hydraulic hammer on a hydraulic excavator to drive pile into strata.
- Piles fitted with a bottom cap plate & can be driven either to a set or length with capacities up to 600kN.
- Upon completion pile is cut to length and then partially filled with concrete then capped.
- Virtually nil spoil production.

Ground Work – Social Impact

- Minimise loss of car parking space during construction – typical loss 25-40 spaces.
- Foundations remain permanently accessible yet secure.



Construction of ClearSpan



- Clear Span is suited to car parks with high movement of traffic.
- A modular system. Finished modules arrive on site thus minimising disruption to existing car park.
- High capacity transportation reduces congestion both on the road and on site.
- Lead in times typically 10/12 weeks.
- Steelwork finished in accordance with the NC-2A general specification.

Construction phasing

ClearSpan

- Typical 200 space car park can be erected in 5 weeks, dependent on phasing.
- Steel work erected in phases of typically one day.
- Modular system allows for specific design constraints and future expansion.
- Steel structure retains a contemporary appearance.
- Customer experience: good ambience, security and accessibility.



Exterior Cladding Design

used on ClearSpan & ClearBay

- Designs can be tailored to client requirements and accommodate a range of materials.



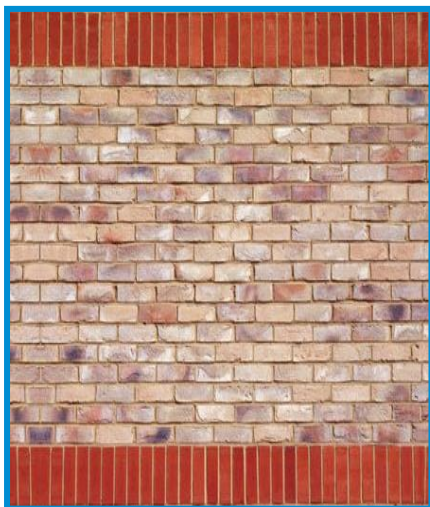
Standard Solid Infill



Cedar and Granite



No cladding



Textile



Kingspan



Eurobrick and timber



Client Design

Car Park Decking

used on ClearSpan & ClearBay

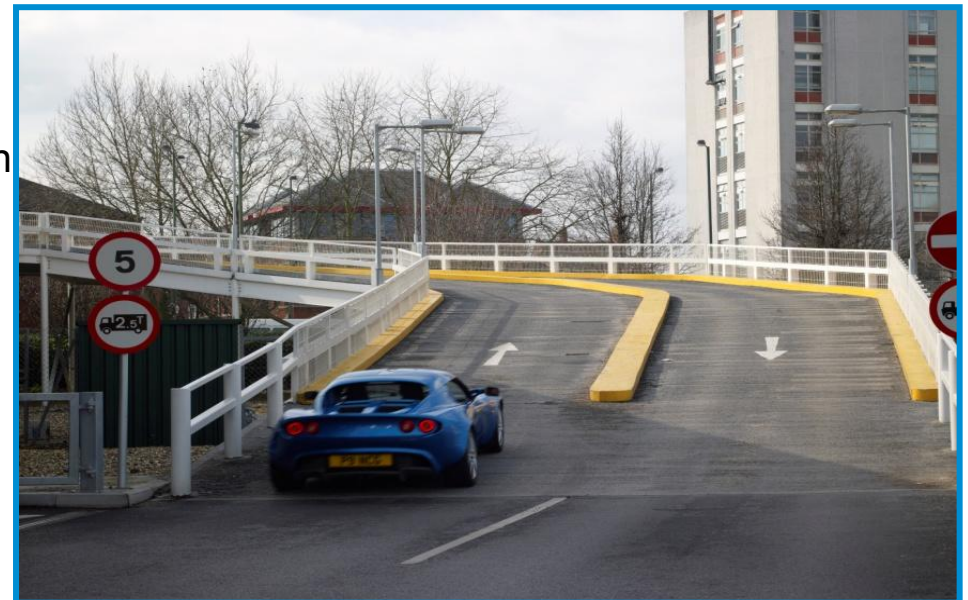


- Highly durable yet recyclable light weight GRP decking
- Anti-slip GRP panels
- Lighting is adaptable to each situation
- Custom-built 'furniture' and signage

Ramp Solutions



- Ramp layout, gradient and details will be designed to suit the specific site.
- Typical ramp surface is concrete.



Panel design change



Gen 1 – 3 Panels
Water drained through panels to RL60
then to gutter box on column line

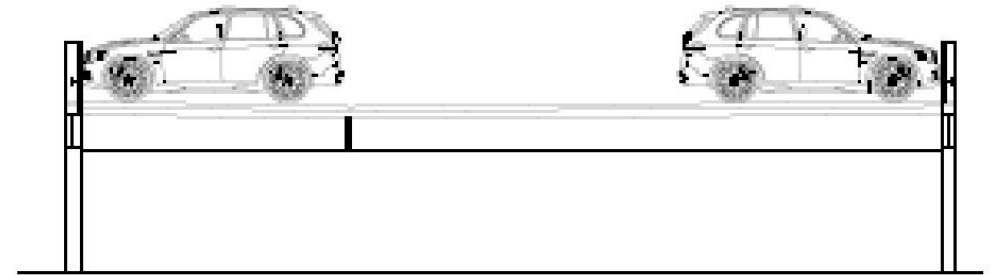


Gen 4 Panels
Sealed infill panels
water drains to slot channel
then to std ali gutter

Panel design change



GEN 1 - 3 CAMBERED DECK



GEN 4 PITCHED DECK



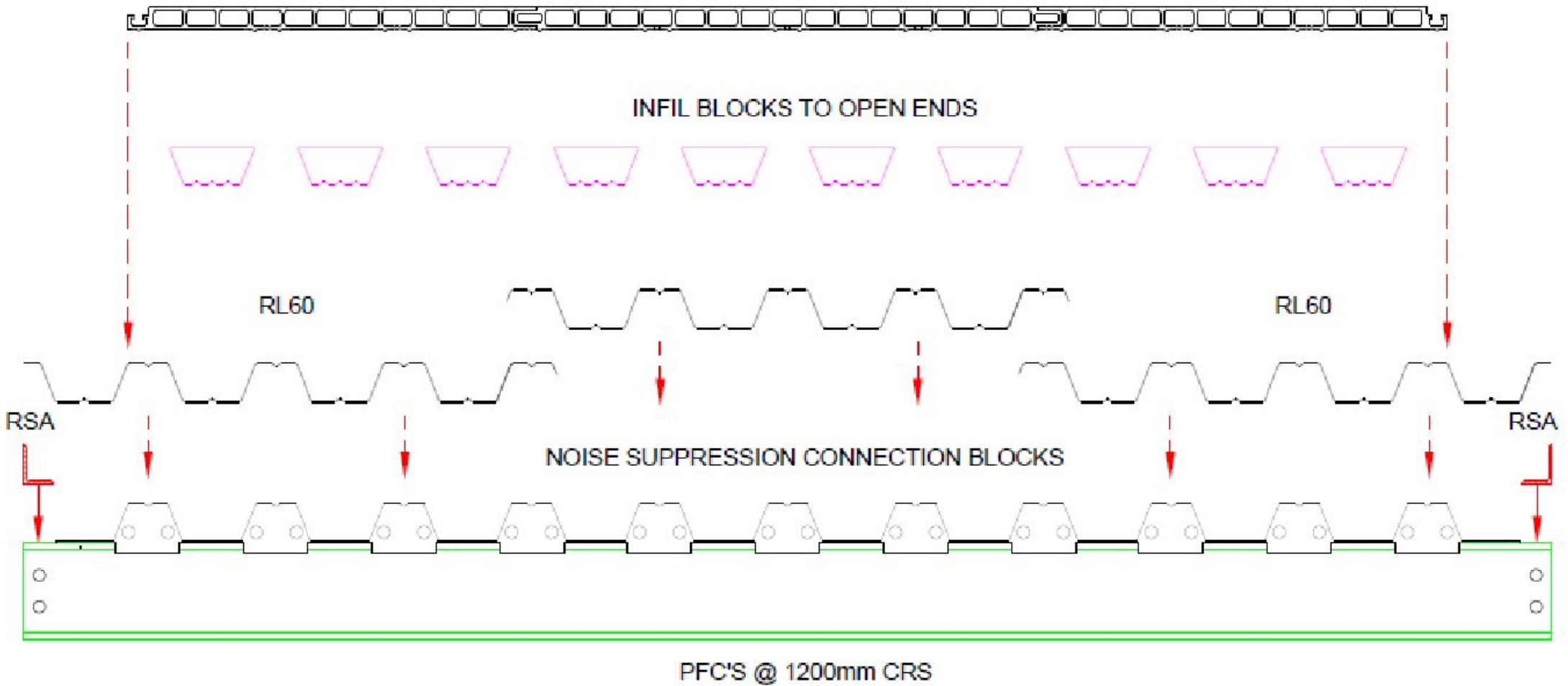
Truss design change

Gen 1 – 3 Cambered trusses

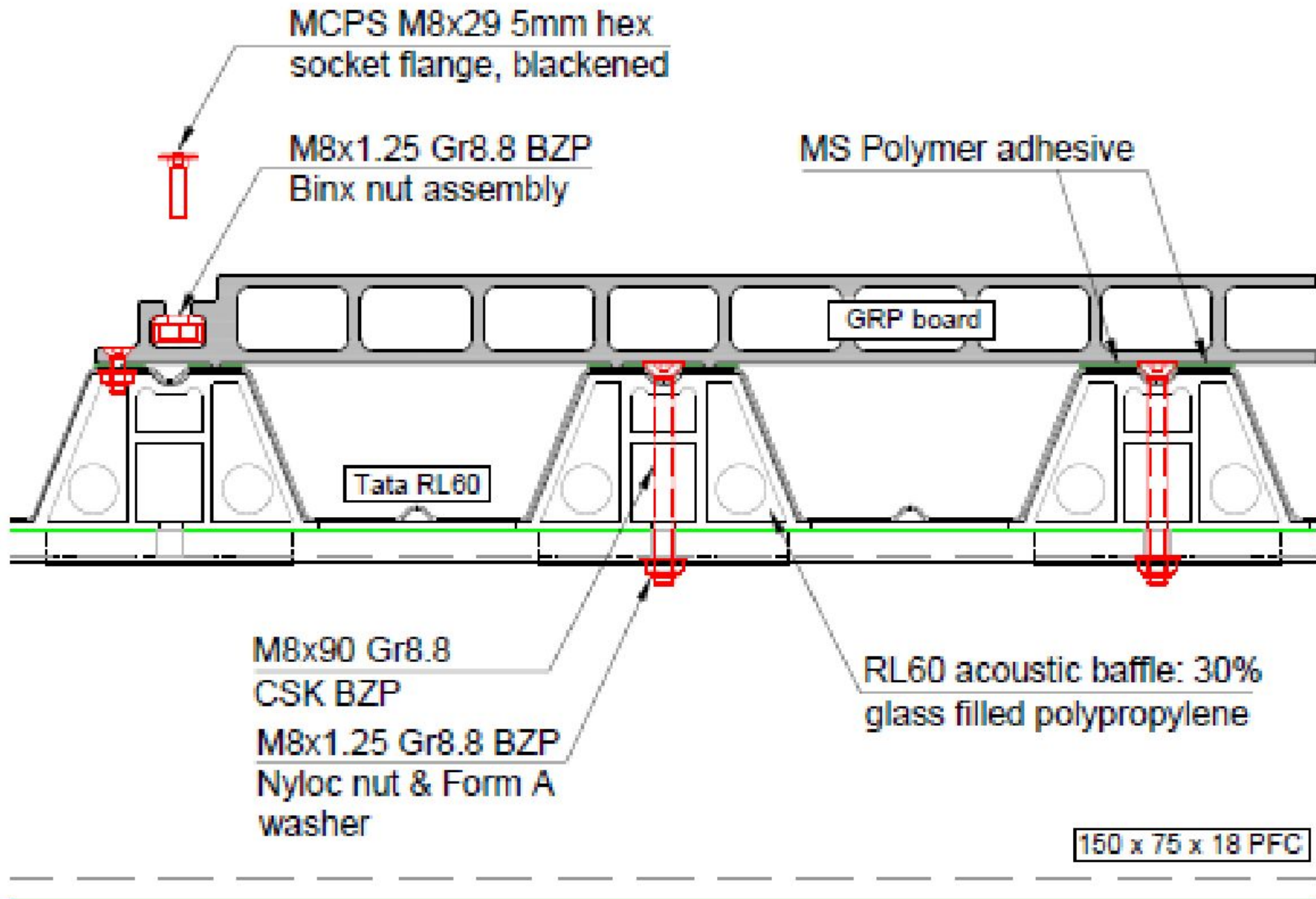


Panel make up

GRP PANEL WEARING COURSE



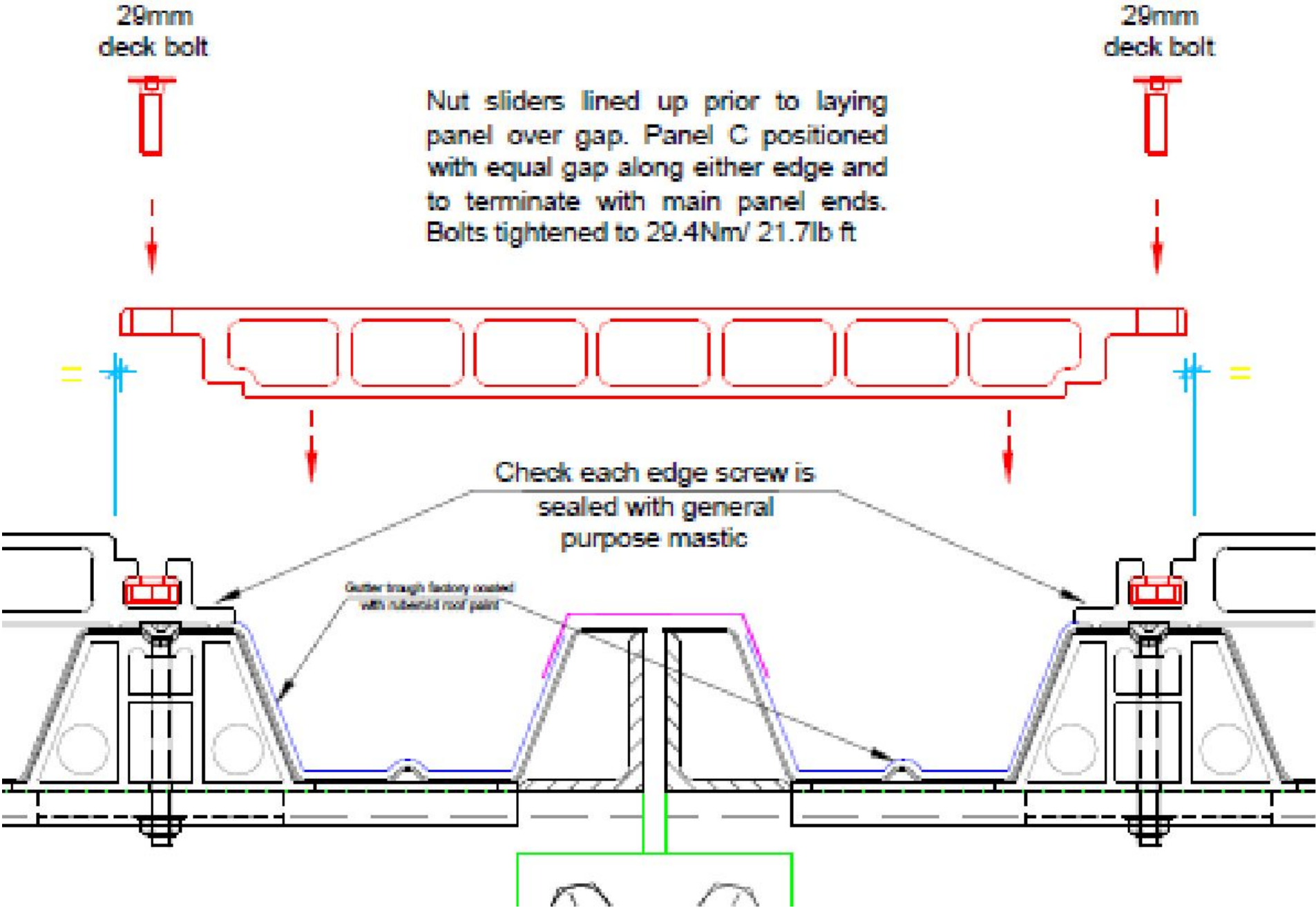
Panel make up



Completed panel



Site fixed panel



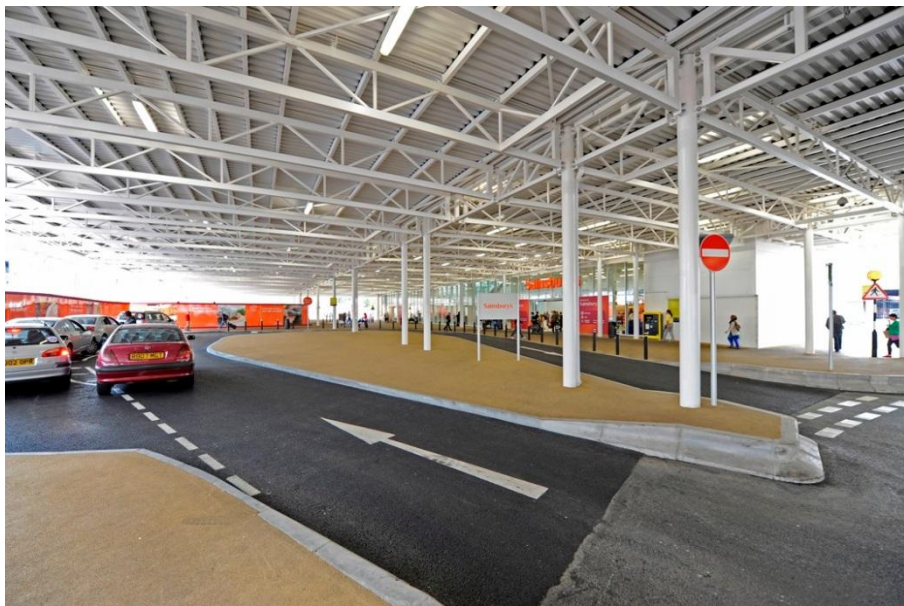
Site erection



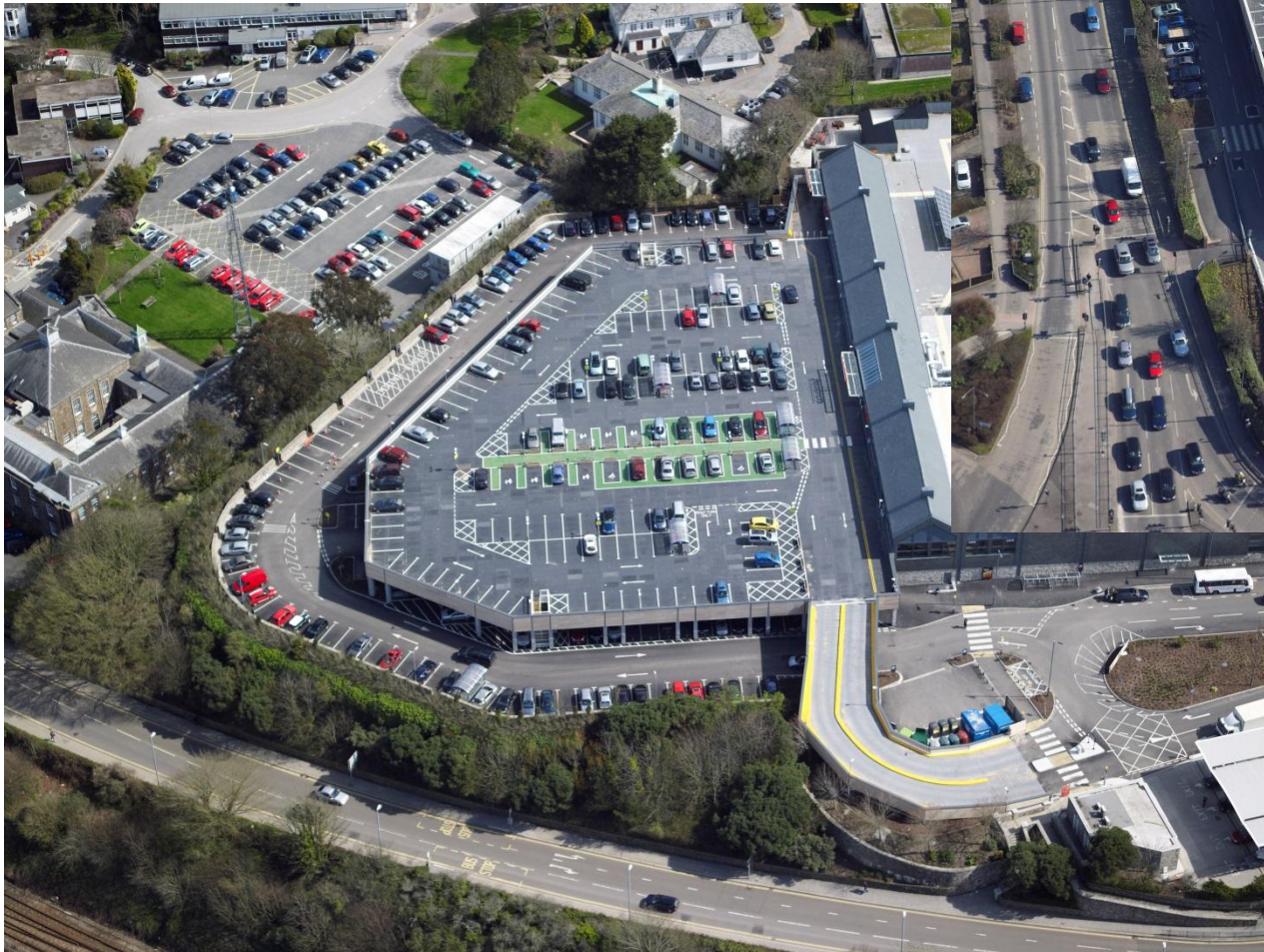
Site erection



Retail projects



Retail projects



Retail projects



Rail projects



Thank you