

REFURBISHMENT PORTFOLIO



Waverley Gate, Edinburgh.
Balfour Beatty Civil
Engineering Ltd.

Megashor and Megatruss
façade retention, both
internal and external. The
largest and most complex
façade retention ever
undertaken by RMD
Kwikform, at 6410m² of
retained façade, up to
40m high.

Howard Street, Glasgow.
St. Andrews Demolition.

Megashor façade retention
complete with pedestrian
access beneath, slender
façade retention towers.
370m² of retained façade.



Oswald Street, Glasgow
JCJ Demolition &
Construction Ltd.

Megashor façade retention
complete with our special
portalised lower section to
allow pedestrian access
beneath. Customer utilised
building blocks as kentledge
which were used later on the
reconstruction.
543m² of retained façade.

Crispin Lofts, Leeds.
Totty Construction Group.

Megashor façade retention
with pedestrian access
beneath and UB incorporated
into the height of the tower to
assist in using the self weight
of the building as kentledge.
2420m² of retained façade.



MET Centre, Liverpool.
Carillion Construction Ltd.

Megashor external façade
retention to former GPO
building. Interestingly
utilised TVCB and sand as
kentledge.
3050m² of retained façade.

Asda, Oldbury
Coleman & Company Ltd

Superslim façade retention
with raking shores using self
weight of the building as
kentledge.
615m² of retained façade.



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Free Trade Hall, Manchester
Laing Construction Ltd

Megashor facade retention with portalised base section to allow pedestrian access and beams incorporated to use building self weight to eliminate kentledge on the inner leg. Outer leg founded on mini piles.
1495m² of retained facade.

Clarendon Court, London
John Doyle Construction Ltd.

Megashor facade retention with complex tower configurations on some elevations due to narrow footpaths.
2840m² of retained facade.



Rutherglen Town Hall
Dem-Master Demolition Ltd

Superslim internal facade retention using a combination of flying shores, cantilevers and bowstring cantilevers.
450m² of retained facade.

Birmingham
Wates

Megashor facade retention internal and external.



Fox Street, Glasgow
Hunter Demolition

Megashor facade retention complete with portalised pedestrian access beneath towers, internal building blocks used as kentledge together with self weight of strip footings.
433m² of retained facade.

Ca D'Oro Building, Scotland
Wallis Building

Inside view of a facade restrained by external Superslim towers.



Falkirk, Scotland
WJ & D Demolition

Inside view of the first and second floors of a retained facade. Needles to the underside of the first floor have enabled the ground floor structure to be removed.

Northumberland Court
John Laing Construction

Aerial view of a Superslim facade retention complete with cabins within the retention system.



C U S T O M E R S E R V I C E S - 0 8 0 0 3 8 9 8 2 3 1

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Old Clock Tower, Holyrood
Dew Pitchmastic

Megashor in a heavy duty needling application supporting both the external wall and internal floor slabs.

The Tramsheds, Bath
E.P Rothwell & Sons Ltd

Megashor façade retention internal and external towers with flying shores from the towers.



Car Park, Birmingham Airport
Makers Construction

Superslim preloaded 'spider' props to support car park floor slabs during concrete slab strengthening near the column heads.

typical needling and propping application using Superslim.



Arnolfini, Bristol
TR Services (Bristol) Ltd

Megashor tower support, during column and floor replacement.

Lombard St., London
Wallis

Typical back propping/dead shore system using Superslim and Light Trishore props through multiple floor levels.



Botany Building, Glasgow
Reigart Contracts Ltd

Megashor and Superslim façade retention both internal and external to support this fire damaged building which forms part of Glasgow University.

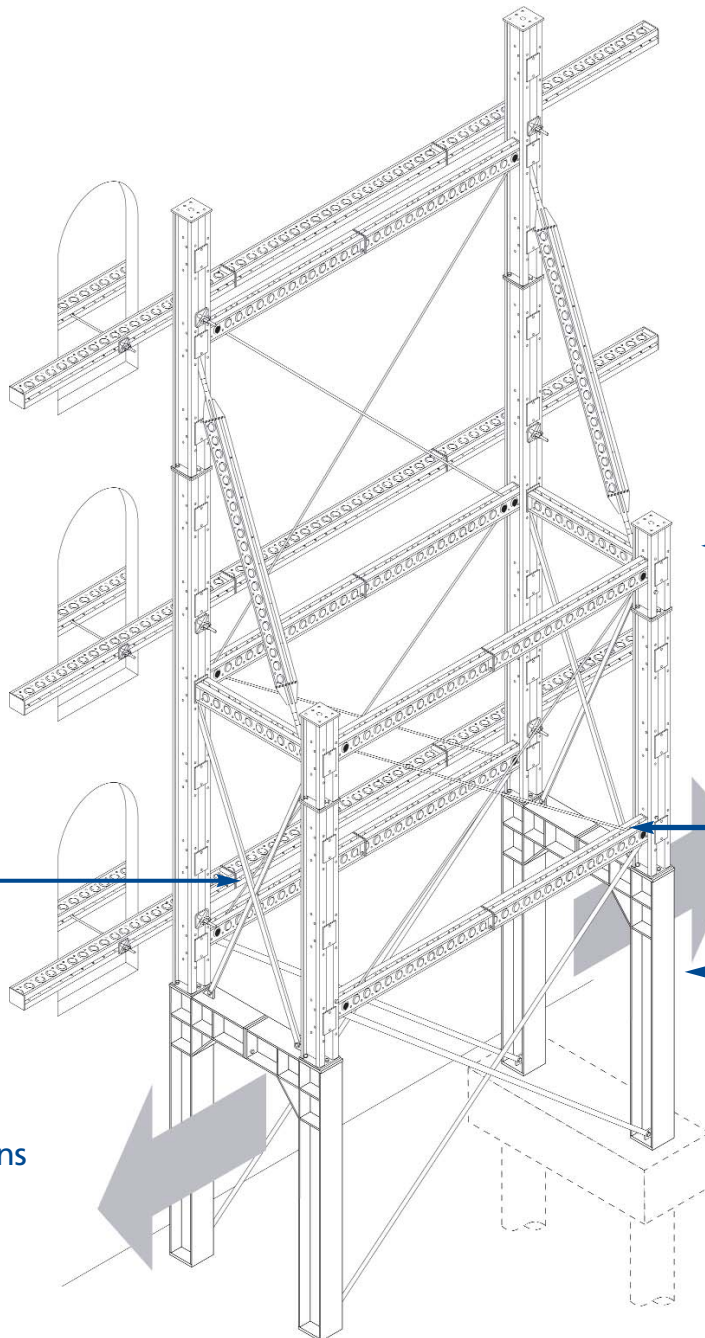
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TYPICAL MEGASHOR FAÇADE RETENTION



Superslim walers tied through window openings.



60mm x 8mm flat braces.

Access for pedestrians



Megashor legs.

Superslim soldier ledgers.

Megashor half portals providing brace-free pedestrian access.



C U S T O M E R S E R V I C E S - 0 8 0 0 3 8 9 8 2 3 1

DESIGN PROCEDURE

Safety

- We fully recognise our Health and safety and CDM related responsibilities.
- Safety is embedded throughout the RMD Kwikform service package, from initial enquiry taking through to dismantling of the equipment, from materials handling to product development.
- As well as our Health and Safety policy we have a corporate and Specific Policy developed to drive our compliance with the requirements of the CDM regulations.
- This is underpinned by a suite of comprehensive CDM documents such as Equipment Guidance Notes and Application Risk Assessments.



Pre - Tender

- Work with property owner, developer, architect and consultant to provide specialist advice on the façade retention options available.
- Draw from our extensive library of successful projects to provide previous similar where appropriate, or devise unique solutions where required.
- Produce outline designs for inclusion in tender packages together with budget pricing for project feasibility studies.



Tender

- Provide designs to meet tenderers' specific requirements.
- Facilitate contacts with experienced erectors of RMD Kwikform equipment on façade retention schemes.
- Provide pricing for the supply of RMD Kwikform design solutions.

Contract Award

- Work with the successful contractor in the further development of the design.
- Meet with the contractor's engineer to advise on the optimisation of the façade retention design.
- Assimilate details of customer designed foundations onto RMD Kwikform drawings.
- Liaise with erector and site team to fine tune design to suit erection restrictions such as restricted crane movements, manual handling and site access.



Design Service

- Attend site meetings to discuss customer requirements for the façade retention structure.
- Collect relevant information from site location and customer to facilitate wind load design in accordance with current wind load code BS6399-2: Code of Practice for Wind Loads.
- Collect relevant information from customer to produce detailed design brief using RMD Kwikform Design Brief Document.
- Design façade retention structure in accordance with CIRIA Guide C579, Retention of Masonry Façades - Best Practice, BS5975: Code of Practice for Falsework and BS449: The Use of Structural Steel in Building .
- Use drawings of existing structure and new structure to ensure temporary works are , as far as practicable, designed to avoid clashes.
- Carry out detailed designed of the façade retention structure ensuring practicable design incorporating when necessary special fabrications to optimise the design.
- Provide detailed design based on the information collected. Submit to the contractor, contractor's engineer and others as necessary for comments.
- Take responsibility for the adequacy of the RMD Kwikform supplied components within the constraints of the provided Design Brief.
- Provide BSEN ISO 9000/2001 compliant QA back-up in the form of a structured drawing issue process working towards Working Drawing Status. Provide calculations supporting the design.
- Provision of all anchorage to customer's foundations and details of reactions imposed on the foundations, for customer foundation and kentledge design.
- Check the erection of the completed RMD Kwikform structure is in accordance with the RMD Kwikform drawing.
- Assist and advise with the aspects of the scheme which remain the customer's responsibility such as; Foundation design, Kentledge provision; checks on the adequacy of the masonry to span between the lateral restraint points provided by the RMD Kwikform design; survey of the existing building; interfaces with statutory undertakers, Local Councils, Highways Authorities, owners or occupants of neighbouring properties etc.



Sales and Supply Service

- Provision of fully itemised quotations with a series of hire and sale options as appropriate to suit project duration.
- Delivery of components in a manner to suit the availability of site plant as communicated by the customer.

Erection Co-ordination

- RMD Kwikform has a library of detailed portfolios of companies throughout the UK who have experience in the assembly and erection of façade retention systems and heavy duty equipment.
- We can provide you with the details of such companies and co-ordinate the provision of erection pricing by them on your behalf.



A Positive Step Forward in Customer Care

- RMD Kwikform is leading the way with it's unique after sales service working closely with the customer throughout the contract, offering on site guidance for identification of equipment, co-ordinating deliveries and returns, as well as offering product appreciation courses and on site assistance on the erection of the equipment.
- No other supplier offers such an extensive after sales service helping to make the contract a successful one.

CASE STUDY

WAVERLEY GATE

Project: Waverley Gate
Location: Edinburgh City Centre
Contractor: Balfour Beatty Construction Ltd
Demolition Contractor: Dem Master
Developer: Castlemore Ltd
Scheme: Megashor & Megatruss Façade Retention

- In many instances a mixture of internal and external retention system.
- Utilising new permanent works foundations.
- Horizontal trusses 55m span.
- Elevations up to 40m high.
- Total area of retention supported 6410m².



Introduction:

RMD Kwikform has been involved in the design and supply of the huge and diverse façade retention at the new Waverley Gate development in Edinburgh. This project was the first that RMD Kwikform has designed in accordance with the new CIRIA 579 document.

RMD Kwikform equipment was selected in preference to structural steel due to the short lead in times and the increased flexibility. RMD Kwikform designed and supplied retention structures to over 7200m² of façade using predominantly Megashor - that's the area of around 30 tennis courts!

Design Development Process:

Rather than just being one large project, the retention split itself logically into 5 separate, but in some cases linked areas - Waterloo Place, Waverley Station, Waverley Car Park, Calton Road and North Bridge.

Waterloo Place was the most straight forward elevation to restrain being 30m high and having a relatively unobstructed wide paved area at the front. The internal legs of the façade frame were extended downwards into the light well onto piled foundations, while the horizontal loads are resisted by the existing foundations at this low level.

The Waverley Elevation provided a greater challenge. This huge façade measuring in at 3100m² was split into two distinct areas, Waverley Station & Waverley Car Park. New basement construction within the existing building at the Waverley Station end of the façade meant that the eventual height of the retained masonry would be nearly 40m. The retention structures for the two sections were completely different from each other. The Waverley Station end of the façade had to be supported from within, whilst the retention frame for the Car Park section could be external.

The car park end, although measuring in at a comparatively less 28m high posed its own challenges as the available footprint for the retention structure was limited to a narrow tapering strip external to the building. In this area the structure was restrained using cantilever Megashor towers braced in Warren girders configuration. Legs were doubled up near the base of the structure and the towers were narrow and close spaced in order to fit into the limited 3m footprint and to satisfy the deflection criteria. The narrow width of the towers gave rise to substantial foundation loads, which were



accommodated by fixing the structure down to a piled raft foundation.

At one end of the Car Park Elevation an existing footbridge obstructed the installation of the temporary works piles. This meant that the configuration of the support structure had to be changed again. The width of the towers was increased by siting the façade retention structure half inside and half outside of the building. Careful control of the geometry enabled all of the bracing members to pass through existing openings in the façade. This additional width meant that smaller piled foundations could be used in this area.

The Waverley Station part of the façade was restrained using Megashor Towers. Multiple tower frames were used and a crank was added at the base of the tower to provide the stiffness required to limit deflections and foundation loads. The towers were founded on heavy structural steel rafts supported on inclined piles. Once demolition was complete the basement level was reduced by 5m. The towers and inclined piles were modelled together to check the performance of the entire structure.

The North Bridge Elevation was 55m long and 30m high, with little pavement width on the outside



of the structure. Again, this meant that the retention structure needed to be sited on the inside. This complicated the façade retention design, due to the number of things in the way. A piling rig needed to work at ground level close to the existing façade, meaning that the frame could not extend to ground level. A mutual restraint was therefore the only option and so 6m deep Megatrusses were designed to span the entire length of the building between the return walls. The walls that restrained the façade prior to the truss becoming active had to be avoided. Thick load bearing walls at each end also had to be missed. This resulted in the ends of the trusses needing to be cranked in plan - one end shallower than the other. Many columns that would support the new construction also had to be avoided as did the zone required for the construction of a new shaft. 3D Analysis was used to determine the structural behaviour of the façade retention space frame. The frame took support and lateral restraint from a Megashor tower at mid-span.

The Calton Road end of the building measures 28m wide and 29m high. Access for site traffic was required through existing openings and the



retention structure could not extend to ground level in these areas. The presence of substantial return walls on either side of the structure lent themselves to retaining the façade in a mutual manner. Stiff Megatrusses 4m deep were used to span between the flank walls at five levels. Use of the in plane stiffness of the retained façade was made in order to support one of the flank walls laterally.

The project used 480 tonnes of Megashor and Megashor Plus, 190 tonnes of Superslim Soldiers and took 60 man weeks to design with 130 CAD drawings detailing the installation.



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CASE STUDY

CRISPIN LOFTS

Project: Crispin Lofts
Location: Leeds City Centre
Contractor: Totty Construction
Demolition Contractor: Sharpe & Scarfe
Developer: Cityfusion
Scheme: Megashor Façade Retention

- Two 60m elevations of façade up to 25m high. Amassing to 2420m² of retained façade.
- Buildings self weight used as kentledge.
- Modular towers used to ease erection speed.



Introduction:

This case study relates to a Victorian building called Crispin House in Leeds. The developer put together a £7m plan to convert the building, which was a former orthopedic factory, into 76 apartments and penthouses.

The existing 25m high building had four floors and a basement and was of red brick construction with limestone lintels, corbels and ornate details. The building is situated on a tapering plot of land between two streets, Trafalgar Street and New York Road. The internal structure consists of steel beams built into pockets in the brickwork piers, spanning onto cast iron columns along the centre line of the building, with timber floors. The building was heavily glazed and the footpaths outside sloped steeply on both elevations.

The refurbishment of the building introduced more floors within the existing building and extended the building upwards above the current roof level. The existing internal steel frame did not suit the new usage and so was replaced with a new one. In addition the basement was to be deepened to provide underground car parking facilities. This was to be achieved by staged underpinning the existing foundations. The two 65m long elevations of Crispin House, one along Trafalgar Street and the other New York Road were to be restrained with an external façade retention system.



Design Development Process:

The information required to design the façade retention came from a number of sources. Electronic copies of the existing structure drawings were used together with results of condition surveys and verticality surveys as well as detailed specifications. Meetings with the contractor and engineer identified site specific requirements such as access points, crane capacity and programme constraints. RMD Kwikform offered their expertise in this specialist field by advising on the standard practices, options available and guidelines for design. Outline designs were produced and the final design was developed considering the design parameters covered in the next section.

Design:

The loading to be applied to the façade retention frame come from two main sources, the wind load and lateral load due to out-of-plumb of the retained façade. The wind loading was calculated in



accordance with BS5975, and CP3 Chapter 5. (since superseded by BS6399 Pt2) Crispin House is situated in the city centre of Leeds and was surrounded by buildings of a similar height of 20 to 25m. This enabled appropriate wind pressures to be established for the design.

Detailed surveys of the building at each floor level enabled the wall thickness to be established. The verticality survey and condition survey showed that the facade was in good condition and at better than 1:67 out of verticality. This enabled the percentage of brickwork dead weight acting as a de-stabilising force to be reduced to from 2.5% to 1.5% of the façade weight.

Support to walls is provided by walers both inside and outside effectively sandwiching the wall. These walers are secured with ties through the window openings and positioned to avoid new and existing floors whilst still providing adequate lateral restraint to the façade.

Due to the basement deepening works we needed to avoid surcharge on the footpath adjacent to the building. This was achieved by using the self weight of the façade. The inner leg loads were transferred to the facade via a beam introduced into the height of the tower. This beam projected into the building through the windows and was connected to shear plates bolted to the inside face of



the façade. To standardise the steel frame connecting to the building the beams were made to enter the building all at the same level. This was further complicated by the 3m slope of the footpath outside on which the towers were founded. It was overcome by tailoring the make-up of the tower beneath the beam and having a standard tower configuration above the beam. This enabled a good proportion of the towers to be a standardised design which facilitated a modular erection process.

RMD KWIKFORM worked with the engineer in the design and detailing of the foundations providing design loads for each leg position. The engineers basic design was then modified to suit the street slope of the site by stepping the upper surface of the foundation. The kentledge on the outer leg was installed on top of the low level stepped strip footing. The anchorage system to the footing was designed by RMD Kwikform.

Pedestrian access was maintained throughout the contract by the introduction of RMD Kwikform's unique Megashor Half Portal frames at the base of the



tower system. These frames are specifically designed to enable the bottom of the façade retention towers to be left clear of bracing and can be spaced apart with Megashor to suit the width of tower used.

It was established that the party wall required restraint. This was achieved by continuing walers around the party wall having flying shores, knee braces, across the corners thus transferring loads back to the main retention system. This meant that internal towers were avoided thus leaving the basement clear for deepening and underpinning works.

The development of the inside of Crispin House left a section of the original structure untouched. The main façade retention system was already installed when it was discovered that a large concrete roof beam needed extensive concrete repairs. The beam needed to be propped down to the basement for the duration of the repairs. It also transpired that the existing steel and timber flooring was left unsupported at the demolition line once the load bearing walls and stairwells were removed. Further more the removal of the stairwells and load bearing walls left the façade unsupported beyond the extent of the current façade retention system.

A single system was designed to accommodate all of these issues and took the form of a a braced frame across the entire 13m width of the building. The frame had header beams at roof level to support the concrete beam during repairs. The Megashor verticals had brackets fixed to them which picked up the unsupported steel frame. The ledgers had superslims suspended on ties which cradled the unsupported timber floors. Finally the whole frame was braced across the width of the building and connected to walers extended from the external façade retention.

It took around three weeks to develop the design which was ultimately represented by 11 drawings. The project used 72 tonnes of Megashor, 46 tonnes of Superslim Soldiers to restrain the two elevations amounting to 2420m² of facade.



HEAVY DUTY PRODUCT RANGE AND APPLICATIONS

Girder 500

The Girder 500 is a unique lightweight lattice sectional girder which can be used as falsework support for straight, curved or arched bridges. It may also be used for large span floors, access walkways and underpropping existing structures during demolition. A common use is for the support of arched bridge structures during the removal of back fill in order to apply strengthening saddle of concrete. The girders are made up from a combination of the 750mm deep lattice girder sections and end sections connected with pins and turnbuckles. Statistics: Bending Moment; Single Depth 146.9kNm; Double Depth 294kNm.



Girder R700

The Girder R700 is a 2100mm deep modular panel girder system available in a range of lengths connected together with simple shear pins on the top and bottom chord. The system can be used in many clear span applications such as construction of new bridges and viaducts, temporary pedestrian footbridges, temporary road bridges. Statistics: Bending Moment; Single Chord 1280kNm and 3317kNm with reinforcing chord.



Superslim

Superslim with its unrivalled range of sizes and accessories is the backbone of the RMD Kwikform Product Range. It is designed for its high strength to weight ratio and durability. Its uses are wide and varied beyond the more traditional formwork applications and include needling and propping, back propping, travelling gantries, lifting frames, cabin gantries and façade retentions. Statistics: Axial capacity of 150kN when used as a strut and 40kNm bending moment when used as a beam.



Megashor, Megashor Plus, Megaprop and Megatruss

Megashor is an ultra heavy duty propping system designed for axial loads of 1000kN. Megashor Plus is also available with an axial load capacity of 1400kN. The real strength of this product is in its versatility. Not only can it be combined with the wide range of Megashor accessories but also with the Superslim range. This enables Megashor to be configured in a huge variety of applications, vertical, inclined and horizontal struts, support towers, beams, bridge propping, travellers and façade retentions. The Megashor sections can be formed into a range of trusses to provide incredibly strong spanning girder systems. Megaprops can be formed where groups of four or six shaft sections are connected together to act as one composite strut capable of taking axial loads of up to 8400kN. This combined with the bending capacity of Megashor of 102kNm make Megashor one of the most versatile products in the RMD Kwikform Heavy Duty Product Range.



Steel Beams and Specials

RMD Kwikform have an extensive stock of steel UB and UC beams for use in clear spanning applications, headers, spreaders and needles. In addition to the standard steel header beams we hold a stock of "specials" from previous schemes and will design and manufacture additional special items to work with our standard product range.



Light Trishore

The Light Trishore is a three legged lattice strut forming an equilateral triangle on plan, designed to carry axial loads up to 200kN. They have a very high strength to weight ratio and come in a series of lightweight man-handleable units. There are a selection of fixed or adjustable heads and bases to suit all applications which can achieve the required propping height. Typically used in the refurbishment sector for back propping applications.

