

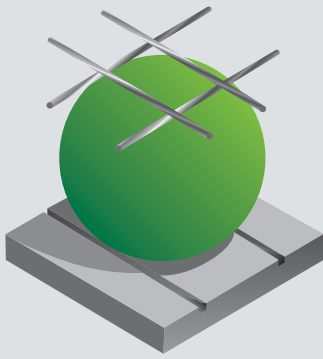
BubbleDeck Structure Solutions



Site Erection & Installation Manual

Type A - Filigree Elements

The Original Voided Flat Slabs
with BubbleDeck



Site Erection and Installation Manual

Type A – Filigree Elements

BubbleDeck is a structural voided flat slab system that reduces dead weight of a floor slab by 33%, allowing longer spans between column supports and a whole range of other design, cost and construction benefits. The system eliminates secondary supporting structure such as beams – the completed floor slab spans in two directions directly onto pre-cast / in-situ reinforced concrete columns or structural walls.

BubbleDeck is usually manufactured as partly pre-cast filigree elements, combining the benefits gained from off-site MMC techniques of factory manufacture in controlled conditions, ensuring quality control and consistency, with on-site completion of the final concrete pour, resulting in a seamless completed floor slab - without the issues associated with fully pre-cast methods arising from dry joints resulting in noise transfer needing additional work to seal gaps, and need for structural toppings with additional construction layers. When the site topping concrete has been cast a BubbleDeck structure is complete – providing integral overall building stability, fire resistance, weatherproofing, and sound insulation.

Site erection and installation is simple and fast, well within the capabilities of any competent concrete contractor or sub-contractor. On previous projects over 800m² of BubbleDeck has been erected and completed within 4 working days. The elements are manufactured 3 metres wide (upon request prior to ordering 2.4 metres wide where site access is restricted) and the length is varied, to suit project floor-plate configuration and transport efficiency, up to a maximum of 10 metres long.

For more background information about the BubbleDeck system please study our separate Product Introduction Brochure prior to reading further.

Pre-Construction Planning

We believe the key to achieving a successful construction build is meticulous preparation and planning, with good communication. Well in advance of construction commencing on site BubbleDeck's managerial and technical team will closely work with you - advising on and defining a detailed programme for the timing and phasing of drawing preparation, drawing review, drawing sign-off approval, element manufacture and element delivery to site – to match your strategic approach and reflect your overall construction programme.

Please take into account there is a lead in period from the date of placing your BubbleDeck order – typically 3 weeks for our design / general arrangement drawing work plus 9 weeks for preparation, producing production / installation drawings and manufacturing of the elements (on larger projects drawing and manufacturing will be undertaken in phases to match your construction programme) – before we can commence site deliveries. Between these periods you need to allow sufficient time for submitting our design / general arrangement drawings to your Approved Inspector and receiving Building control approval, although in special circumstances and smaller projects we can reduce these periods if our other commitments allow.

The pre-construction planning stages comprises:-

1. Issuing to us frozen 'For Construction' Architects / Engineers general arrangement plans, sections and relevant details in ,dwg file format together with final loading information and firm order / deposit payment.
2. Preparation by us of BubbleDeck full engineering design and general arrangement plans, showing element layout, and submission to you for review and technical approval.
3. Submission by you of our design / drawings to Approved Inspector. Referral to us of any queries and us providing answers / further information as may be required.
4. Confirmation from you Building Control approval receipt and issuing to us sign-off approval of BubbleDeck design / general arrangement drawings.
5. Develop together programme for production / installation drawings, manufacturing and delivery to site
6. Preparation by us of a detailed programme for production / installation drawings, manufacturing and delivery to site. Review by you and issuing to us programme approval.

Project:	Le Coie Hotel Jersey																												Status:	Issue 04 - 4th June 2004						
Subject:	Programme for production, manufacture & delivery of BubbleDeck floors																																			
Date:	4th June 2004																																			
Floor type:	BD 280																																			
Quantity:	7.484 m ²																																			
appr. quantity m ²	2004	3/5	10/5	17/5	24/5	31/5	7/6	14/6	21/6	28/6	5/7	12/7	19/7	26/7	2/8	9/8	16/8	23/8	30/8	6/9	13/9	20/9	27/9	4/10	11/10	18/10	25/10	1/11	8/11	15/11	22/11	29/11	6/12	13/12		
Calendar Week No.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51			
Project Week No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29							
1st floor Blocks A-D	1																																			
2nd floor Blocks A-D	1																																			
3rd floor Blocks A-D	1																																			
4th floor Blocks B-D	1																																			
5th floor Blocks C & D	1																																			
6th floor Block C	1																																			
total	#REF!																																			
KEY	1. BDCI - Provisional production drawings																																			
	2. ACM / DTM check provisional production drawings																																			
	3. BDCI - Final production drawings																																			
	4. ACM / DTM - formal approval final production drawings																																			
	5. BDCI - Factory production																																			
	6. BDCI - Delivery period																																			
	7. ACM - Erection																																			
	Main Contractors last date for FULL delivery																																			

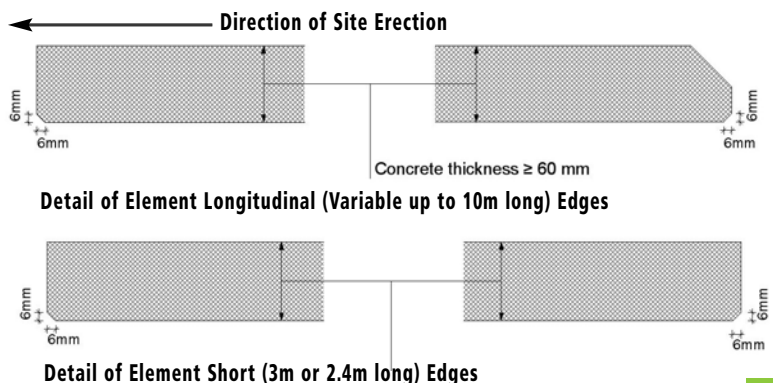
BubbleDeck Drawing / Manufacturing / Delivery Programme

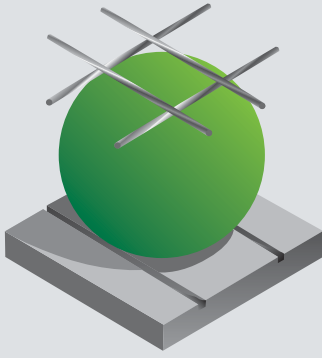
- Confirm to us your planned sequence of erecting the BubbleDeck elements on site.
- Confirm to us your requirements for any phasing, day joints, and service riser holes above 250mm diameter you want pre-forming in the factory.
- Planning by you of fixed / mobile crane provision and location providing adequate capacity to lift heaviest elements.
- Advising us of your arrangements for site access and any access restrictions / procedures.
- Providing our advice on technical and practical construction issues.
- Selection by you of preferred propping system and arranging propping beam layout to be issued to us for review and comment.
- Preparation by us of production / installation drawings (projects above 2,000 m² in phases as programmed) and submission to you for review and formal sign-off approval.
- Preparation by us of Quality and Delivery Control forms showing planned loading of elements onto our transport trailers, submission to you for review and approval.

Planning Pre-Cast Element Erection

Prior to us commencing preparation production / installation drawings (see Stage 7, left) you must confirm to us your planned sequence of erecting the BubbleDeck elements on site during construction. This sequence has to be incorporated on our drawing element numbering at an early stage and passed to our factory in order to ensure a) the correct element edge profiles are manufactured, and b) plan the sequence of manufacturing / transporting elements.

a) Element Edge Profiles: Longitudinal edges of elements require different detailing dependant upon their position – see drawing below showing slab edge cross-sections element as planned. It is important the large splay shown on the right hand longitudinal edge is present at every junction between two elements to provide adequate concrete cover, for fire resistance and durability performance, to the loose reinforcement splice bars laid across the elements joints on top of the pre-cast concrete layer.





Planning Pre-Cast Element Erection
continued

b) Manufacturing and Transporting Sequence: We will programme the order of manufacturing elements and loading of the elements onto our transport to reflect, as closely as practically feasible, your planned erection sequence. However, for transport efficiency and safety, some elements have to be loaded on the transport trailers out of sequence to their erection order (e.g. small elements have to be stacked on top of larger elements), in which case these elements can be temporarily lifted off and stored elsewhere on site while the transport trailer is unloaded. The order of loading elements onto the transport trailers will be shown on our Quality and Delivery Control form.

Formal drawing review & sign off prior to manufacture

Once you have reviewed and we have received your sign-off of our production / installation drawings we can then implement manufacture of materials and the elements and be ready to commence site deliveries of prefabricated BubbleDeck elements within advised manufacturing lead-in period.

We appreciate progress of construction on site can be affected by many external factors including exceptionally adverse weather and other events beyond your control. If you need to change the programming of BubbleDeck deliveries and/or manufacture in response to such events please immediately inform us so we can then re-programme to your requirements. Once BubbleDeck trailers have left our factory we regret we are unable to defer site delivery without passing on additional transport and storage / trailer hire costs. We have even advanced deliveries to keep up with quicker than expected progress constructing BubbleDeck slabs on site.

BubbleDeck's Construction Package

Our Services and Products

Our design service includes full engineering calculations and site installation drawings.

As part of our comprehensive service we will supply you with the following construction information, advice, products and assistance:-

Project Stage	Service / Product
BubbleDeck Design	Engineering Design of BubbleDeck floor slabs & drawings. Submitting design to you for review and sign-off. Liaison with you about any checking engineer / Approved Inspector queries and providing further information as required.
BubbleDeck Drawing Production	Preparation of manufacturing and construction drawings comprising i) Element layout plan, ii) Loose bottom reinforcement (site installation), iii) Loose top reinforcement (site installation), iv) Bubble pattern v) Pre-cast reinforcement (incorporated into elements at factory). Submitting drawings to you & Consultants for review and sign-off.
Construction Planning	Preparing programme for manufacture and supply of products to site, agreeing with you and placing orders for materials and manufacturing. Preparation of bar bending schedules of loose site reinforcement for supply to site by others. Providing site operatives with product induction seminar.
Product Advice and Support	Providing our advice on technical and practical construction issues. BubbleDeck Site Erection and Installation Manual. BubbleDeck Health & Safety Policy Guidance. Quality and Delivery Control Forms.
Manufacturing Product	Manufacture of prefabricated BubbleDeck elements comprising top & bottom mesh reinforcement / girders joining top / bottom mesh together / additional bar reinforcement / plastic bubble void formers (Type A Filigree elements with 70mm pre-cast concrete layer encasing bottom mesh reinforcement).
Loose Reinforcement	Preparing loose site reinforcement bar bending schedules for supply to site by others.
Site Delivery	Monitoring and arranging delivery of prefabricated BubbleDeck elements to site, on time, using between 8 metre to 13.6 metre long flatbed trailers. Loan of BubbleDeck lifting chainsets during site installation for lifting and placing BubbleDeck elements.
Site Support	Technical advice and guidance to yourselves and site operatives on site installation & construction works.
Site Inspections	Site inspections of BubbleDeck installation & loose reinforcement checking prior to casting of in-situ concrete.
Insurance / Guarantees	Following completion of works on site and account settlement entering into suitable Collateral Warranty/s (subject to wording acceptable to our Insurers) as may be required and provision of our Professional Indemnity & Product Liability Insurance cover.

Concrete Column / Wall Construction

Important: In accordance with good practice and British Standards DO NOT overpour r.c. columns / walls in order to avoid reducing the slabs effective depth at support locations. Only use enough concrete to bring r.c. columns / walls up to the underside of the BubbleDeck flat slab level. In the event r.c. columns / walls are concreted above this level our Site Advisor/Inspector may require the concrete to be cut down around the perimeter of r.c. columns / walls to ensure adequate connection with the BubbleDeck slabs.

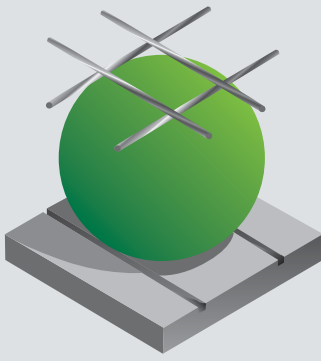


Combined Column / Wall & BubbleDeck Construction Method

While sequencing of site operations is your responsibility to decide we recommend the most efficient method, saving valuable site time and overheads, is to plan construction of supporting r.c. columns and walls together with the BubbleDeck floor slab in one combined erection operation as detailed in the following table:-

Stage	Operation	Activities
1	Column / wall reinforcement & formwork (Prior to BubbleDeck element delivery)	a) Fabricate & erect r.c. column & wall reinforcement. b) Fabricate formwork shuttering with horizontal plywood top flange 200mm wide extending out from vertical shuttering & bracket supported by vertical shuttering.
2	Temporary Propping (Prior to BubbleDeck element delivery)	a) Erect Temporary Propping beams. (Refer to Stage 1 on page 5) b) Erect formwork shuttering and (when suitable stable propping such as SGB GASS system is used) brace upper formwork off temporary propping frames. Note: When column / wall formwork is to be braced off slab it will be more convenient to erect this before erecting temporary propping
3	BubbleDeck Element Erection	Receive, lift and place BubbleDeck elements onto temporary propping beams. (Refer to Stage 2 on page 6)
4	Loose Reinforcement	Install BubbleDeck loose reinforcement (Refer to Stage 3 on page 8)
5	Slab shuttering	Fabricate and erect perimeter & tolerance joint shuttering (Refer to Stage 4 on page 9)
6	Slab Preparation	Prepare columns, walls and BubbleDeck slab for concreting (Refer to Stage 5 on page 9)
7	BubbleDeck Site Inspection	Notify us of the date set for concreting (Refer to Stage 6 on page 10)
8	Pouring Site Concrete	Pour concrete firstly into columns and walls, vibrate and compact. Then as a continuous process pour concrete onto BubbleDeck slabs (Refer to Stage 7 on page 10)

This combined erection method has the advantages of a) Condensing a two stage sequence (erecting & casting columns / walls first and then BubbleDeck slabs second) into a one stage sequence; b) Providing a stable & firm platform for casting columns / walls; c) Eliminating separate concrete deliveries for columns / walls and slabs; and d) ensuring a good bond between column / wall and BubbleDeck slab site concrete.



Site Erection and Installation

Type A – Filigree Elements

Stage 1 – Erect Temporary Propping

During erection each slab must be placed on suitable temporary propping beams arranged in parallel rows mounted on props sufficient to adequately support the weight of the pre-cast filigree elements plus the loose reinforcement fixed on site, concrete poured on site and all other site construction loads applied during final pouring of the concrete topping and curing of the slab.

- The maximum distance between propping beams must not be greater than 1.8 metres or as advised
- The maximum distance of the propping beams from slab edges must be as follows:
 - from an edge where a slab is supported on brick or concrete walls – 300mm
 - from an edge next to construction tolerance joints – 200mm

Propping beams must be at right angles to the direction of the reinforcement girders pre-cast in the element. Normally the girder reinforcement is placed parallel to the length of each slab but this must always be checked against the manufacturing and installation drawings. The propping beams, and individual props below, must form a stable platform prior to placing filigree elements onto them and maintained stable during casting of the site concrete.

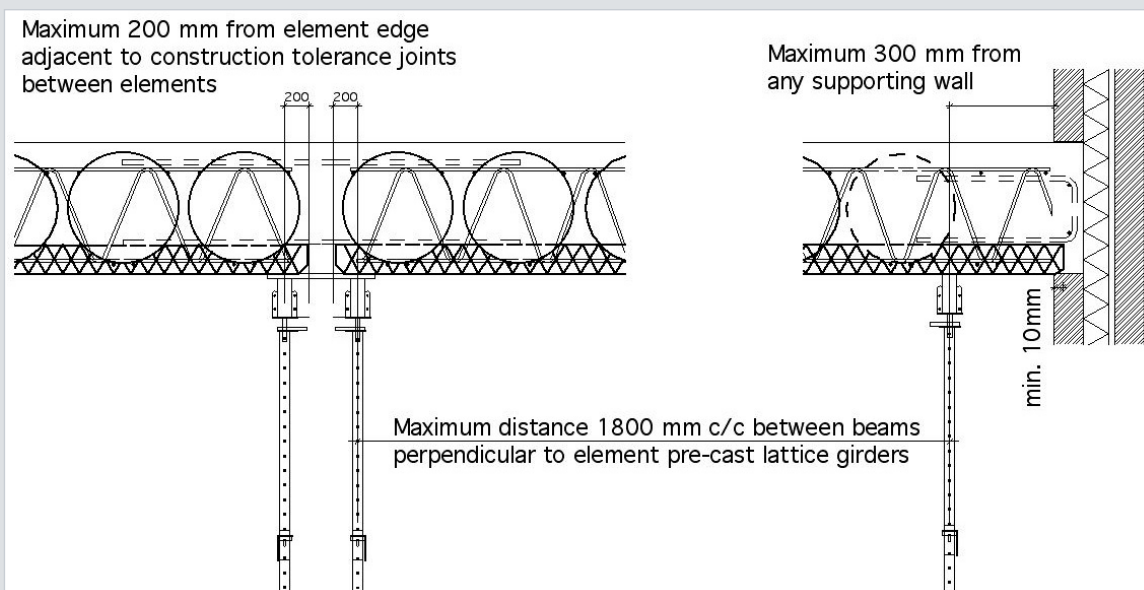
Important: Removal of the temporary propping is **NOT** allowed before each slab is cured sufficient to support its own weight and temporary construction loads.

Back-Propping

When consecutive floor slabs within one block are to be constructed above each other either:- **a)** the slab below the one being constructed must be back-propped, or alternatively **b)** each completed slab must be self-supporting within the maximum allowed deflection.

Option a) Prior to erecting propping for the next, subsequent, slab above the completed slab remove the propping from below the completed slab and erect back-props at 2.4m intervals (without parallel beams) at either mid-span or third-span, dependant upon length of spans involved.

Option b) Prior to erecting propping for the next, subsequent, slab above loosen the props below the completed slab, to allow the floor to reach it's maximum deflection, and then tighten the props again. This is to ensure additional loads from the slab being erected above are taken on its own props rather than adding to loads onto the floor directly below, avoiding weight accumulation from consecutive floors placing unnecessary strain on props and other construction elements.



Typical cross-section of temporary propping system

Typical arrangement of props and propping beams



Stage 2 – Delivery, Lifting and Placing Elements

Site Delivery: We deliver the elements on flatbed trailers typically between 12m to 13.6m long, excluding drivers cab. The filigree elements will be stacked on top of each other up to a maximum 2.5 metres overall height. For example, with BD280 slabs there will be maximum 7 layers of slabs, with a transport height of 250mm each plus wooden packers typically 50mm deep separating each element, making an overall height of 2.1 metres above the trailers bed. Each individual load will be planned so the weight of a load will be a maximum 29 Tonnes and you must provide suitably hard and level access for our delivery transport to reach the offloading position you have determined.

Important:

Upon arrival of the delivery trailers on site it is your responsibility to carefully inspect the filigree elements for quality and to ascertain any damage that has been incurred during transport. Any damage to the filigree elements, or other unacceptable characteristics, must be reported by you to us by entering the details on our Quality and Delivery Control Form and faxing this back to our Head Office within 2 hours of trailer arriving on site. Once the elements have been lifted off the trailer we may be unable to determine when any damage occurred and in this event we cannot accept responsibility.

Loaded trailers arriving on site



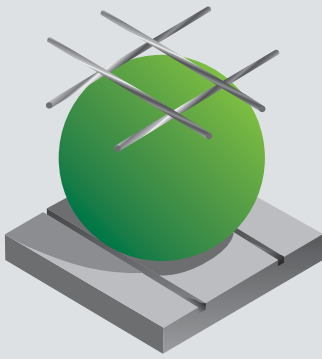
Following your inspection the delivery driver will require you to sign the Quality and Delivery Control Form to confirm you have received the elements, which will be retained by him / her for our records. After removing all the filigree elements from the flatbed trailer the wooden transport packing beams / blocks must be replaced back onto the trailer before it leaves site, for return to our factory and re-use. Any transport materials that are not returned to our transport operator will be contra-charged by us to your account.

Offloading Filigree Elements: It is your responsibility to provide attendance and adequate mechanical equipment (fixed or mobile crane with typical 6 Tonne lifting capacity) for offloading elements from the trailers upon their arrival at site. **For optimum working efficiency we recommend you plan site operations to allow the filigree elements to be lifted off the trailers and moved straight into their final position on the temporary propping.**

However, for transport efficiency and safety some elements are loaded onto the trailer out of sequence to their erection order, in which case or in the event of site circumstances preventing final placing the filigree elements can be temporarily stored elsewhere on site. The elements must be transversely supported on timber packers laid between the bubble rows (sat on the top reinforcement mesh) at maximum 1.8 metres centres resting on flat, level, ground and protected from soiling by mud, dirt, or other materials. Elements can be stacked on top of each other to a maximum 7 layers high.

While we will organise and plan deliveries in accordance with your programme as earlier agreed with us (refer to Pre-construction Planning on page 1) we are unable to accept any responsibility for any delays with deliveries or construction progress arising from events outside our control such as unexpected access restrictions or force majeure.

Lifting and Placing Filigree Elements: The filigree elements must ONLY be lifted by the lattice beam girder reinforcement. Lifting hooks must ALWAYS be attached under the upper angles of the girder reinforcement diagonal web bars. Lifting hooks must NEVER be attached to the upper reinforcement mesh as this would be unsafe.



Stage 2 - Delivery, Lifting and Placing Elements continued

Lifting element into position



Positioning of Filigree Elements on Propping: It is important the elements are lifted into position in the planned erection system, and care is taken with correct positioning of the elements. Each element must be positioned the correct way round (often obvious from position of column cut outs and building shape, but please refer to element installation drawings) so the top chamfer along the longitudinal edge is butted up to the adjacent elements vertical longitudinal edge. Adjacent elements must NOT have their top chamfers facing together.

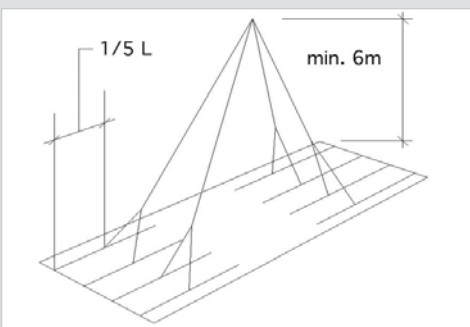
Important: During final positioning of the elements ensure the bubble pattern between adjacent elements are aligned as shown on the installation drawings, so the spaces between bubble rows on adjacent elements align to facilitate inserting splice reinforcement across the joint between elements.

Lifting hooks under girder diagonal web bars



It is your responsibility to organise and provide suitable lifting equipment. All lifting equipment must be tested and certified capable of lifting a minimum of 6 Tonnes, appropriate for the purpose as described below, and must meet all legal health and safety requirements.

Each individual element requires the use of EIGHT lifting hooks, in 2 parallel rows of 4 hooks each attached around the lattice girders positioned approx. 1/5 of the total element length in from each end. The upper part of the hoisting system (4 suited chains) must be at least 6 metres minimum in length. Chain branches to the eight lifting hooks must be equal lengths. When in use, care should be taken that lifting forces are equal at each lifting hook point and the element remains horizontal during lifting. Before lifting attach suitable ropes at two opposite corners of the element for guiding element into position on the propping beams.



Typical lifting chain configuration



Aligning bubbles between elements

For quick installation of the bottom splice reinforcement we recommend when the first element is in final position the bottom splice bars are temporarily slid fully in between the bubble rows on top of the pre-cast concrete layer before the adjacent element is placed. At a later stage please remember to slide the bottom splice bars back across the element joint between the bubble rows in the adjacent element, so the bars are finally positioned half in one element and half in the adjacent element prior to concreting.

Stage 3

– Fixing Loose Site Reinforcement.

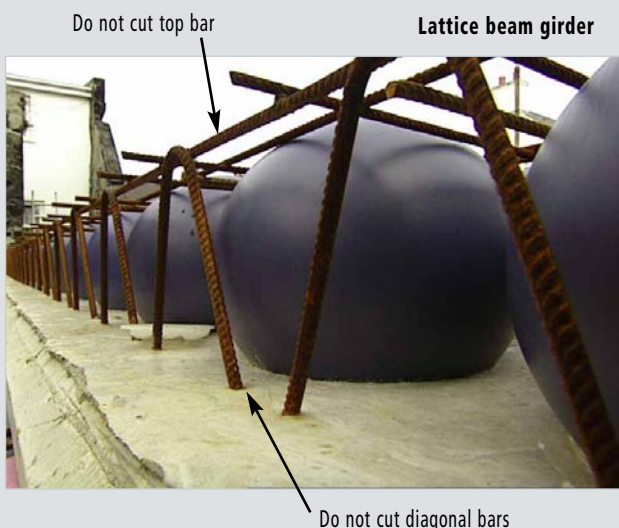
We provide site installation drawings for loose site reinforcement (supplied by others) fixed at the bottom of the slab (directly on top of the pre-cast concrete filigree permanent formwork without spacers or on top of site shuttering on spacers) and reinforcement fixed at the top of the slab (directly onto top mesh reinforcement), together with accompanying bar bending schedules. These must be studied and closely followed at all times, if you have any question please call our Site Advisor/Inspector or Head Office for assistance. The sequence for fixing loose reinforcement is at your discretion, however we recommend the following procedure is adopted:-



Sliding bottom splice bar central over joints

Site Adjustment of Filigree Elements: The filigree elements are designed and manufactured to suit the buildings configuration and column / wall layout. They arrive on site with cut-outs / recesses / steps for column or wall positions (including a 50-100mm construction tolerance margin between r.c. columns / walls and the pre-cast concrete layer) and larger service holes already formed, therefore they should not require any site adjustment. However it has been known for columns to be erected out of position on site and in this unusual event it is possible to carefully alter the filigree element with a disc cutter to maintain the margin between r.c. columns / walls and the elements pre-cast concrete biscuit.

Important: The upper and diagonal bars in the lattice beam girder reinforcement must NOT be cut on site as they have an important structural function both during lifting and once in place.



Cut-Outs, Recesses and Service Holes: During the manufacturing process polystyrene void formers are fixed in these locations to create areas without any concrete bottom biscuit. During erection of the elements these are quickly broken out with a suitable chisel and mallet.

Typical Reinforcement Type

1. Bottom Joint Splice Bars

Installation / Fixing Procedure

Inserted loose between every bubble directly on top of the pre-cast concrete biscuit permanent formwork. If they have been inserted into one element during lifting elements into position, as we recommend, then simply slide the bars across the joint between adjacent elements to sit with equal lengths both sides of the joint between elements.

2. Bottom Shear Bars

Inserted loose between bubbles in positions shown on drawings across holes, openings and returns in slabs where applicable

3. "Beam Strips" within Slab Depth

Where applicable assemble bars into cages and fix between and / or around columns (as shown on drawings)

4. Perimeter Hairpins / Bars

Slide hairpins in between bubble rows and slide in top / middle / bottom edge bars around slabs perimeter, tying to hairpins as shown on drawings

5. Column Shear Reinforcement

Insert bottom bars across columns directly on top of the pre-cast concrete bottom formwork. Fix bars over top mesh reinforcement (between the bubbles) across and around column heads as shown on drawings, tying in place to mesh.

Note: where shear studs or shear rails have been pre-cast into element at factory there may not be any bars to be fixed on site.

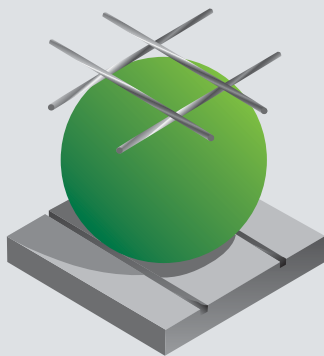
6. Top Joint / Top bar Reinforcement

Element joint splice reinforcement comprising either individual short bars or purpose made mesh sheets (supplied by others) are placed with the bars between bubble rows and tied in place equally across the joint between adjacent elements. In certain areas, for engineering reasons, additional top bar reinforcement will be required (supplied by others) which must be laid between bubble rows (not across top of bubbles) directly onto and tied to top mesh reinforcement, as shown on the drawings. The first layer of top additional bar reinforcement must be laid across top of lower bars of top mesh reinforcement to avoid unnecessarily reducing top concrete cover.

Other Loose Reinforcement

As building configurations vary it is not possible to describe all possible non-typical loose reinforcement configurations (such as cages for steps between main slab and cantilever slab) requiring site fixing. This non-typical reinforcement will be shown and detailed on the site installation drawings.

Important: Top joint and additional bar reinforcement first layer must be laid between bubble rows (not across top of bubbles) straight onto top of lower bars of top mesh reinforcement to avoid excessive layers of steel and difficulty with achieving required concrete cover.



Stage 4 – Constructing Shuttering

Once the perimeter loose reinforcement has been installed work on erecting perimeter and construction joint shuttering can commence. Temporary works are your responsibility to determine, but our recommendations are:-

Location	Shuttering Erection Procedure
Perimeter Shuttering	<p>Cut sheet of 18mm ply into strips to width of finished slab depth. Fix 75x50mm battens along back edge at top and bottom. Where BD element is tight to edge of finished slab simply plug and screw through bottom batten & ply shuttering straight into centre of pre-cast concrete permanent formwork edge. Fix top of ply shuttering by wire tying back to top mesh reinforcement from screws fixed into top batten.</p> <p>When an in-situ concrete edge strip has been planned to make up the overall floor-plate width then construct perimeter shuttering with timber gallows brackets & plywood perimeter / soffit shuttering in traditional manner, except bracket bottom batten can be plugged and screwed to underside of pre-cast concrete permanent formwork.</p>
Construction Tolerance margin around r.c. columns / walls *	<p>Cut sheet of 18mm ply into strips 150mm wide, plug and screw 50x50 battens to face of r.c. columns / walls (top 18mm below slab soffit), slide ply into position. Plug and screw external edge of ply shuttering into underside of pre-cast concrete permanent formwork.</p> <p>* Note: When our combined column / wall and BubbleDeck construction method is adopted (see page 6) the pre-assembled column / wall formwork top flange eliminates any need for this operation.</p>
Construction tolerance joints between groups of elements	<p>Cut sheet of 18mm ply into strips 180mm wide and prop up to underside of pre-cast concrete permanent formwork.</p>

Note: We can manufacture and supply pre-cast into edge of elements a pre-fabricated "BubbleDeck Quick Edge" steel permanent formwork, eliminating the need for constructing perimeter shuttering on site – enquire for further details at time of placing order.

Stage 5 – Preparation for Concreting

The pre-cast concrete permanent formwork edges are manufactured to a high accuracy and care taken to get a tight joint during laying the elements can render joint filling unnecessary. When joints between slab elements have not been closely butted they must be filled to prevent grout seepage. Should this be required joint filling can be undertaken with either mortar grout or a small bead of silicone sealant inserted at the bottom of the splay joint between elements. This is most easily undertaken prior to installing the loose splice reinforcement.

Important:

– expanding foam must NOT be used for joint filling as the uncontrollable thickness can adversely reduce concrete cover to splice reinforcement impairing durability and fire resistance of the finished slab.

Prior to pouring topping concrete remove element labels, unused tying wire, unused reinforcement, loose concrete and all other debris or foreign matter. Then immediately before placing in-situ concrete power-wash top of the pre-cast concrete permanent formwork to clean off residual dirt and moisten the pre-cast concrete surface.

Important:

– maintain the pre-cast concrete biscuit top surface, particularly during hot weather, in a damp (not wet) condition to ensure a good bond between the pre-cast concrete permanent formwork concrete and the in-situ concrete.



Pouring, Vibrating & Floating Site Concrete

Stage 7 – Pouring Topping Concrete

Important: When ordering concrete please take into account the volume taken up by the bubble void formers mean the concrete volume is NOT arrived at by taking the pour area x depth from top of shuttering to pre-cast concrete permanent formwork. The concrete volume to order can be estimated, dependant upon BubbleDeck slab depth type, from the following table:-

When pouring concrete evenly distribute across the area and avoid placing in heaps. Due to the limited space between the bubbles a thin vibrating

BubbleDeck Slab Type	Overall Slab Depth (inc. pre-cast filigree)	Concrete pour Volume m ³ / m ² plan area	Max aggregate size
BD230- A	230 mm	0.112	10mm
BD280- A	280 mm	0.147	10mm
BD340- A	340 mm	0.192	15mm
BD390- A	390 mm	0.224	15mm
BD450- A	450 mm	0.271	15mm
BD510- A	510 mm	0.316	15mm
BD600- A	600 mm	0.374	15mm

poker MUST be used to compact the concrete,

remove any entrained air and to ensure a good flow around the bubbles. Avoid separation occurring due to the vibrating of shuttering, reinforcement and/or bubbles that can result in segregation of the concrete mix. Once the concrete has been poured a steel beam or power float is then used to level the top and finish to an even and level surface.

Stage 6 – BubbleDeck Site Inspection

Once you are able to predict when all loose reinforcement will be fixed please contact our Site Advisor/Inspector to notify the date you intend to pour concrete and arrange our site inspection. He will then arrange for our technical representative to visit site and undertake a full inspection of the BubbleDeck element and loose reinforcement installation. Following inspection our technical representative will issue you with an inspection record listing any work that needs to be undertaken prior to site concreting, or confirming the installation is ready for concreting and the work is to our approval.

Important:

– While we always seek to provide a quick and efficient service we do need at least 2 working days notice of any site concrete pour to be able to ensure our inspection team are available to attend site. It is essential we are able to inspect prior to site concreting in order to be able to cover your project with our Professional Indemnity and Product Liability Insurance cover.

Stage 8 – Removing Temporary Propping

During construction planning we will confirm to you the minimum period for removal of propping before back-propping. This is usually between 3 to 5 days from pouring of the site concrete as long as the early concrete test results have confirmed the site concrete has reached at least 60% of its final design strength, but can vary dependant upon our floor slab design, strength of site concrete, and ambient temperatures.

Once you have received the 3-5 day concrete test results please forward them to our Head Office, our technical team will then confirm to you it is acceptable to remove temporary propping. If you are then proceeding to construct another floor immediately above the one just completed please refer to the section about Back Propping on Page 5 of this Manual.

Subsequent Site Operations

Lightweight Fixings

There is a minimum of 20mm concrete below the centre of each bubble, but just a short distance away from the bubble centre the concrete depth quickly increases to 70mm plus up the side of each bubble. Therefore fixings for attaching light and medium weight articles can be made using normal methods (plug & screw / expanding anchors, etc.) to provide adequate fixings for wiring conduits, small cable trays, small ventilation ducts and the like.

Heavy Weight Fixings

Where stronger fixings are required to resist higher pull out (downward) forces from heavy loads to be suspended from the soffit we recommend our Bubble layout drawings are inspected to determine where fixings will occur directly below or close to the edge of a bubble. Where fixing locations and lengths are likely to project into a bubble void we recommend Hilti HIT HY20 Injection Resin Anchor with HIT sieve, item no. 00068613, are used. Hilti also produce a range of other fixing systems designed for fixing through into voids.

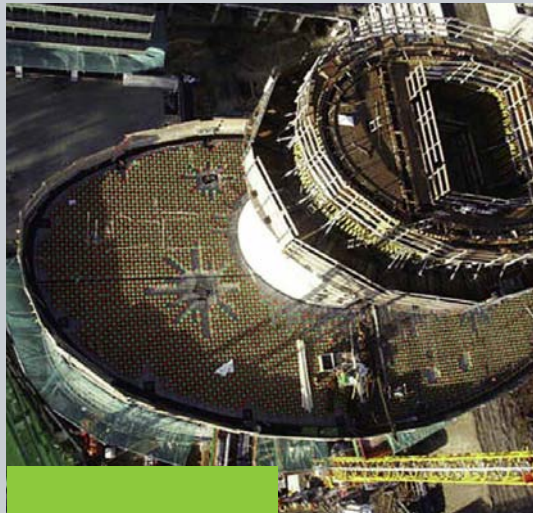
Holes through slabs

Holes can easily be diamond core drilled through the completed BubbleDeck slab. Due to the two way spanning attributes of BubbleDeck slabs there are few limitations on the positioning of holes, except near columns where loads are transferred from the slab into the columns and shear forces are highest.

Service risers larger than 250mm square should be designed into the slab for forming in the factory & boxed out on site prior to pouring insitu concrete. Pipe holes up to around 250mm diameter are best diamond core drilled after casting of slabs to ensure optimum vertical alignment. There is great flexibility where these can be placed because the slab will span around such holes. The only limitations are to avoid cutting off too much support when holes are formed near supporting columns / walls, or a series of holes in a row in certain situations, but these can be allowed for during design stage.

Prior to forming holes in completed slabs larger than 250mm diameter, within 500mm of a supporting column / wall, or multiple holes in close proximity please refer to our Technical Department for advice before undertaking such works.

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